RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT

S7 CE

B TECH IN CIVIL ENGINEERING

RAJAGIRI SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

VISION

The department strives to excel in the areas of academia, research and industry by moulding professionals in the field of Civil Engineering to build a sustainable world.

MISSION

To impart quality education and mould technically sound, ethically responsible professionals in the field of Civil Engineering with a broad skill set of creativity, critical thinking and effective communication skills to meet the desired needs of the society within realistic socio-economic environmental constraints.

Program Educational Objectives (PEOs)

Within a few years of graduation, the candidate is expected to have achieved the following objectives:

PEO 1: Knowledge in Civil Engineering: Graduates shall attain state of the art knowledge in the various fields of Civil Engineering and will take every opportunity coming their way to augment the already existing knowledge.

PEO 2: Successful in career: Graduates shall achieve successful career which they will be able to commit to with responsibility and passion.

PEO 3: Commitment to society: Graduates shall display a high sense of social responsibility and ethical thinking and suggest sustainable engineering solutions

Program Specific Outcomes (PSOs)

Civil Engineering Graduates will be able to:

PSO 1: Structural Analysis & Design Skills: Acquire ability to analyse, design and develop feasible solutions with emphasis to earthquake resistant design.

PSO 2: Professional Skills: Acquire ability to confront real time problems by developing sustainable solutions.

PSO 3: Interdisciplinary Skills: Graduates will be able to collaborate with engineers from other disciplines to develop products for the betterment of the society.

Program Outcomes (POs)

Engineering Graduates will be able to:

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

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

PO 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.

PO 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.

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

PO 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.

PO 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.

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

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

PO 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.

PO 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.

PO 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.

INDEX

ASSIGNMENT SCHEDULE

DATE	SUB. CODE	SUBJECT
1.9.2018	CE 401	Design of Steel Structures
3.9.2018	CE 403	Structural Analysis – III
4.9.2018	CE 405	Environmental Engineering- I
5.9.2018	CE 407	Transportation Engineering -II
6.9.2018	CE 409	Quantity Surveying and Valuation
7.9.2018	CE 465	Geo-Environmental Engineering
7.9.2018	CE 469	Environmental Impact Assessment
7.9.2018	CE 473	Advanced Computational Techniques and Optimization
2.11.2018	CE 401	Design of Steel Structures
5.11.2018	CE 403	Structural Analysis – III
7.11.2018	CE 405	Environmental Engineering- I
9.11.2018	CE 407	Transportation Engineering -II
12.11.2018	CE 409	Quantity Surveying and Valuation
14.11.2018	CE 465	Geo-Environmental Engineering
14.11.2018	CE 469	Environmental Impact Assessment
14.11.2018	CE 473	Advanced Computational Techniques and Optimization

SCHEME: B.TECH 7TH SEMESTER

COURSE CODE	COURSE NAME	L-T-P	CREDITS	EXAM SLOT
CE 401	Design of Steel Structures	4-0-0	4	A
CE 403	Structural Analysis – III	3-0-0	3	B
CE 405	Environmental Engineering- I	3-0-0	3	C
CE 407	Transportation Engineering -II	3-0-0	3	D
CE 409	Quantity Surveying and Valuation	3-0-0	3	E
	Elective 3	3-0-0	3	F
CE451	Seminar & Project Preliminary	0-1-4	2	S
CE431	Environmental Engineering Lab	0-0-3	1	T

Total Credits = 22 Hours: 27 Cumulative Credits= 162

Elective 3:-

1. CE461 Water Hydrodynamics and Coastal Engineering
2. CE463 Bridge Engineering
3. CE465 Geo-Environmental Engineering
4. CE467 Highway Pavement Design
5. CE469 Environmental Impact Assessment
6. CE471 Advanced Structural Design
7. CE473 Advanced Computational Techniques and Optimization

A

CE 401
DESIGN OF STEEL STRUCTURES

COURSE INFORMATION SHEET

PROGRAMME: CE	**DEGREE**: BTECH
COURSE: DESIGN OF STEEL STRUCTURES	**SEMESTER:** S7 **L-T-P-CREDITS**: 3-0-0-3
COURSE CODE: CE401	**COURSE TYPE**: CORE
COURSE AREA/DOMAIN: CIVIL ENGINEERING	**CONTACT HOURS**: 4 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	**LAB COURSE NAME**: NIL

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to steel and steel structures, properties of steel, structural steel sections, Introduction to design: Design loads and load combinations, limit state design concepts, Connections bolted and welded(direct loads)	9
II	Tension members-Types of sections- net area- design of tension members-concept of shear lag- use of lug angle-connections in tension members	9
III	Compression members- design of struts-solid and built up columns for axial loads- design of lacings and battens- column bases-slab base-gusseted base	10
IV	Design of beams- laterally restrained and un restrained – simple and compound beams – plate girders subjected to uniformly distributed loads – design of stiffeners.	9
V	Design of roof trusses- types- design loads and load combinations-assessment of wind loads- design of purlins.Moment resistant/Eccentric connections(in plane and out of plane)	10
VI	Design of timber structures: types of timber – classification – allowable stresses-design of beams- flexure, shear, bearing and deflection considerations- design of columns. Design of composite beam sections with timber and steel.	9
TOTAL HOURS		56

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	L S Jayagopal,D Testing, Design Of steel structures Chand&Company,2015
T2	S K Duggal, Limit State design of steel structures, Tata Mc Graw Hill,2010
T3	Subramanian N,Design of Steel structures,Oxford University Press,2011
T4	P.Dayaratnam,Design of Steel Structures,Wheeler Publishing,2003
R1	PunmiaB.C., Jain A.K.and Jain A.K, Design of Steel Structures,Laxmi Publications(P)Ltd,2017
R2	Raghupathi,Steel Structures, Tata Mc Graw Hill,2016

T/R	BOOK TITLE/AUTHORS/PUBLICATION
R3	Ramachandra S and Virendra Gehiot, Design of Steel Structures Vol.II,Standard Book House,2007
R4	V L Shah & Veena Gore,Limit State design of steel structures,Structures Publications,2009
R5	William T Segui,Steel Design,Cenage Learning, 6e,2017
R6	IS 800- 2007, Code of practice for Structural steel design, BIS

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEMESTER
PY100	Engineering physics	Concept of Force vectors	S1
BE100	Engineering Mechanics	Basic concept of Force and its applications	S1
CE202	Structural Analysis 1	Concepts of Bending moment and Shear force	S4

COURSE OBJECTIVES:

1	To introduce the limit state design of steel structural components subjected to bending, compression and tensile loads including the connections
2	To enable design of structural components using timber.

COURE OUTCOMES:

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Students will be able to design bolted and welded connections											
	H	M	M									
2	Ability of the students to design tension members and beams using the IS specifications											
	H											
3	Ability of the students to design columns under axial loads using IS specifications											
	M	M	M									
4	Students will be capable of designing beams and plate girders.											
	M	H	M									
5	Students will be able to assess loads on truss and design purlins											
	M	M	M									
6	Students will be able to design structural components using timber											
	M						H					

JUSTIFICATION FOR CO-PO MAPPING:

CO	PO	MAPPING	JUSTIFICATION
CO1	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of designing of bolted and welded connections.
	PO2	MEDIUM	The students will be able to identify and analyse the connections in the limit state design reaching substantiated conclusions using first principles of mathematics and engineering sciences
	PO3	MEDIUM	The students will be able to design solutions for the design of load and load combinations and design system components that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
CO2	PO2	HIGH	The students will be able to identify, formulate and review research literature and analyse complex engineering problems in designing the tension members and beams using first principles of mathematics, natural sciences, and engineering sciences
CO3	PO1	MEDIUM	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to design steel columns under axial loads
	PO2	MEDIUM	The students will be able to identify and formulate reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
	PO3	MEDIUM	The students will be able to initiate the design solutions for steel structures and design system components that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
CO4	PO1	MEDIUM	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to design
	PO2	HIGH	The students will be able to identify, formulate, review research literature, and analyse complex engineering problems in designing steel beams and plate girders reaching substantiated conclusions using first principles of mathematics, natural science and engineering science.
	PO3	MEDIUM	The students will be able to design solutions for complex engineering problems and design components of beams and

CO	PO	MAPPING	JUSTIFICATION
			plate girders that meet the specific needs for the public health and safety.
CO5	PO1	MEDIUM	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems in designing roof truss.
	PO2	MEDIUM	The students will be able to identify and formulate the design of roof truss and purlins reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
	PO3	MEDIUM	The students will be able to initiate the design solutions for structures and design system components that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
CO6	PO1	MEDIUM	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of designing structural components of timber sections
	PO7	HIGH	Understand the impact of the professional engineering solutions in societal and environmental contexts by using material timber for the construction purpose and demonstrate the knowledge of and need for sustainable development.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl No	DESCRIPTION	PROPOSED ACTIONS
1	Comparison of various design methods and materials available	Seminars, Assignments

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl No	DESCRIPTION
1	Concept of Torsion

WEB SOURCE REFERENCES:

Sl No	DESCRIPTION
1	www.nptel.ac.in
2	INSDAG materials

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK	✓	**STUD. ASSIGNMENT**	✓	WEB RESOURCES	
LCD/SMART BOARDS		STUD. SEMINARS		ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS	✓	STUD. SEMINARS		**TESTS/MODEL EXAMS**	✓	**UNIV. EXAMINATION**	✓
STUD. LAB PRACTICES		STUD. VIVA		MINI/MAJOR PROJECTS		CERTIFICATIONS	
ADD-ON COURSES		OTHERS					

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓	**STUDENT FEEDBACK ON FACULTY (TWICE)**	✓
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS		OTHERS	

Prepared by
ANITHA VARGHESE

Approved by
Dr. Aysha Zeneeb Majeed

COURSE PLAN

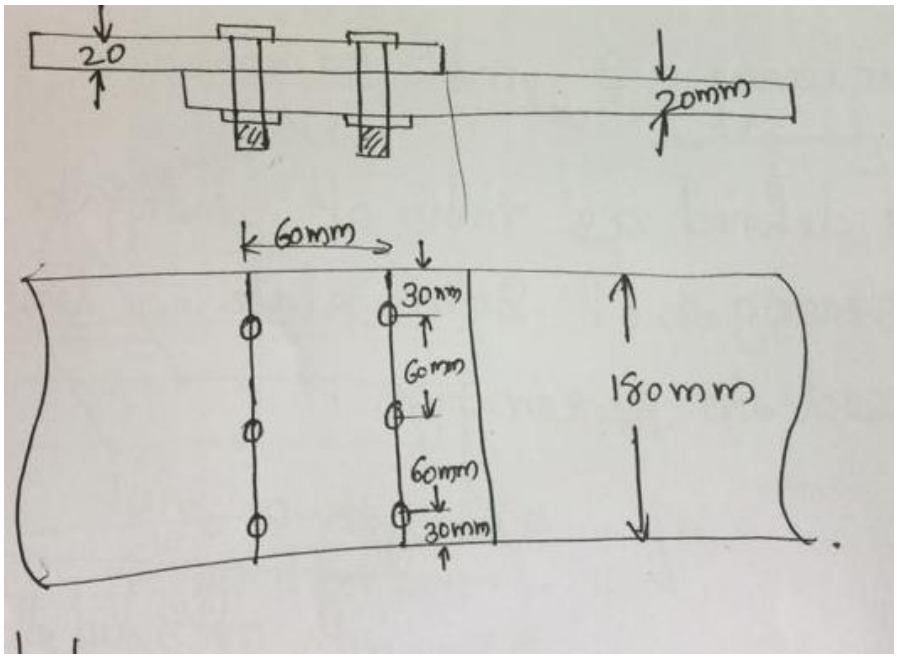
HOUR	MODULE	TOPICS PLANNED
HOUR 1	1	Introduction to steel and steel structures
HOUR 2	1	Properties of steel, structural steel sections
HOUR 3	1	Bolted connections and welded connections,different types
HOUR 4	1	Advantages and disadvantages,lap joint,Butt joint
HOUR 5	1	Design loads and load combinations ,limit state design concepts
HOUR 6	1	Problem in bolt connection
HOUR 7	1	Contd...
HOUR 8	1	Problem in welded connection
HOUR 9	1	Contd....
HOUR 10	1	Discussion on problem
HOUR 11	1	Discussion on problem
HOUR 12	2	Tension member definition ,types of sections
HOUR 13	2	Design of tension member ,procedure steps
HOUR 14	2	Contd..
HOUR 15	2	Shear lug angle concept ,uses
HOUR 16	2	Problem 1 on Tension member
HOUR 17	2	Contd..
HOUR 18	2	Contd...
HOUR 19	2	Problem 2
HOUR 20	2	Contd
HOUR 21	2	Contd
HOUR 22	2	Discussion
HOUR 23	2	Discussion
HOUR 24	3	Compression member definition ,design of struts theory
HOUR 25	3	Problem
HOUR 26	3	Design of solid and built up columns for axial load ,problem
HOUR 27	3	Contd..
HOUR 28	3	Design of lacing, problem
HOUR 29	3	Design of batten ,problem
HOUR 30	3	Design of column base
HOUR 31	3	Design of slab base
HOUR 32	3	Design of gusseted base
HOUR 33	3	Discussion
HOUR 34	4	Problem on Design of beams laterally restrained
HOUR 35	4	Contd....
HOUR 36	4	Problem on design of beams unrestrained
HOUR 37	4	Contd.....
HOUR 38	4	Discussion
HOUR 39	4	Discussion
HOUR 40	4	Plate girders subjected to uniformly distributed load
HOUR 41	4	Contd.....
HOUR 42	4	Contd....

HOUR 43	4	Contd.....
HOUR 44	4	Design of Stiffners
HOUR 45	4	Contd.....
HOUR 46	4	Contd.....
HOUR 47	4	Discussion
HOUR 48	4	Discussion
HOUR 49	5	Roof truss types ,parts of roof truss
HOUR 50	5	Design load and load combinations
HOUR 51	5	Design of Roof truss
HOUR 52	5	Contd.....
HOUR 53	5	Contd.....
HOUR 54	5	Contd....
HOUR 55	5	Contd.....
HOUR 57	5	Contd.....
HOUR 58	5	Contd.....
HOUR 59	5	Types of timber, classification ,allowable stresses
HOUR 60	5	Design of beams
HOUR 61	5	Contd...
HOUR 62	5	Contd.....
HOUR 63	5	Contd.....
HOUR 64	5	Design of columns
HOUR 65	5	Contd.....
HOUR 59	5	Contd.....
HOUR 60	5	Design of composite sections. steel and timber
HOUR 61	5	Contd.....
HOUR 62	5	Contd.....

ASSIGNMENT – I

All questions are compulsory

1. Find efficiency of Lap joint shown in the fig .Given M20 bolts of grade 4.6 and Fe410(E250) plates are used

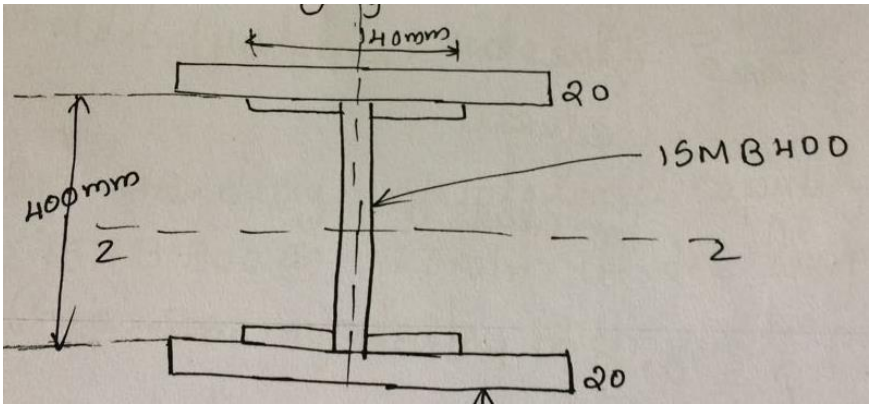


2. Design a lap joint between two plates each of width 120mm,if the thickness of one plate is 16mm and the other is 12mm.The joint has to transfer a design load of 160kn.The plates are of Fe410 grade .Use bearing type bolt.
3. Explain the properties of Steel in detail
4. Explain different types of structural steel sections

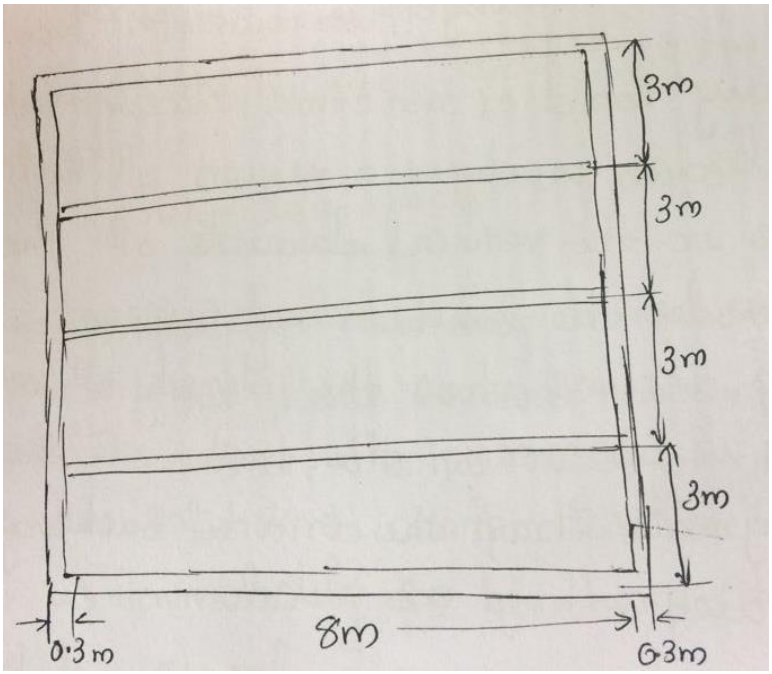
ASSIGNMENT – II

All questions are compulsory

1. Determine the load carrying capacity of column section shown in fig.If its actual length is 4.5 m. Its one end may be assumed to be fixed and the other end is hinged



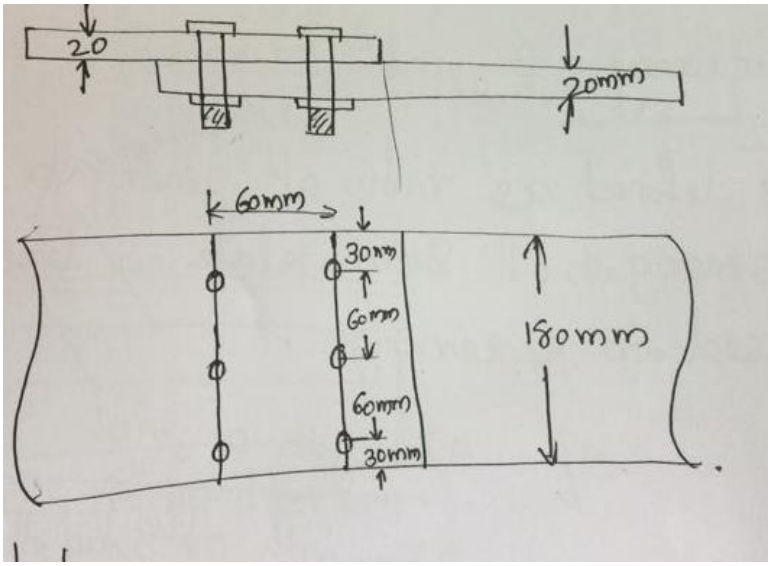
2. Calculate the moment carrying capacity of laterally unrestrained beam made of ISMB 400 and length of member is equal to4m. Also find maximum factored load that can be carried by the beam.
3. A roof of a hall measuring 8mx12m consists of 100mm thick RCC slab supported on steel I beams spaced 3m apart as shown in the fig .The finishing load may be taken as 1.5 kN/m2 and live load as 1.5 kN/m2. Design the steel beam



QUESTION BANK

Module 1

1. Explain properties of steel. Explain its advantages and disadvantages
2. Explain structural steel sections
3. What are the different types of loads acting on steel sections and its effects
4. Explain limit state of design
5. Explain types of bolted connections
6. Explain classification of bolt connections
7. Explain advantages and disadvantages of High Strength Friction Grip Bolt
8. What are the advantages of bolt connection
9. Explain types of bolted joint and types of failures
10. Find efficiency of Lap joint shown in the fig .Given M20 bolts of grade 4.6 and Fe410(E250) plates are used



11. Design a lap joint between two plates each of width 120mm,if the thickness of one plate is 16mm and the other is 12mm.The joint has to transfer a design load of 160kn.The plates are of Fe410 grade .Use bearing type bolt.
12. Explain advantages and disadvantages of welded connections
13. Types of welded connections
14. A 18mm thick plate is joined to a 16mm plate by 2oom long butt weld. Determine strength of joint if,
    a. A double V butt weld is used
    b. A single V butt weld is used.

    Assume that Fe410grade plates and shop weld are used.

Module II

1. What are the types of Tension members? Explain
2. Explain net sectional area of a tension member
3. Explain the procedures followed in the design of an axially loaded tension member
4. Explain the procedures in the design of a tension member subjected to axial load and Bending moment
5. Explain the concept of shear lag
6. What is Lug Angle? Where it is used?
7. Write short notes on member splices and Gusset plate.
8. Explain different modes of failure of Tension members
9. Determine the tensile strength of a roof truss diagonal 100x75x10mm.The longer leg is connected to the gusset plate with 20mm diameter bolts in one row. Number of bolts used is 6, the edge/end distance=30mm and pitch=50mm
10. Design a tension member to carry a factored force of 340kN. Use 20mm diameter black bolts and a gusset plate of 8mm thick.
11. A tension member of truss consists of a single angle ISA 125X75X10mm carrying a factored load of 300kn if 20mm diameter bolts are used .Design the connection to a gusset plate using a lug angle.

Module III

1. With neat sketches explain different types of the following
    a. Splices
    b. Base connections
2. Determine the load carrying capacity of a strut made with ISA 10075, 10mm, if its length is 2.8m in the following cases of connections
    a. One bolt used
    b. Two bolts used
    c. Welded rigidly to gusset plate
3. Design a gusseted base to carry an axial factored load of 3000Kn.The column is ISHB450@855N/m with two 250x22mm cover plates on either side. The effective height of the column is 5m.The column is to rest on M20 concrete pedestal.

Module IV

1. Distinguish between laterally restrained and unrestrained beams
2. What is meant by a Stiffener? Explain with sketches
3. What is a plate girder? Where it is used?
4. Design the floor beam shown in fig. The beam is laterally restrained. Check for shear and deflection

5. Design a built up column with two channels placed face toface.The column is of 6.6m effective length and supports a load of 1080Kn.Also design the Lacing
6. Design a built up column with four angles laced together. The effective length of the column is 7.2m and it supports a load of 1800Kn
7. A column section ISHB 225@459.1 n/m is to be spliced at floor level. The forces at the section are axial load, transverse shear and bending moment of 325Kn, 90kn, 31knm respectively. Design a suitable splice
8. A plate girder with Fe415 steel plate is having 12mmX1500mm web plates and 56mmX500 mm flange plates. Determine the
    a. Design flexural strength, if the compression flange is supported laterally.
    b. Design strength in shear if no intermediate stiffeners are used
    c. Design shear strength, if stiffeners are provided at every 2m interval.
9. The following data refers to a gantry girder on which an electrically operated crane of capacity 200kn moves,

    Span of gantry girder =6m
    Span of crane girder =18m
    Crane capacity =200Kn
    Self weight of crane girder =180kn
    Self weight of trolley =75Kn
    Minimum hook approach =1m
    Distance between wheels =3.5 m
    Self Weight of rails =.3Kn/m

    Determine
    a. The maximum moment and shear force due to vertical and horizontal loads
    b. Check whether ISMB 600 with ISMC 300 on compression flange is adequate to
        i. Carry moment
        ii. Carry shear force
        iii. In buckling resistance
        iv. In limiting deflections

Module V

1. Different types of Roof truss?
2. Explain the loads and load combinations acting on roof truss
3. Design a roof truss of span 15m spacing 4m o be built near Visakapattanam.

    Class of building-General with life of 50 years.
    Terrain category- 2
    Maximum dimension -40m
    Width of building -15m
    Height at eve level -8m
    Topography -Theta less than 3degrees
    Permeability -Medium

Span of truss -15m
Pitch -1/5
Sheeting -AC sheets
Spacing of purlins -1.35 m
Spacing of trusses -4m

Module VI

1. Explain the procedure for designing of a Timber beam
2. Explain the procedure for designing of a Timber column
3. Explain the procedure for designing of a composite beam with steel and timber

B

CE 403
STRUCTURAL ANALYSIS - III

COURSE INFORMATION SHEET

PROGRAMME: CE	**DEGREE**: BTECH
COURSE: STRUCTURAL ANALYSIS - III	**SEMESTER:** S7 **L-T-P-CREDITS**: 3-0-0-3
COURSE CODE: CE403 **REGULATION**: 2016	**COURSE TYPE**: CORE
COURSE AREA/DOMAIN: CIVIL ENGINEERING	**CONTACT HOURS**: 4 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	**LAB COURSE NAME**: NIL

SYLLABUS:

UNIT	DETAILS	HOURS
I	Approximate Methods of Analysis of Multi-storeyed Frames: Analysis for vertical loads-substitute frames – loading condition for maximum hogging and sagging moments in beams and maximum bending moment in columns – wind load analysis of multi-storeyed frames – portal method and cantilever method for lateral load analysis.	6
II	Matrix analysis of structures: static and kinematic indeterminacy – force and displacement method of analysis – definition of flexibility and stiffness influence coefficients – Concepts of physical approach	6
III	Flexibility method: flexibility matrices for truss and frame elements – load transformation matrix – developmentt of total flexibility matrix of the structure – analysis of simple structures – plane truss and plane frame – nodal loads and element loads – lack of fit and temperature effects	7
IV	Stiffness method: Development of stiffness matrices by physical approach – stiffness matrices for truss and frame elements – displacement transformation matrix – analysis of simple structures – plane truss and plane frame – nodal loads and element loads – lack of fit and temperature effects	7
V	Introduction to direct stiffness method – Rotation of axes in two dimensions, stiffness matrix of elements in global co-ordinates from element co-ordinates – assembly of load vector and stiffness matrix, solution of two span continuous beam – single bay single storey portal frame.	8
VI	Structural dynamics – introduction – degrees of freedom – single degree of freedom subjected to harmonic load – linear systems – equation of motion, D'Alembert's principle – damping – free response of damped and undamped systems – logarithmic decrement – transient and steady state responses, Dynamic magnification factor – Vibration isolation – Concept of two degree of freedom systems (No derivation and numerical problems)	8
TOTAL HOURS		42

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	G S Pandit and S P Gupta, Structural analysis a Matrix approach, McGraw Hill Education (India), 2e, 2008
T2	Gere, J.M. and William Weaver, Matrix Analysis of framed structures, CBS Publishers, 1990
T3	Kenneth M Leet, Chia Ming Uang, Anne M Gilbert, Fundamentals of structural analysis, Tata McGraw Hill Pvt Ltd., 4e, 2010
T4	Reddy, C.S., Basic Structural Analysis, Tata McGraw Hill, 3e, 2011
R1	Anil. K. Chopra, Dynamics of structures, Pearson Education/ Prentice Hall India, 5e, 2016
R2	Clough R.W. and Penzein, J., Dynamics of structures, Tata McGraw Hill, 1995
R3	Madhujith Mukhopadhyay and Abdul Hamid Sheikh, Matrix and Finite Element Analysis of Structures, Ane Books India, 2009
R4	Mario Paz , Structural Dynamics: Theory & Computation, 2e, CBS Publishers, 2004
R5	Rajasekharan. S. and Sankarasubramanian G., Computational structural Mechanics, PHI, 2009
R6	Wang C.K., Matrix method of structural analysis, International Text book company, 1970

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEMESTER
BE100	Engineering Mechanics	Fundamentals of application of load	S1
CE201	Mechanics of Solids	Loads and supports. Drawing the bending moment diagrams and shear force diagrams of basic determinate structures	S3
CE202	Structural Analysis - I	Calculation of deflection, introduction to statically indeterminate structures	S4
CE303	Structural Analysis - II	Analysis of statically indeterminate structures	S5

COURSE OBJECTIVES:

1	To enable the students to have a comprehensive idea of matrix structural analysis with emphasis on the relative advantages of the flexibility method and the stiffness method
2	To enable the students to visualize structural dynamics problems with a proper blend of structural analysis and vibration theory

COURSE OUTCOMES:

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	The students will be able to analyse multi-storeyed frames for vertical and horizontal loads											
	H	H	M									
2	The students will be able to understand the basic concepts and definitions of matrix analysis of structures											
		L										
3	The students will be able to develop flexibility matrix of a structure											
	H	M	L									
4	The students will be able to analyse simple plane trusses and plane frames using flexibility method											
	H	H	M									
5	The students will be able to develop stiffness matrix of a structure											
	H	M	L									
6	The students will be able to analyse simple plane trusses and plane frames using stiffness method (physical approach)											
	H	H	M									
7	The students will be able to analyse simple plane trusses and plane frames using direct stiffness method											
	H	H	M									
8	The students will be able to understand the basic concepts of structural dynamics											
	M	L										

JUSTIFICATION FOR CO-PO MAPPING:

CO	PO	MAPPING	JUSTIFICATION
CO1	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of multi-storeyed frames
	PO2	HIGH	The students will be able to identify and analyse multi-storeyed frames reaching substantiated conclusions using first principles of mathematics and engineering sciences
	PO3	MEDIUM	The students will be able to design solutions for multi-storeyed frames and design system components that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
CO2	PO2	LOW	The students will be able to identify, formulate and review research literature for matrix methods reaching

CO	PO	MAPPING	JUSTIFICATION
			substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
CO3	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to develop flexibility matrix
	PO2	MEDIUM	The students will be able to identify and formulate flexibility matrix reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
	PO3	LOW	The students will be able to initiate the design solutions for structures and design system components that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
CO4	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of plane trusses and plane frames using flexibility method
	PO2	HIGH	The students will be able to identify, formulate, review research literature, and analyse plane trusses and plane frames using flexibility method reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
	PO3	MEDIUM	The students will be able to design solutions for plane trusses and plane frames using flexibility method
CO5	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to develop stiffness matrix
	PO2	MEDIUM	The students will be able to identify and formulate stiffness matrix reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
	PO3	LOW	The students will be able to initiate the design solutions for structures and design system components that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
CO6	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of plane trusses and plane frames using stiffness method (physical approach)

CO	PO	MAPPING	JUSTIFICATION
	PO2	HIGH	The students will be able to identify, formulate, review research literature, and analyse plane trusses and plane frames using stiffness method (physical approach) reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
	PO3	MEDIUM	The students will be able to design solutions for plane trusses and plane frames using stiffness method (physical approach)
CO7	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of plane trusses and plane frames using direct stiffness method.
	PO2	HIGH	The students will be able to identify, formulate, review research literature, and analyse plane trusses and plane frames using direct stiffness method reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
	PO3	MEDIUM	The students will be able to design solutions for plane trusses and plane frames using direct stiffness method
CO8	PO1	MEDIUM	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization understand the basic concepts of structural dynamics
	PO2	LOW	The students will be able to identify and formulate basic concepts of structural dynamics reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl No	DESCRIPTION	PROPOSED ACTIONS
1	Characteristics of stiffness and flexibility matrix	Assignment

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl No	DESCRIPTION
1	Developing a C++ program or an excel sheet to analyse structures using stiffness method

WEB SOURCE REFERENCES:

Sl No	DESCRIPTION
1	www.nptel.ac.in

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK	✓	**STUD. ASSIGNMENT**	✓	WEB RESOURCES	
LCD/SMART BOARDS		STUD. SEMINARS		ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS	✓	STUD. SEMINARS		**TESTS/MODEL EXAMS**	✓	**UNIV. EXAMINATION**	✓
STUD. LAB PRACTICES		STUD. VIVA		MINI/MAJOR PROJECTS		CERTIFICATIONS	
ADD-ON COURSES		OTHERS					

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓	**STUDENT FEEDBACK ON FACULTY (TWICE)**	✓
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS		OTHERS	

Prepared by
Nimisha Reji

Approved by
Dr. Aysha Zeneeb Majeed

COURSE PLAN

HOUR	MODULE	TOPICS PLANNED
HOUR 1	1	Introduction, substitute frame method
HOUR 2		Problem 1.1
HOUR 3		Problem 1.2
HOUR 4		Problem 1.2 contd…
HOUR 5		Lateral load analysis, portal method, problem 1.3
HOUR 6		Cantilever method. Problem 1.4
HOUR 7		Problem 1.5
HOUR 8	2	Static indeterminacy
HOUR 9		Internal indeterminacy, problems
HOUR 10		Kinematic indeterminacy
HOUR 11		Problems
HOUR 12		Methods of analysis
HOUR 13		Flexibility and stiffness
HOUR 14	3	Flexibility method, steps, flexibility influence coefficients
HOUR 15		Equivalent joint loads, problems on analysis of beams
HOUR 16		Problems on analysis of beams
HOUR 17		Problems on analysis of frames
HOUR 18		Problems on analysis of frames
HOUR 19		Problems on analysis of trusses
HOUR 20		Problems on analysis of trusses
HOUR 21	4	Stiffness method, steps, stiffness influence coefficients
HOUR 22		Problems on analysis of beams
HOUR 23		Problems on analysis of beams
HOUR 24		Problems on analysis of frames
HOUR 25		Problems on analysis of frames
HOUR 26		Problems on analysis of trusses
HOUR 27		Problems on analysis of trusses
HOUR 28	5	Direct stiffness method, steps
HOUR 29		Stiffness matrix of elements
HOUR 30		Problems on analysis of beams
HOUR 31		Problems on analysis of beams
HOUR 32		Problems on analysis of beams
HOUR 33		Problems on analysis of frames
HOUR 34		Problems on analysis of frames
HOUR 35		Problems on analysis of frames
HOUR 36	6	Structural dynamics - introduction, degrees of freedom
HOUR 37		Single degree of freedom subjected to harmonic load, linear systems
HOUR 38		Equations of motion, D'Alembert's principle
HOUR 39		Free response of damped and undamped systems
HOUR 40		Logarithmic decrement
HOUR 41		Transient and steady state vibrations
HOUR 42		Dynamic magnification factor, vibration isolation
HOUR 43		Concept of two degree of freedom system

ASSIGNMENT – I

All questions are compulsory

1. Analyse the building frame shown in Fig. 1 for **gravity loads only** by substitute frame method. Draw BMD for the 1st floor and tabulate the maximum values obtained for the following cases:
   a. Maximum sagging moment at the centre of each of the 4 spans in 1st floor
   b. Maximum hogging moment at the centre of each of the 4 spans in 1st floor
   c. Maximum hogging moment at each support in 1st floor
   d. Maximum moment in columns

   All floors and bays are loaded as follows:
   At intermediate floors: LL = 15 kN/m and DL = 10 kN/m
   At roof level: LL = 12 kN/m and DL = 10 kN/m
   Size of columns = 300mm x 550mm (550mm parallel to the plane of frames)
   Size of beams = 300mm x 450mm

2. Analyse the building frame shown in Fig. 1 for lateral loads of magnitude 50kN, 70kN, 85kN and 60kN for 1st floor, 2nd floor, 3rd floor and roof level respectively, the loads acting at the extreme left end of the frame towards the right using
   a. Portal method
   b. Cantilever method

   Compare and comment on the results.

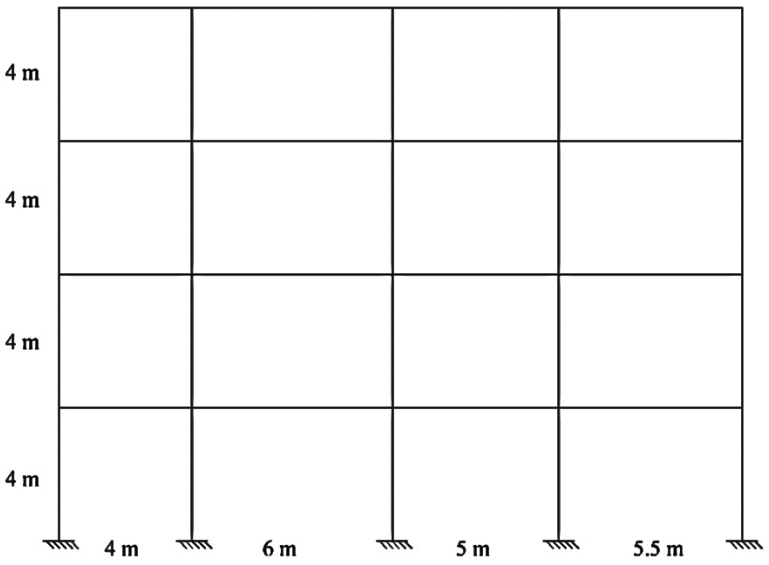


Fig. 1

To be submitted on September 4th, 2018

ASSIGNMENT – II

All questions are compulsory

1. What are the characteristics of stiffness and flexibility matrix?
2. Analyse the following structures (Figures 1, 2 & 3) using
   a. Flexibility method
   b. Stiffness method using physical approach
   c. Direct stiffness method

   Compare and comment on the results.

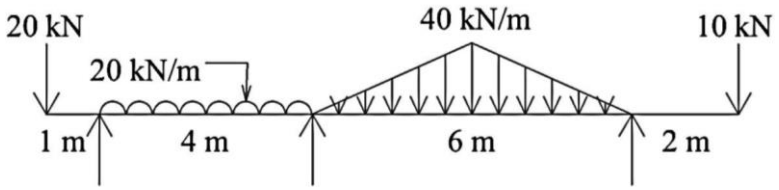


Fig. 1

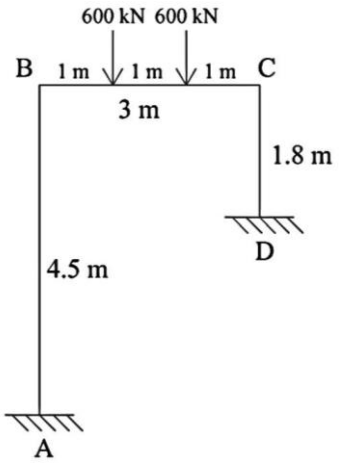


Fig. 2

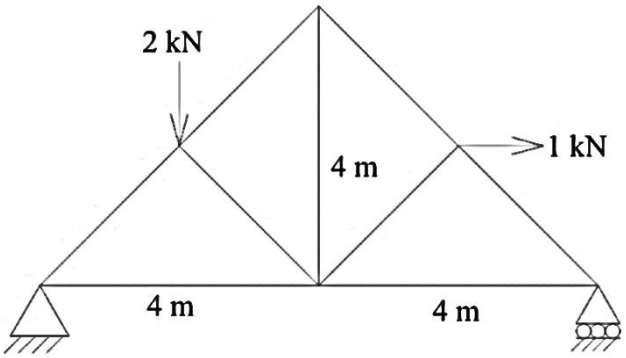


Fig. 3

3. Explain D'Alembert's Principle

To be submitted on November 5th, 2018

QUESTION BANK

MODULE I

1. Analyse the frame shown in Fig. 1.1 using portal method.

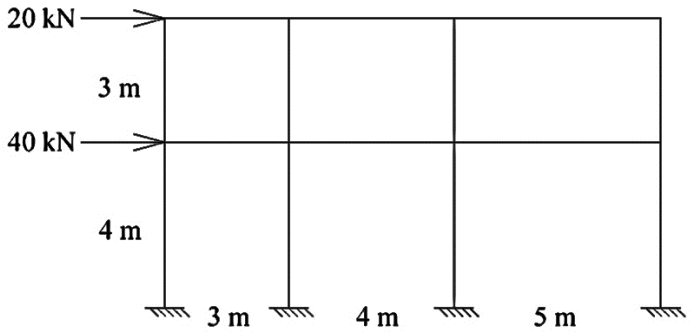


Fig. 1.1

2. Analyse the frame shown in Fig. 1.2 using cantilever method. All columns have the same cross-sectional area

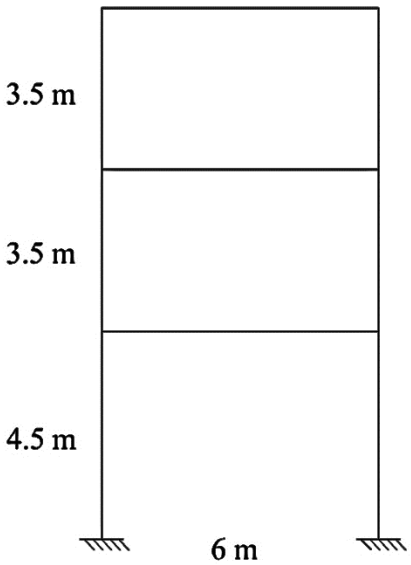


Fig. 1.2

3. Analyse a frame shown in Fig. 1.3 using cantilever method. Draw the BMD.

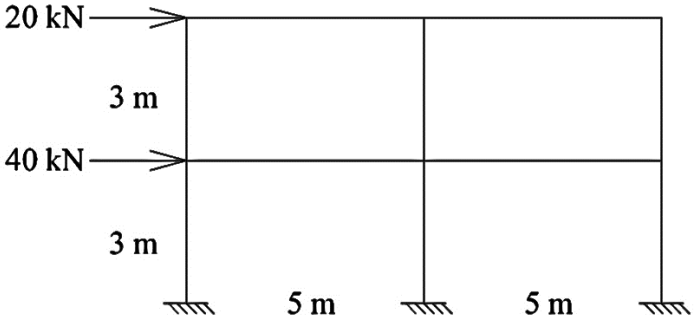


Fig. 1.3

4. Analyse the building frame shown in Fig. 1.4 for **gravity loads only** by substitute frame method. Draw BMD for the 1st floor and tabulate the maximum values obtained for the following cases:

a. Maximum sagging moment at the centre of each of the 4 spans in 1st floor
b. Maximum hogging moment at the centre of each of the 4 spans in 1st floor
c. Maximum hogging moment at each support in 1st floor
d. Maximum moment in columns

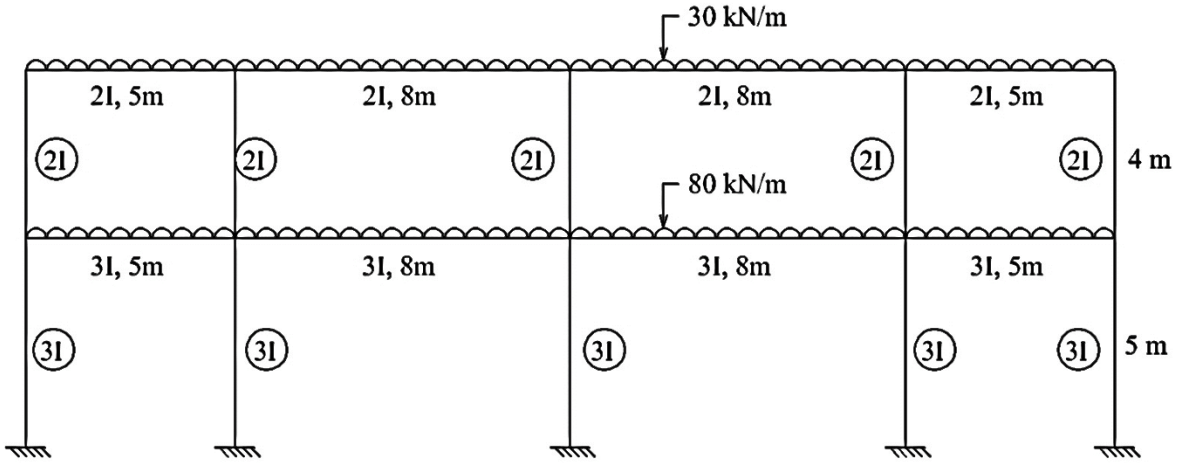


Fig. 1.4

MODULE II

1. Differentiate force and displacement methods of analysis
2. Determine the static and kinematic analysis of the following structures

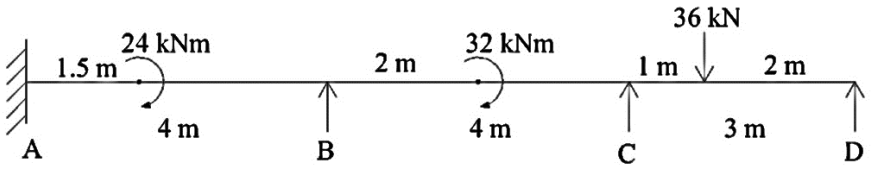


Fig. 2.1

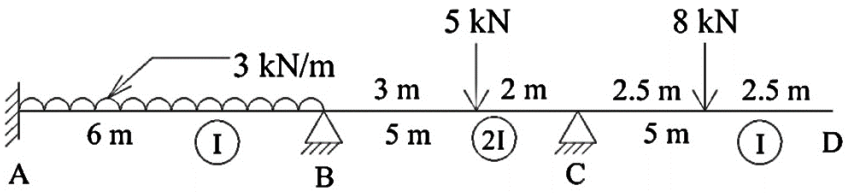


Fig. 2.2

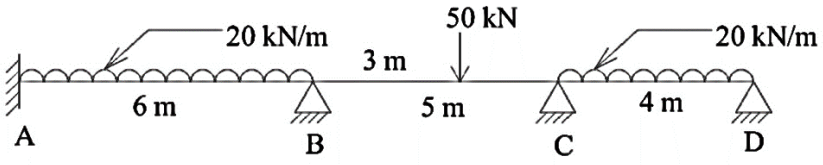


Fig. 2.3

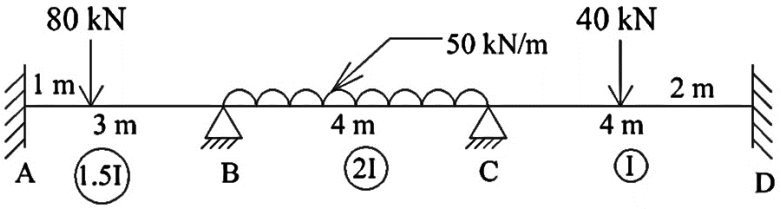


Fig. 2.4

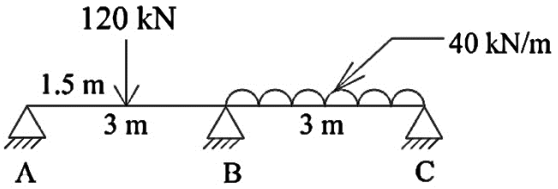


Fig. 2.5

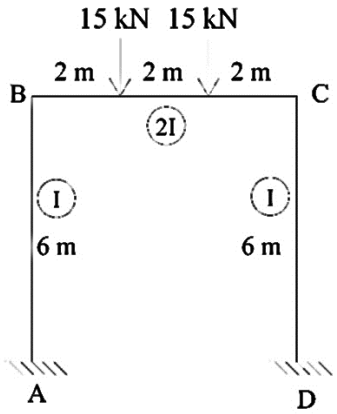


Fig. 2.6

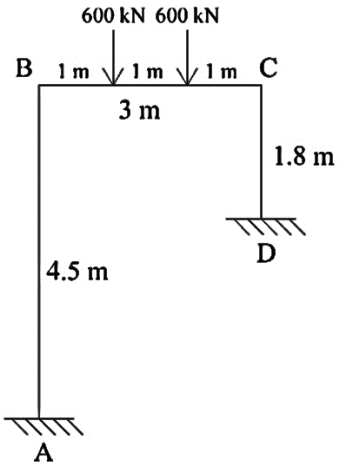


Fig. 2.7

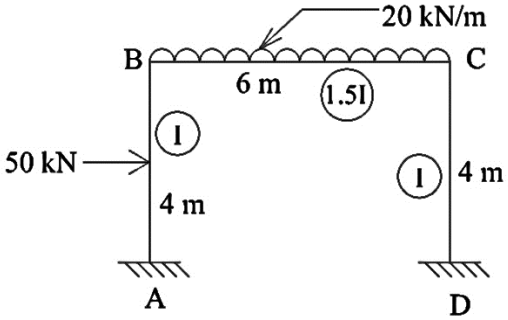


Fig. 2.8

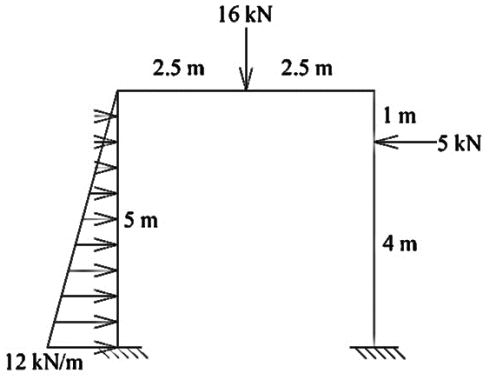


Fig. 2.9

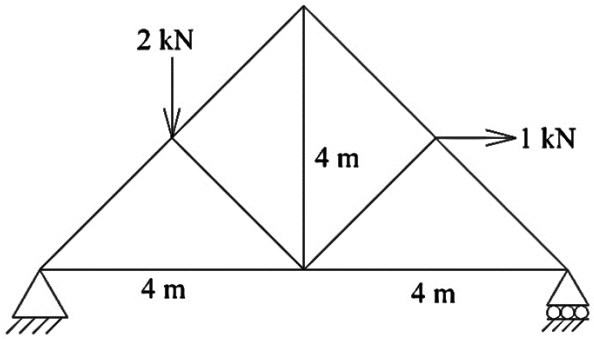


Fig. 2.10

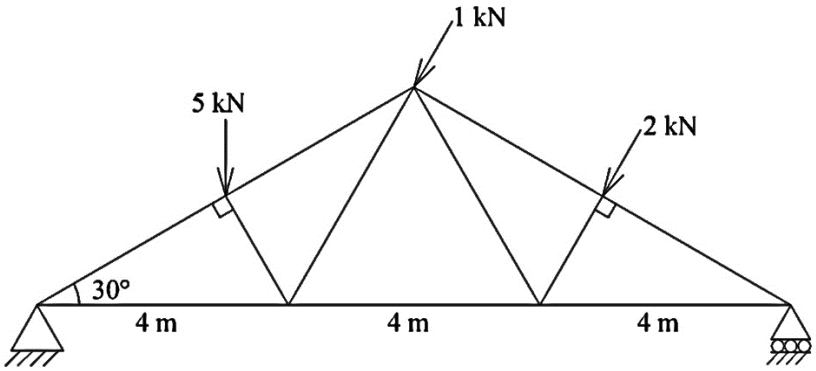


Fig. 2.11

MODULE III

1. Analyse the continuous beams shown in Fig. 3.1 by flexibility method

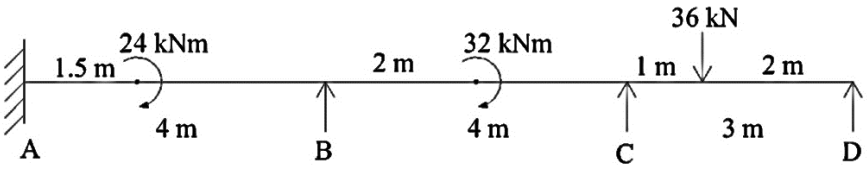


Fig. 3.1 (a)

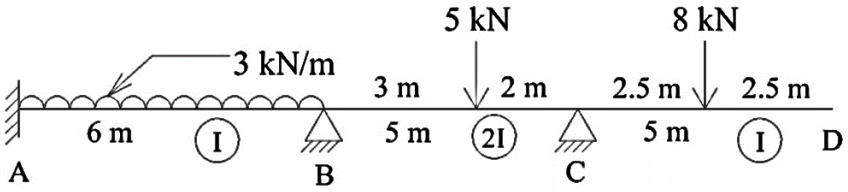


Fig. 3.1 (b)

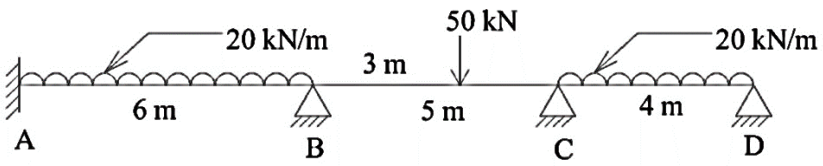


Fig. 3.1 (c)

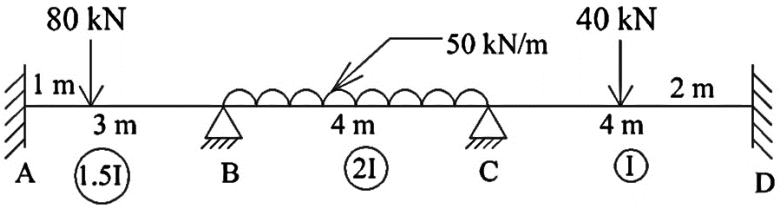


Fig. 3.1 (d)

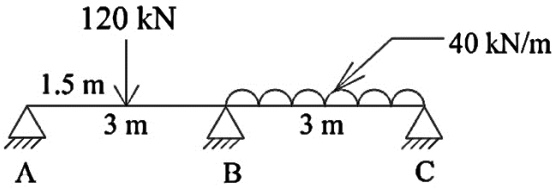


Fig. 3.1 (e)

2. Analyse the plane frames shown in Fig. 3.2 by flexibility method

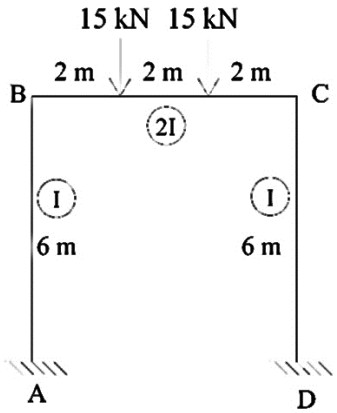


Fig. 3.2 (a)

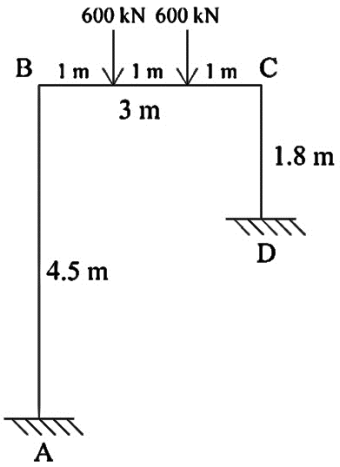


Fig. 3.2 (b)

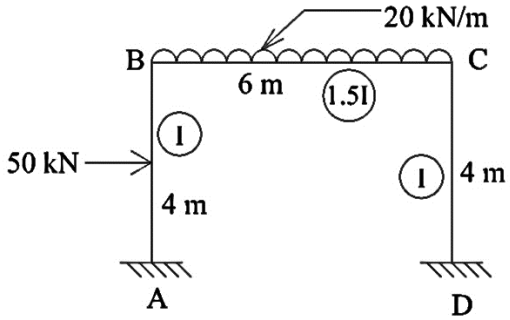


Fig. 3.2 (c)

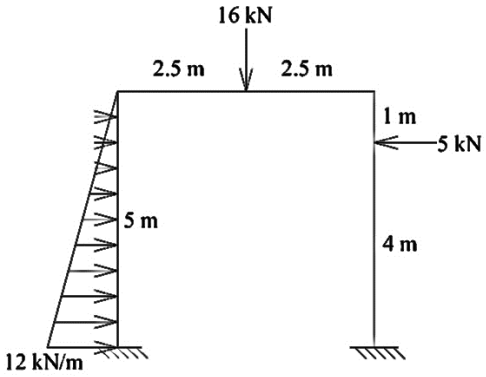


Fig. 3.2 (d)

3. Analyse the plane trusses shown in Fig. 3.3 by flexibility method

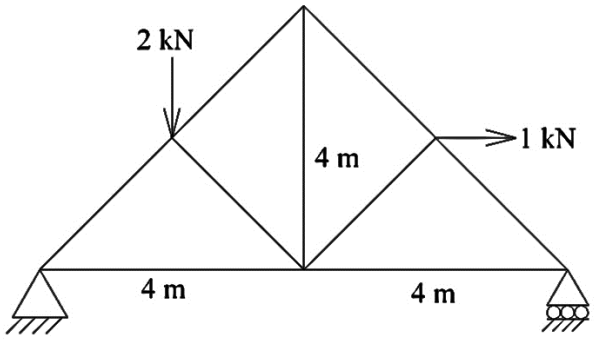


Fig. 3.3 (a)

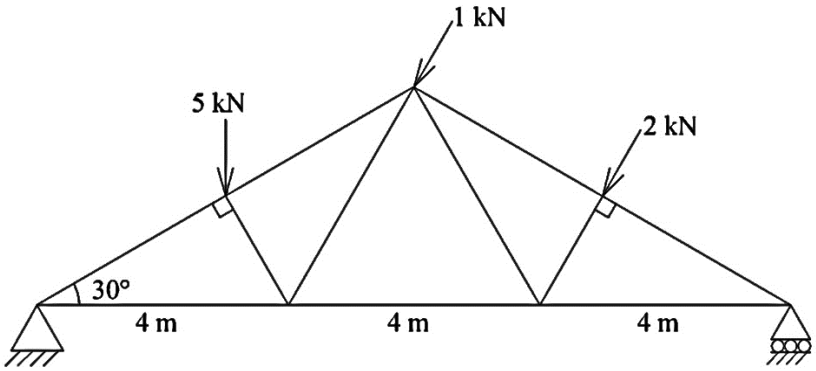


Fig. 3.3 (b)

MODULE IV

1. Analyse the continuous beams shown in Fig. 4.1 by stiffness method

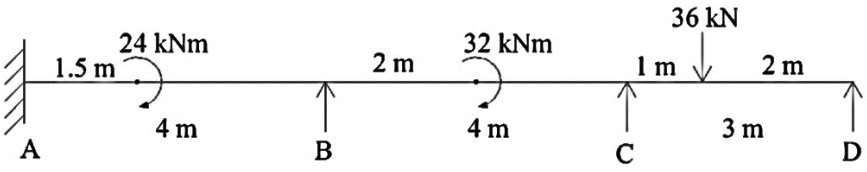


Fig. 4.1 (a)

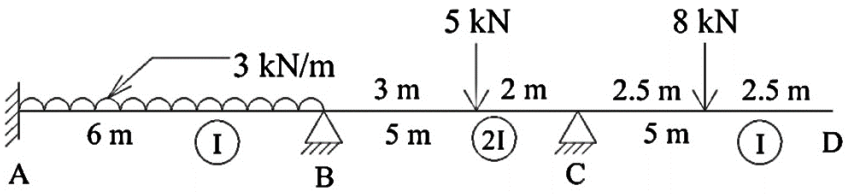


Fig. 4.1 (b)

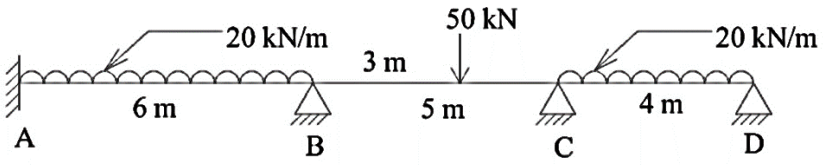


Fig. 4.1 (c)

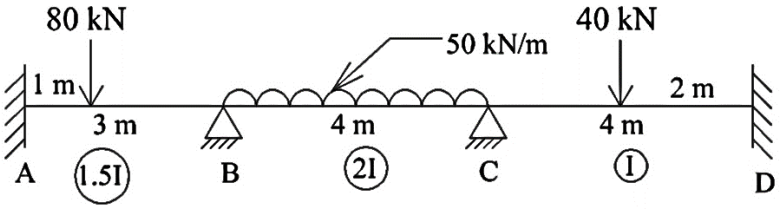


Fig. 4.1 (d)

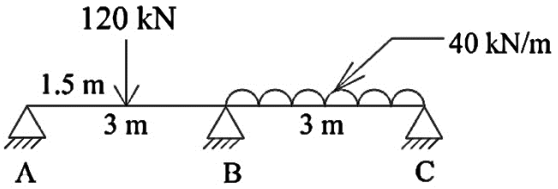


Fig. 4.1 (e)

2. Analyse the plane frames shown in Fig. 4.2 by stiffness method

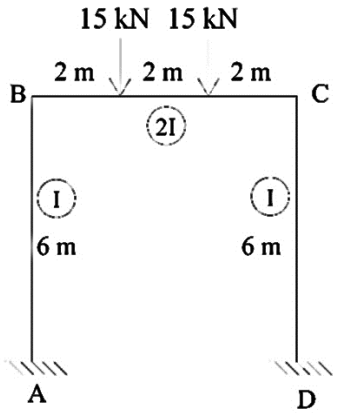


Fig. 4.2 (a)

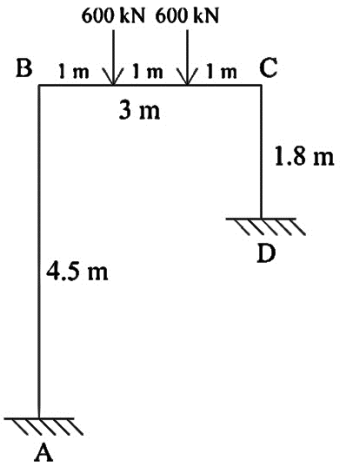


Fig. 4.2 (b)

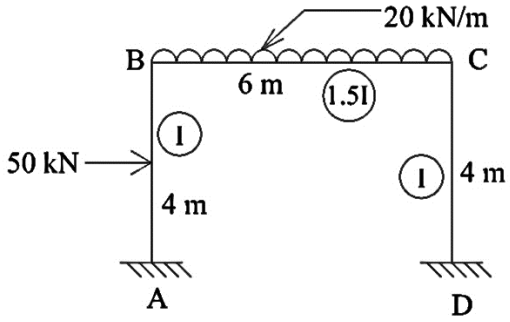


Fig. 4.2 (c)

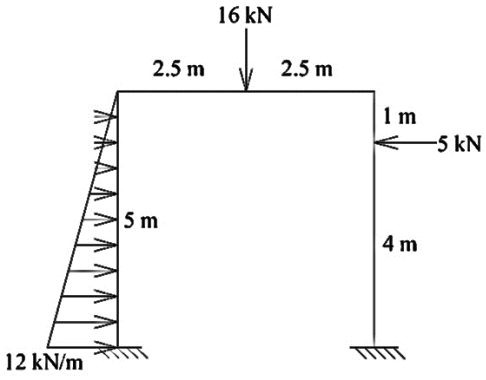


Fig. 4.2 (d)

3. Analyse the plane trusses shown in Fig. 4.3 by stiffness method

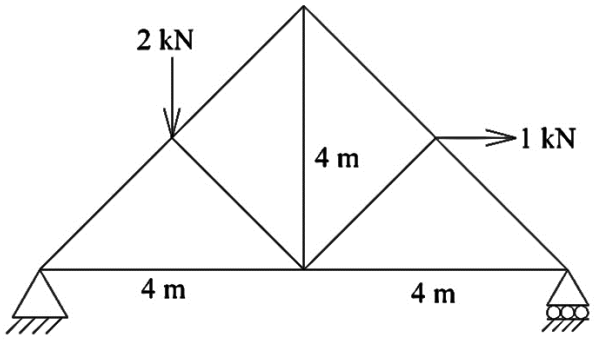


Fig. 4.3 (a)

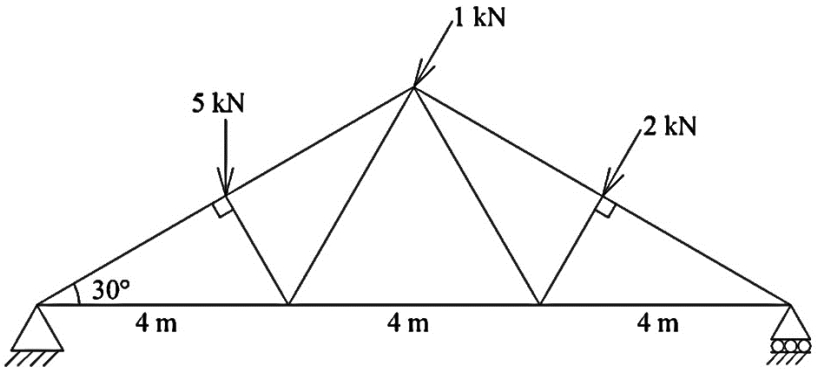


Fig. 4.3 (b)

MODULE V

1. Analyse the continuous beams shown in Fig. 5.1 by direct stiffness method

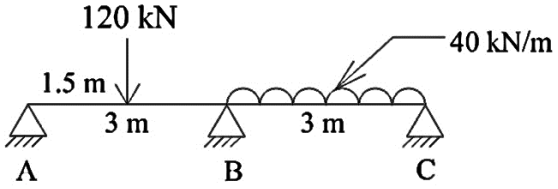


Fig. 5.1

2. Analyse the plane frames shown in Fig. 5.2 by direct stiffness method

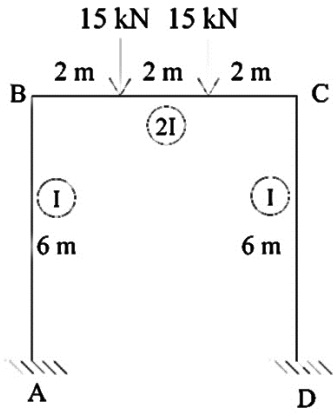


Fig. 5.2 (a)

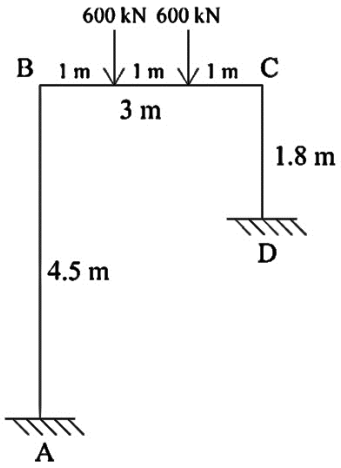


Fig. 5.2 (b)

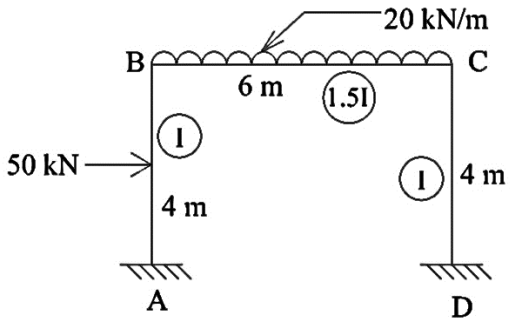


Fig. 5.2 (c)

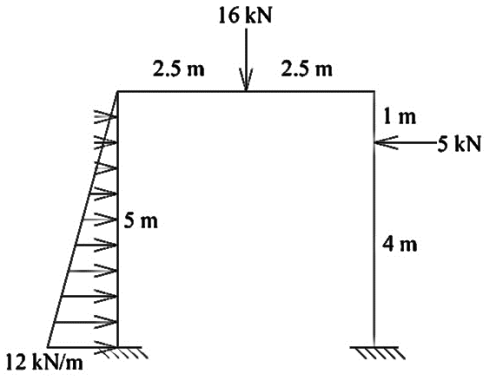


Fig. 5.2 (d)

3. Analyse the plane trusses shown in Fig. 5.3 by direct stiffness method

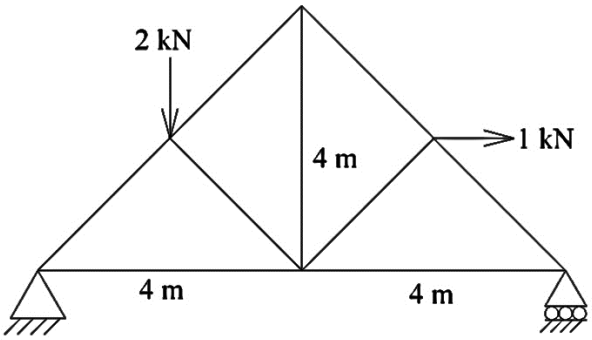


Fig. 5.3 (a)

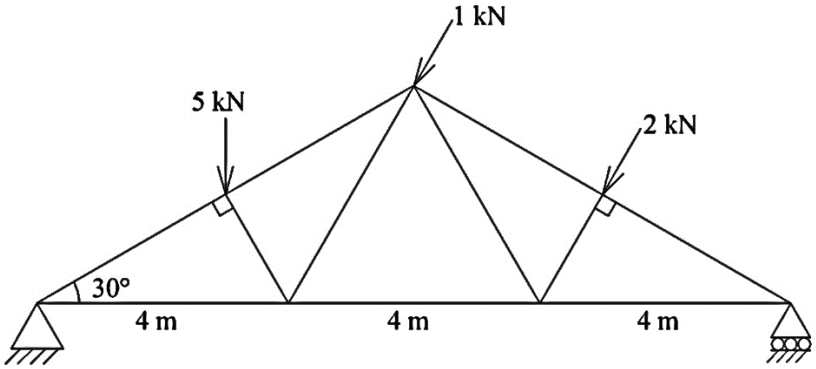


Fig. 5.3 (b)

MODULE VI

1. What is dynamic loading?
2. A harmonic motion has a maximum velocity of 6m/s and it has a frequency of 12cps. Determine its period, amplitude and maximum acceleration.
3. Find the natural period of vibration of a system in which a simply supported beam having a span of 4m is having a spring mass system attached at a distance of 1m from the end, having a constant of 25,000 N/m and the mass of the body is "M" kg.

The circular cross-section of the beam is having a diameter of 15cm. E = 2×10^5 N/mm^2.

4. Explain with examples
    a. Critically damped system
    b. Overdamped system
    c. Underdamped system
5. A vibrating system consisting of a weight of 4.5kg and a spring with stiffness k = 0.4kg/mm is viscously damped so that the ratio of two consecutive amplitudes is 1.00 to 0.85. Determine:
    a. The natural frequency of the undamped system
    b. The logarithmic decrement
    c. The damping ratio
    d. The damping coefficient
    e. The damped natural frequency
6. Determine the natural frequency of a fixed beam of length L, carrying a concentrated weight W at the centre. Neglect the mass of the beam.

C

CE 405
ENVIRONMENTAL ENGINEERING I

COURSE INFORMATION SHEET

PROGRAMME: CE	**DEGREE**: BTECH
COURSE: ENVIRONMENTAL ENGINEERING- I	**SEMESTER:** S7 **L-T-P-CREDITS**: 3-0-0-3
COURSE CODE: CE405, **REGULATION**: 2016	**COURSE TYPE**: CORE
COURSE AREA/DOMAIN: CIVIL ENGINEERING	**CONTACT HOURS**: 4 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): CE431	**LAB COURSE NAME**: ENVIRONMENTAL ENGINEERING LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction of environment- sources of water supply-Water demand, quantification of water demand through population forecasting –Factors affecting consumption-Fluctuations in demand	7
II	Types of intakes-Conveyors, pumps and location of pumping station-Quality of water - Drinking water standards - Physical, chemical and biological analysis.	6
III	Treatment of water-Theory and principles of Sedimentation tanks-Stoke's law-Types of settling (Type I & Type II only)-Coagulation-Mixing-Flocculation, Design of Sedimentation tanks (circular and rectangular)-Clariflocculators	7
IV	Filtration-Types of filters- Working and Design of Rapid and Slow sand filters. Loss of head in filters, Pressure filters	7
V	Disinfection of water - Methods, Chlorination-Types, Factors affecting - Chlorine demands. Miscellaneous treatment-Ion exchange, Lime-soda process, Electro dialysis - Colour, Taste and Odour removal-Adsorption-Aeration-Fluoridation-Defluoridation	7
VI	Lay out of water distribution network-Methods of distribution-Hardy cross method-Equivalent pipe method-Pipe appurtenances.	8
TOTAL HOURS		42

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	B.C Punmia, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., 2014
T2	G S Birdie, Water Supply and Engineering, Dhanapat Rai Publishing Company, 2014
T3	Peavy H S, Rowe, D.R. Tchobanaglous "Environmental Engineering" Mc GrawHill Education, 1984
T4	S.K.Garg, "Water Supply Engineering", Khanna Publishers. 2010
T5	P.N. Modi, "Water Supply Engineering", Standard Book House, NewDelhi

T/R	BOOK TITLE/AUTHORS/PUBLICATION
R1	Metcalf & Eddy , "Waste Water Engineering", Tata Mc Grawhill Publishing Co Ltd, 2003
R2	K N Dugal, Elements of Environmental Engineering, S Chand and Company Pvt Ltd, 2007
R3	Subhash Verma, Varinder Kanwar, Siby John, Water supply Engineering, Vikash Publishing, 2015
R4	Mackenzie L Davis, Introduction to Environmental Engineering, McGrawhill Education (India), 2012

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEMESTER
CE203	Fluid Mechanics- I	Basic knowledge of pipe flow and Bernoulli's Equation	S3
CY100	Engineering Chemistry	Basic concepts of chemical reactions and mass balance	S1

COURSE OBJECTIVES:

1	To study the significance of water resources and the factors affecting quantity and quality of water
2	To study the various types of techniques adopted for a public water supply system

COURSE OUTCOMES:

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Understand the importance of water treatment and the operations and processes involved											
	M											
2	Analyse water quality and suggest treatment methods to increase the quality of it											
			M	H								
3	Solve the water demand of a city by using population forcasting methods											
	H		M									
4	Design sedimentation and coagulation tank											
			M									
5	Design Rapid and Slow Sand Filter											
			M									
6	Analyse and Design water Network system for a city											
	H		M									

JUSTIFICATION FOR CO-PO MAPPING:

CO	PO	MAPPING	JUSTIFICATION
CO1	PO1	MEDIUM	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to find the solution for water independence for an entire city
CO2	PO3	MEDIUM	The students will be able to analyse the water quality of a surface or ground water body and develop strategies for improving them in concern with the public health/ environmental concerns
	PO4	HIGH	The students will be able to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid treatment methods to complex pollution scenarios
CO3	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to solve the total amount of water needed for a city by population forecasting
	PO3	MEDIUM	The students will be able to design the water demand of a city in such a way that it will cater all the environmental/ public health needs
CO4	PO3	HIGH	The students will be able to design individual treatment units in concern with the environment
CO5	PO3	LOW	The students will be able to initiate the design solutions for rapid and slow sand filters in such a way that it will be cost effective and efficient
CO6	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to analyse and solve the complex water network system for a community/city
	PO3	MEDIUM	The students will be able to design water network system by analysing the layout of the city and available water sources

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl No	DESCRIPTION	PROPOSED ACTIONS
1	Methods of Sampling for analysis	Environmental Laboratory
2	Advanced methods in water treatment	Assignment

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl No	DESCRIPTION
1	Sampling for the analysis of water as per IS 3025- part 1
2	Technological advancement in the field of water treatment

WEB SOURCE REFERENCES:

Sl No	DESCRIPTION
1	www.nptel.ac.in
2	https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-85-water-and-wastewater-treatment-engineering-spring-2006

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK	✓	**STUD. ASSIGNMENT**	✓	WEB RESOURCES	
LCD/SMART BOARDS		STUD. SEMINARS		ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS	✓	STUD. SEMINARS		**TESTS/MODEL EXAMS**	✓	**UNIV. EXAMINATION**	✓
STUD. LAB PRACTICES		STUD. VIVA		MINI/MAJOR PROJECTS		CERTIFICATIONS	
ADD-ON COURSES		OTHERS					

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓	**STUDENT FEEDBACK ON FACULTY (TWICE)**	✓
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS		OTHERS	

Prepared by
Arun B

Approved by
Dr.Aysha Zeneeb Majeed

COURSE PLAN

HOUR	MODULE	TOPICS PLANNED
HOUR 1	1	Introduction to Environmental Engineering
HOUR 2		Sources of Water, Water demand
HOUR 3		Quantification of water demand through population forecasting
HOUR 4		Quantification of water demand through population forecasting
HOUR 5		Quantification of water demand through population forecasting
HOUR 6		Factors affecting consumption
HOUR 7		Fluctuations in demand
HOUR 8	2	Types of intakes
HOUR 9		Conveyors, pumps and location of pumping station
HOUR 10		Quality of water - Drinking water standards
HOUR 11		Physical, chemical and biological analysis
HOUR 12		Physical, chemical and biological analysis
HOUR 13		Physical, chemical and biological analysis
HOUR 14	3	Treatment of water- An Introduction
HOUR 15		Theory and principles of Sedimentation tanks- Stoke's law
HOUR 16		Theory and principles of Sedimentation tanks- Stoke's law
HOUR 17		Coagulation-Mixing-Flocculation
HOUR 18		Design of Sedimentation tanks (circular and rectangular)
HOUR 19		Design of Sedimentation tanks (circular and rectangular)
HOUR 20		Design of Sedimentation tanks- Clariflocculators
HOUR 21	4	Filtration-Types of filters
HOUR 22		Working and Design of Rapid sand filters
HOUR 23		Working and Design of Rapid sand filters
HOUR 24		Working and Design of slow sand filters
HOUR 25		Working and Design of slow sand filters
HOUR 26		Loss of head in filters, Pressure filters
HOUR 27		Loss of head in filters, Pressure filters
HOUR 28	5	Disinfection of water - Methods
HOUR 29		Chlorination-Types, Factors affecting - Chlorine demands
HOUR 30		Miscellaneous treatment-Ion exchange, Lime-soda process,
HOUR 31		Electro dialysis , Taste and Odour removal-Adsorption
HOUR 32		Taste and Odour removal-Adsorption
HOUR 33		Aeration-Fluoridation-Defluoridation
HOUR 34		A brief overview on Module 1 to 4
HOUR 35		Lay out of water distribution network-Methods of distribution
HOUR 36	6	Lay out of water distribution network-Methods of distribution
HOUR 37		Hardy cross method
HOUR 38		Hardy cross method
HOUR 39		Equivalent pipe method
HOUR 40		Equivalent pipe method
HOUR 41		Pipe appurtenances

HOUR 42		Pipe appurtenances
HOUR 43		Question paper discussion

ASSIGNMENT – I

All questions are compulsory

1. What is meant by per capita water demand and factors affecting per capita demand?
2. List out all the methods for calculating the fire demand and find out the fire demand for the population of 3.3 lakh.
3. Explain in detail about the variations in demand.
4. What is meant by coincidental draft? How is it used in the design of water distribution system?
5. Explain in detail about the physical characteristics of water.
6. What are the different kinds of water demand?
7. What are the effects of variations in demand on the design capacities of different components of a water supply system?
8. List out different population forecasting methods and explain about any two.
9. The population of a town during four decades in 1960, 1970, 1980 and 1990 are 39500, 48000, 60000 and 69000 respectively. Predicts its population in the year 2010 by geometric increase method and incremental increase method.
10. What are indicator organisms? What are the requirements of an ideal indicator organism?
11. What are water borne diseases? How can they be controlled? List any three water borne diseases and their causative organisms?
12. What is the standard for microbial quality of drinking water as per IS 10500:2012? Write the procedure for the confirmatory test for fecal coliforms.
13. Explain about diurnal variation in water demand?
14. Define turbidity and its measurement in laboratory?

ASSIGNMENT – II

All questions are compulsory

1. Explain of different types of pumps and their working principles
2. What are the chemical parameters in water quality analysis, list out their desirable and permissible limits as per IS 10500: 2012 and WHO Standards.
3. Draw a flow diagram indicating the various units in a typical drinking water treatment plant?
4. How is the purpose of aeration different from ground water and surface water? Explain with sketch the working of a cascade aerator?
5. Explain MPN test for the bacteriological analysis of water.
6. Water is supplied at a rate of 260 lpcd for a community having a population of 0.5 lakhs Design suitable filter beds (number of beds and area of each bed) if
    a. Slow sand gravity filter is employed for treatment
    b. Rapid sand gravity filter is employed for treatment.
7. Assume characteristic filtration rates for each and mention it explicitly. Further compare the above two methods of filtration highlighting the suitability of each other under various circumstances

QUESTION BANK

Module I

1. List four factors affecting per capita water demand.
2. What are the components of a water supply system?
3. What is the objective of water supply system?
4. What is the significance of Nitrite and fluoride in water?
5. Define Design period.
6. Define the term potable water.
7. State the causes for water pollution.
8. Write the advantage of sub-surface sources
9. What are the uses of nomograms?
10. State the effects when each of the following substances exceeds the prescribed limits in a water sample. (a) Nitrates (b) fluorides.
11. Define per capita demand".
12. List out different methods for population prediction

Module II

1. What are the causes for pollution of surface and subsurface sources of water? State the measures to be adopted to prevent pollution of water.
2. Write in detail about "Water Pollution" in India.
3. Explain in detail about the "Reasons for the analysis of water"
4. What are the requirements of potable water for domestic use?
5. Discuss the various Physical, Chemical and Biological characteristics of water.
6. Name the various methods of population forecast and explain the circumstances under which it is applicable.
7. Explain the different sources of water and their characteristics with respect to turbidity, hardness, chloride and microbiology.
8. Explain the different methods of population forecasting.
9. Explain the significance of different water quality parameters

Module III

1. Differentiate between type 1 and type 2 sedimentation
2. What are the design considerations used while designing a sedimentation tank
3. Explain the process of coagulation and list out important coagulants
4. Design of sedimentation tank/ Clariflocculators

Module IV

1. How filtration helps in water treatment
2. Differentiate between slow and rapid sand filters

3. What are the design criteria's for slow and rapid sand filters
4. List out the important uses of pressure filter

Module V

1. What are the different methods for disinfection of water
2. Explain the process of chlorination
3. List out various factors affecting chlorination
4. Briefly explain the treatment required for colour, odour and taste removal
5. How can we perform fluoridation and defluridation in a water treatment plant

Module VI

1. What are the different methods employed in designing the layout of a treatment network
2. Explain Hardy- Cross method and Equivalent pipe method
3. List out the important appurtenances used in a water treatment network

D

CE 407

TRANSPORTATION ENGINEERING II

COURSE INFORMATION SHEET

PROGRAMME: CE	**DEGREE**: BTECH
COURSE: TRANSPORTATION ENGINEERING II	**SEMESTER:** S7 **L-T-P-CREDITS**: 3-0-0-3
COURSE CODE: CE407 **REGULATION**: 2016	**COURSE TYPE**: CORE
COURSE AREA/DOMAIN: CIVIL ENGINEERING	**CONTACT HOURS**: 3 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	**LAB COURSE NAME**: NIL

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction: Transportation modes - comparison and characteristics of highway and railway. Modem developments - Surface, elevated and tube railways, light rail transit, high speed tracks - technologies	7
II	Railway track: Alignment- basic requirements and factors affecting selection, Component parts of a railway track - requirements and functions - Typical cross section - Rails - functions and requirements, Type of rail sections, rail fastenings, wear and creep of rails - coning of wheels, Train resistances and evaluation of hauling capacity and tractive effort of locomotive. Geometric design of railway track: Horizontal curves, radius - super elevation ¬cant deficiency - transition curves - gradients - different types - Compensation of gradients.	7
III	Railway operation and control: Points and Crossings - Design features of a turn out - Details of station yards and marshalling yards - Signaling, interlocking of signals and points Principles of track circuiting Control systems of train movements - ATC, CTC - track circuiting	6
IV	Maintenance:- Introduction to track maintenance, Items of track maintenance, packing and over hauling, screening Railway accidents: Human and system contribution to catastrophic accidents, Human Factors in Transport Safety.	6
V	Tunnel Engineering: Tunnel sections classification tunnel surveying alignment, transferring centre, grade into tunnel - tunnel driving procedure shield method of tunneling, compressed air method, tunnel boring machine, Tunnel lining, ventilation - lighting and drainage of tunnels	8
VI	Harbour Engineering: Harbours - classification, features, requirements, winds and waves in the location and design of harbours. Break waters necessity and functions, classification, alignment, design principles, forces acting on break water - construction, general study of quays, piers, wharves, jetties, transit sheds and warehouses navigational aids light houses, signals types Moorings	8

UNIT	DETAILS	HOURS
	Dock Engineering: Docks - Functions and types - dry docks, wet docks - form and arrangement of basins and docks - design and construction - dock entrances - floating dry docks, slip ways, dock entrances and caissons. Dredging - functions - general study of dipper dredger, grapple dredger, ladder dredger and hydraulic dredger.	
TOTAL HOURS		42

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	Rao G. V, Principles of Transportation and Highway Engineering, Tata McGraw Hill
T2	Mundrey J. S, Railway Track Engineering, Tata McGraw Hill
T3	S.C. Rangawala, Railway Engineering, Charotor Publishing House
T4	S. C Saxena and S. P Arora., Railway Engineering, Dhanpat rai & Sons
T5	Subhash C. Saxena, Railway Engineering, Dhanpat rai & Sons
T6	R Srinivasan, Barbour, Dock & Tunnel Engineering, Charotor Publishing House
T7	S.P.Bindra, A course in docks and Barbour Engineering, Dhanpat rai & Sons

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEMESTER
BE100	ENGINEERING MECHANICS	BASIC CONCEPT OF FORCES AND THEIR APPLICATION	S1S2
CE207	SURVEYING	CONCEPT OF CURVES	S3

COURSE OBJECTIVES:

1	To set a solid and firm foundation in Railway engineering, including the history development, modern trends, maintenance, geometric design and safety of railways.
2	To introduce dock, harbour and tunneling

COURSE OUTCOMES:

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	The students will be able to explain the geometric parameters of a railway track											
	H	M										
2	The students will be able to compare different modes of transportation											
	H	L										
3	The students will be able to design a turnout											
	H	M	L									
4	The students will be able to describe various safety issues in railway engineering											
	H	M										

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
5	The students will be able to describe various tunnel driving procedures											
	H	M										
6	The students will be able to explain various navigational aids											
	H	L										
7	The students will be able to explain the functions of docks											
	H	L										

JUSTIFICATION FOR CO-PO MAPPING:

CO	PO	MAPPING	JUSTIFICATION
CO1	PO1	HIGH	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problems
	PO2	MEDIUM	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences
	PO3	LOW	The students will be able to apply the knowledge to assess transportation engineering problems
CO2	PO1	HIGH	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problems
	PO2	MEDIUM	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences
	PO3	LOW	The students will be able to apply the knowledge to assess transportation engineering problems
CO3	PO1	HIGH	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problems
	PO2	MEDIUM	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences
	PO3	LOW	The students will be able to apply the knowledge to assess transportation engineering problems
CO4	PO1	HIGH	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problems
	PO2	MEDIUM	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences

CO	PO	MAPPING	JUSTIFICATION
	PO3	LOW	The students will be able to apply the knowledge to assess transportation engineering problems
CO5	PO1	HIGH	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problems
	PO2	MEDIUM	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences
	PO3	LOW	The students will be able to apply the knowledge to assess transportation engineering problems
CO6	PO1	HIGH	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problems
	PO2	MEDIUM	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences
	PO3	LOW	The students will be able to apply the knowledge to assess transportation engineering problems
CO7	PO1	HIGH	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problems
	PO2	MEDIUM	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences
	PO3	LOW	The students will be able to apply the knowledge to assess transportation engineering problems

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl No	DESCRIPTION	PROPOSED ACTIONS
1	DIFFERENT TYPES OF CONTROL SYSTEMS OF TRAIN MOVEMENTS	Seminars, NPTEL, Industrial visit
2	TYPES OF TUNNEL DRIVING PROCEDURE	Seminars, NPTEL

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl No	DESCRIPTION
1	Welding of rails
2	Sleeper design

WEB SOURCE REFERENCES:

Sl No	DESCRIPTION
1	www.nptel.ac.in

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK	✓	**STUD. ASSIGNMENT**	✓	WEB RESOURCES	
LCD/SMART BOARDS		STUD. SEMINARS		ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS	✓	STUD. SEMINARS		**TESTS/MODEL EXAMS**	✓	**UNIV. EXAMINATION**	✓
STUD. LAB PRACTICES		STUD. VIVA		MINI/MAJOR PROJECTS		CERTIFICATIONS	
ADD-ON COURSES		OTHERS					

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓	**STUDENT FEEDBACK ON FACULTY (TWICE)**	✓
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS		OTHERS	

Prepared by
Arun T Moonjely

Approved by
Dr.Aysha Zeneeb Majeed

COURSE PLAN

HOUR	MODULE	TOPICS PLANNED
HOUR 1	1	Introduction: Transportation modes - comparison and characteristics of highway and railway.
HOUR 2		Modern developments – Surface, elevated and tube railways, light rail transit, high speed tracks - technologies
HOUR 3	2	Railway track: Alignment- basic requirements and factors affecting selection,
HOUR 4		Component parts of a railway track - requirements and functions
HOUR 5		Component parts of a railway track - requirements and functions
HOUR 6		Typical cross section - Rails – functions and requirements
HOUR 7		Type of rail sections, rail fastenings,wear and creep of rails
HOUR 8		Type of rail sections, rail fastenings,wear and creep of rails
HOUR 9		Type of rail sections, rail fastenings,wear and creep of rails
HOUR 10		coning of wheels,
HOUR 11		Train resistances and evaluation of hauling capacity and tractive effort of locomotive.
HOUR 12		Train resistances and evaluation of hauling capacity and tractive effort of locomotive.
HOUR 13		Geometric design of railway track: Horizontal curves, radius – super elevation - cant deficiency
HOUR 14		transition curves - gradients - different types - Compensation of gradients.
HOUR 15		transition curves - gradients - different types - Compensation of gradients.
HOUR 16	3	Points and Crossings – Design features of a turnout
HOUR 17		Details of station yards and marshalling yards
HOUR 18		Signaling, interlocking of signals and points
HOUR 19		Signaling, interlocking of signals and points
HOUR 20		Signaling, interlocking of signals and points
HOUR 21		Principles of track circuiting -Control systems of train movements – ATC, CTC – track circuiting
HOUR 22		Principles of track circuiting -Control systems of train movements – ATC, CTC – track circuiting
HOUR 23		Principles of track circuiting -Control systems of train movements – ATC, CTC – track circuiting
HOUR 24		Principles of track circuiting -Control systems of train movements – ATC, CTC – track circuiting
HOUR 25	4	Maintenance:- Introduction to track maintenance
HOUR 26		Items of track maintenance, packing and over hauling, screening

HOUR 27		Railway accidents: Human and system contribution to catastrophic accidents,
HOUR 28		Railway accidents: Human and system contribution to catastrophic accidents,
HOUR 29		Factors in Transport Safety.
HOUR 30		Factors in Transport Safety.
HOUR 31	5	Tunnel Engineering: Tunnel - sections - classification - tunnel surveying - alignment, transferring centre, grade into tunnel
HOUR 32		Tunnel Engineering: Tunnel - sections - classification - tunnel surveying - alignment, transferring centre, grade into tunnel
HOUR 33		Tunnel Engineering: Tunnel - sections - classification - tunnel surveying - alignment, transferring centre, grade into tunnel
HOUR 34		tunnel driving procedure - shield method of tunneling, compressed air method, tunnel boring machine,Tunnel lining, ventilation - lighting and drainage of tunnels
HOUR 35		tunnel driving procedure - shield method of tunneling, compressed air method, tunnel boring machine,Tunnel lining, ventilation - lighting and drainage of tunnels
HOUR 36	6	Harbours– classification, features, requirements, winds and waves in the location and design of harbours
HOUR 37		Harbours– classification, features, requirements, winds and waves in the location and design of harbours.
HOUR 38		Break waters - necessity and functions, classification,
HOUR 39		alignment, design principles, forces acting on break water
HOUR 40		construction, general study of quays, piers, wharves, jetties, transit sheds and warehouses - navigational aids - light houses, signals - types - Moorings
HOUR 41		Dock Engineering: Docks - Functions and types - dry docks, wet docks – formand arrangement of basins and docks
HOUR 42		Dredging – functions -general study of dipper dredger, grapple dredger, ladder dredger and hydraulic dredger.
HOUR 43		design and construction – dock entrances - floating dry docks, slip ways, dock entrances and caissons.

ASSIGNMENT – I

1. Describe the Modem developments in railway engineering (Surface, elevated and tube railways, light rail transit, high speed tracks – technologies)

ASSIGNMENT – II

1. Write about various train accidents and its causes occurred in India
2. Briefly describe the different navigational aids in harbor engineering

UNIT WISE QUESTION BANK

UNIT 1

1. Enumerate the advantages and disadvantages of railway transport over other modes of transport facilities
2. Discuss about the new technologies in railway engineering
3. What do you mean by light rail transit system?
4. Compare surface, elevated and tube railways
5. What do you mean by high speed tracks?

UNIT 2

1. Discuss the requirement of good rail alignment
2. With a neat sketch, explain the different components of a railway track
3. Explain the choice of a railway gauge in a particular location
4. What are the causes for the wear of rails?
5. With a neat sketch explain the effect of coning of wheels on rail fixing
6. What is creep? Discuss the theories propounded for the probable causes of creep.
7. Find out the number of sleepers required for constructing a B.G track 963metres long, adopting sleeper density as n+6
8. Determine the length of the transition curve for a B.G track with the design speed on the curve equal to 90kmph, permissible cant on B.G track is 16.5cm and the cant deficiency is 7.6cm
9. Design the length of transition curve given that the designed speed of the curve is 110kmph on B.G track
10. Define the equilibrium speed and cant deficiency.

UNIT 3

1. Draw a neat sketch of right hand turn out
2. On a straight B.G track, a turnout takes off at an angle of $6^{o}42'35"$. Design the turnout for the following data:
   Angle of the switch = $1^{o}34'27"$
   Heel divergence = 13.65cm
3. What are the requirements of a good marshalling yard?
4. Compare the advantages and disadvantages of the C.T.C and A.T.C systems of train movement control
5. By means of a neat sketch, explain the switch fittings for mechanical interlocking
6. Explain route relay system
7. How are signals classified? Mention the functions of each signals

UNIT 4

1. Describe the realignment of straight tracks
2. Explain the salient features, advantages and disadvantages of measures shovel packing method of maintaining railway track
3. A portion of the track is washed away during floods. What are the emergency measures adopted under such circumstances

4. What are the special measures to be taken for maintaining the high speed railway track?
5. Describe the maintenance of points and crossings

UNIT 5

1. What are the classifications of tunnels?
2. Write short on tunnel surveying
3. Explain shield method of tunneling
4. Briefly explain compressed air method
5. Write short on tunnel boring machine
6. Explain tunnel ventilation

UNIT 6

1. What are the classifications of harbours?
2. Briefly explain the effects of winds and waves in the location and design of harbours
3. What are the functions of breakwaters?
4. What are the design principles of breakwater?
5. Write short notes on
    a. Quays
    b. Piers
    c. Wharves
    d. Jetties
    e. Light house
6. Explain dry docks and wet docks

E

CE 409

QUANTITY SURVEYING & VALUATION

COURSE INFORMATION SHEET

PROGRAMME: CE	**DEGREE**: BTECH
COURSE: QUANTITY SURVEYING AND VALUATION	**SEMESTER:** S7 **L-T-P-CREDITS**: 3-0-0-3
COURSE CODE: CE409 **REGULATION**: 2016	**COURSE TYPE**: CORE
COURSE AREA/DOMAIN: CIVIL ENGINEERING	**CONTACT HOURS**: 4 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): CE 334	**LAB COURSE NAME**: COMPUTER AIDED CIVIL ENGG. LAB

SYLLABUS:

UNIT	DETAILS	HOURS
I	General Introduction- Quantity Surveying- Basic principles-Types of Estimates - Specifications- purposes and basic principles-general specifications - Detailed specifications-Method of measurement of various items of work. Analysis of rates- Introduction to the use of CPWD data book and schedule of rates- conveyance and conveyance statement - Miscellaneous charges.	6
II	Preparation of data and analysis of rates for various items of work connected with building construction and other civil engineering structures with reference to Indian Standard Specification.	6
III	Detailed estimate including quantities, abstract and preparation of various items of works- buildings- center line method and long wall short wall method- sanitary and water supply works- soak pits, septic tanks, overhead tanks, culverts, Retaining walls, road construction. Bar-bending schedule-preparation of bar-bending schedule for RCC works connected with building construction, culverts and minor irrigation works.	18
IV	Valuation - Explanation of terms, types of values, sinking fund, years purchase, Depreciation - Straight line method, constant percentage method, S.F method .Obsolescence. Valuation of real properties-rental method, profit based method, depreciation method. Valuation of landed properties -belting method, development method, hypothecated building scheme method. Rent calculation. Lease and Lease hold property.	12
TOTAL HOURS		42

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	B N Dutta, Estimating and costing in Civil Engineering, USB publishers and distributers Ltd. New Delhi
T2	D D Kohli, RC Kohli, A textbook of Estimating and costing, S Chand Publishing, 2011

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T3	Dr. S. Seetharaman, M. Chinnasamy, Estimation and Quantity Surveying, Anuradha Publications , Chennai.
R1	BS Patil, Civil Engineering contracts and estimates, Universities press
R2	V N Vazirani & S P Chandola, Civil engineering Estimating and Costing, Khanna Publishers.
R3	IS 1200-1968; Methods of measurement of Building & Civil Engineering works.
R4	CPWD data book and schedule of rates.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEMESTER
CE334	Computer Aided Civil Engg. Lab	Drafting of Plan, section and elevation of buildings, structural detailing of beams, columns, slabs in AutoCAD	6

COURSE OBJECTIVES:

1	To have an awareness regarding specifications, analysis of rates, valuation etc. in connection with construction
2	To prepare detailed estimates, bar bending schedules of various items of work

COURSE OUTCOMES:

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Students will be able to identify the quality and quantity of materials, quantity and classes of skilled and unskilled labours and tools and plants required for the project.											
		M										
2	Students will be able to analyse the rate of items of work by working out the quantities of different materials and labours required for execution of various items of work.											
			H									
3	Students will be able to estimate the quantities, prepare abstract for various items of works- buildings, septic tanks, culverts, roads etc. by drawing up specifications, bar bending schedule and also prepare the schedule of programming of the project											
			H									
4	Students will be able to evaluate the value of real and landed property and rent of lease hold property											
				H								

JUSTIFICATION FOR CO-PO MAPPING:

CO	PO	MAPPING	JUSTIFICATION
CO1	PO2	MEDIUM	For carrying out a civil engineering project, quality and quantity of materials and classes of skilled and un skilled labours and tools and plants etc. to be identified.
CO2	PO3	HIGH	Exact quantities of items of work and quantities of different materials required for various items of work is essential for the execution of the civil engineering project without wastage of resources
CO3	PO3	HIGH	Estimate report is essential to meet a number of requirements and also to have a clear picture of the project expenditure and to decide upon how and whether to carry out the project and preparation of the schedule of programming of the project for the execution of the civil engineering project without wastage of resources
CO4	PO4	HIGH	Proper analysis and interpretation of the data is essential to prepare valuation report of real and landed property.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl No	DESCRIPTION	PROPOSED ACTIONS
1	Tenders and contracts	Assignment 2

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl No	DESCRIPTION
1	Report generation – Report on estimate of residential building, culvert roads etc.

WEB SOURCE REFERENCES:

Sl No	DESCRIPTION
1	www.nptel.ac.in

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK	✓	**STUD. ASSIGNMENT**	✓	WEB RESOURCES	
LCD/SMART BOARDS		STUD. SEMINARS		ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS	✓	STUD. SEMINARS		**TESTS/MODEL EXAMS**	✓	**UNIV. EXAMINATION**	✓
STUD. LAB PRACTICES		STUD. VIVA		MINI/MAJOR PROJECTS		CERTIFICATIONS	

ADD-ON COURSES		OTHERS					

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓	**STUDENT FEEDBACK ON FACULTY (TWICE)**	✓
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS		OTHERS	

Prepared by
Tressa Kurian

Approved by
Dr. Aysha Zeneeb Majeed

COURSE PLAN

HOUR	MODULE	TOPICS PLANNED
HOUR 1	1	General Introduction- Quantity Surveying- Basic principles
HOUR 2		Types of Estimates
HOUR 3		Specifications- purposes and basic principles-general specifications
HOUR 4		Detailed specifications-Method of measurement of various items f work.
HOUR 5		Detailed specifications-Method of measurement of various items of work.
HOUR 6		Analysis of rates- Introduction to the use of CPWD data book and schedule of rates
HOUR 7		Conveyance and conveyance statement -Miscellaneous charges.
HOUR 8	2	Preparation of data and analysis of rates for various items of work connected with building construction and other civil engineering structures with reference to Indian Standard Specification.
HOUR 9		Preparation of data and analysis of rates for various items of work connected with building construction and other civil engineering structures with reference to Indian Standard Specification.
HOUR 10		Preparation of data and analysis of rates for various items of work connected with building construction and other civil engineering structures with reference to Indian Standard Specification.
HOUR 11		Preparation of data and analysis of rates for various items of work connected with building construction with reference to Indian Standard Specification.
HOUR 12		Preparation of data and analysis of rates for various items of work connected with building construction with reference to Indian Standard Specification.
HOUR 13		Preparation of data and analysis of rates for various items of work connected with building construction and other civil engineering structures with reference to Indian Standard Specification.
HOUR 14		Preparation of data and analysis of rates for various items of work connected with building construction and other civil engineering structures with reference to Indian Standard Specification.
HOUR 15	3	Detailed estimate including quantities, abstract and preparation of various items of works- buildings- centre line method

HOUR 16		Detailed estimate including quantities, abstract and preparation of various items of works- buildings- centre line method
HOUR 17		Detailed estimate including quantities, abstract and preparation of various items of works- buildings- centre line method
HOUR 18		Detailed estimate including quantities, abstract and preparation of various items of works- buildings- long wall short wall method-
HOUR 19		Detailed estimate including quantities, abstract and preparation of various items of works- buildings- long wall short wall method
HOUR 20		Detailed estimate including quantities, abstract and preparation of various items of works- buildings- long wall short wall method
HOUR 21		Detailed estimate including quantities, abstract and preparation of various items of works- sanitary and water supply works
HOUR 22		Detailed estimate including quantities, abstract and preparation of various items of works- buildings- soak pits
HOUR 23		Detailed estimate including quantities, abstract and preparation of various items of works- septic tanks
HOUR 24		Detailed estimate including quantities, abstract and preparation of various items of works- buildings- overhead tanks
HOUR 25		Detailed estimate including quantities, abstract and preparation of various items of works- culverts
HOUR 26		Detailed estimate including quantities, abstract and preparation of various items of works- Retaining walls
HOUR 27		Detailed estimate including quantities, abstract and preparation of various items of works- road construction.
HOUR 28		Bar-bending schedule-preparation of bar-bending schedule for RCC works connected with building construction
HOUR 29		Bar-bending schedule-preparation of bar-bending schedule for RCC works connected with building construction
HOUR 30		Bar-bending schedule-preparation of bar-bending schedule for RCC works -culverts
HOUR 31		Bar-bending schedule-preparation of bar-bending schedule for RCC works -culverts
HOUR 32		Bar-bending schedule-preparation of bar-bending schedule for RCC works minor irrigation works.
HOUR 33	4	Valuation - Explanation of terms, types of values
HOUR 34		Valuation - sinking fund, years purchase
HOUR 35		Depreciation - Straight line method, constant percentage method
HOUR 36		Depreciation -S.F method Obsolescence.
HOUR 37		Valuation of real properties-rental method

HOUR 38		Valuation of real properties- profit based method
HOUR 39		Valuation of real properties -depreciation method.
HOUR 40		Valuation of landed properties -belting method
HOUR 41		Valuation of landed properties -development method
HOUR 42		Valuation of landed properties - hypothecated building scheme method.
HOUR 43		Rent calculation. Lease and Lease hold property.
HOUR 44		Rent calculation. Lease and Lease hold property.

ASSIGNMENT – I

1.
   a. Write down the detailed specification of Roofing with M.P tile.
   b. Work out unit rate for Plastering of ceiling with cement mortar 1:3, 9 mm thick. [For 10 m2 , River Sand – 0.09 m3 @Rs. 1200/ m3, Cement – 43Kg@ Rs 5000/t, Mason -0.9@ Rs. 450/E, Man -0.55@ Rs.350/E ,Women 1.1 @ Rs.325/E]
2.
   a. Write down the detailed specification of reinforcement for R.C.C Work.
   b. Work out unit rate for brick work, in cm 1:6 using wire cut brick of size 22.9x11.2x7 cm. For foundation and basement [For 1 m3 ,brick 460 Nos @ Rs. 6000/1000 Nos ,Sand 0.2103 @ Rs 1200/m3 , Cement 48Kg @Rs 5000/t, mason – 0.7 @Rs.450/E , man – 0.35 @ Rs 350/E, women – 0.7 @ Rs.325/E]
3. Write a detailed specification for the following items of work:
   a. RCC 1:2:4 for roof slab
   b. Foundation and basement in rubble masonry
   c. Doors and windows in wood
   d. Flooring using ceramic tiles
4.
   a. Give the detailed specification for plastering for wall with CM 1:3 mix 9mm thick.
   b. Give a detailed specification for 2.5cm cement concrete floor of 1:2:4 proportion.

To be submitted on September 6th, 2018

ASSIGNMENT – II

1. Calculate standard rent of a building with the following data:
    a. Cost of land =Rs.8,00,000/-
    b. Cost of building= Rs.5,00,000/-
    c. Expected life of building = 60 years
    d. Return expected = 6% on land, 9% on building
    e. Annual repairs = @12% on the cost of building
    f. Sinking fund =@30 of the return from building
2. Explain in detail about the preparation of tender notices and documents.
3. Explain the various types of contract system.
4. Discuss in detail about the report preparation for estimation of a residential building.

To be submitted on November 12th, 2018

TUTORIAL QUESTIONS

TUTORIAL 1

1. Prepare a detailed estimate of quantity of the following item of a building given in the Figure-1.
    a. Earth work excavation
    b. Brick work for superstructures
    c. Wood work for shuttering of doors
    d. Wall Plastering
    e. RCC work for Roof and Lintel
2. Prepare a detailed estimate of quantity of the following item of a building given in the Figure-1.
    a. PCC 1:4:8 for foundation
    b. Rubble masonry foundation and basement
    c. Wood work for frame of door and windows
    d. Wall painting

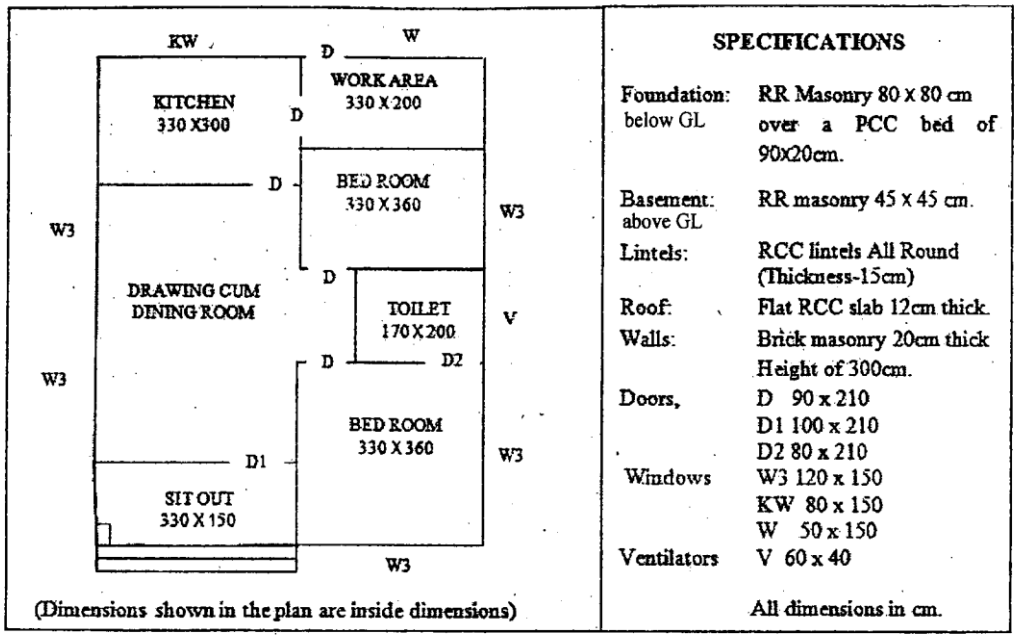
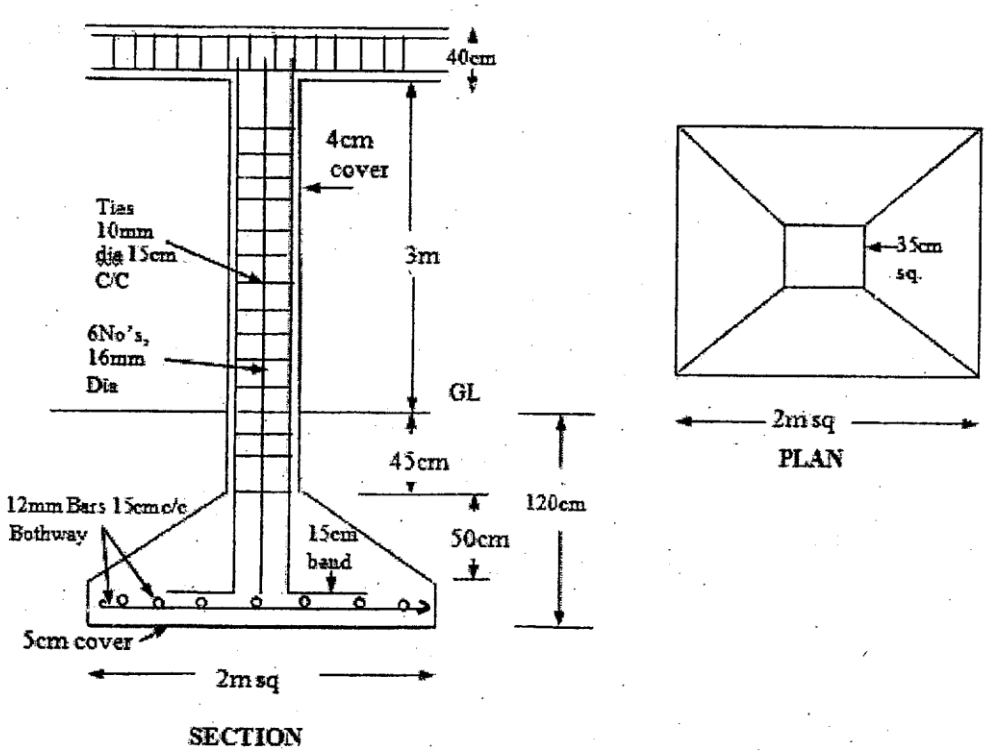


Figure - 1

TUTORIAL 2

1. Prepare bar bending schedule of a RCC column with foundation footing shown in the figure 2.



2.
   a. Explain the principles of valuation.
   b. A building costing Rs 4,50,000/- has recently been constructed in a big city. The plot measuring 450m2 was purchased @ Rs 1,500/m2 .Work out the rent of the property. Assume 7% as net return on the cost of construction and 4% in the land value. All expected outgoing are Rs 1,50,000/year.

UNIT WISE QUESTION BANK

Unit 1

1. Define analysis of rates.
2. Briefly explain about preliminary Estimate.
3. State the different types of specification.
4. Explain the general specification for first class buildings?
5. Explain the detailed specifications for any four items of work?
6. Explain the different types of estimates & differentiate detailed estimate from cube rate estimate?
7. Write note on
    a. General or brief specification
    b. Detailed specification
    c. Standard specification
8. Write short notes on data book and schedule of rates.
9.
    a. Write the detailed specification for first class brick work used in residential building construction
    b. Work out the unit rate for the following work in m3 reinforced cement concrete M20 grade

Description	Quantity	unit	Rate Rs.	unit
20mm (nominal size) broken stone	0.900	m^3	1463.00	m^3
Sand	0.450	m^3	2238.00	m^3
Cement	0.360	Tonne	4934.00	Tonne
Mason	0.200	Nos	325.00	Each
Man	1.000	Nos	240.00	Each
Women	3.500	Nos	240.00	Each
Man for lifting materials	0.200	Nos	240.00	Each
Form work	7	m^2	3629.94	m^2

Unit 2

1. Estimate the quantities of brickwork and plastering required in a wall 4m long, 3m high and 30 cm thick. Calculate also the cost if the rate of brickwork is Rs.32.00 per cu.m and of plastering is Rs. 8.50 per sq.m.
2. Calculate the quality of brickwork in an arch over a 1.80m span opening. The arch is 40cm. thick and the breath of a wall is 40 cm.
3. Analyses the rate of cement concrete of ratio 1:2:4 and 1:3:6.
4. Write down the detailed specification for the following item : Damp proof course 2.5 cm thick, with CC 1 1.5 3.
5. What is the necessity of specifications for building materials and construction.
6. Work out the unit rate for the following work in m2 - Painting two coats with approved quality plastic emulsion paint two coats.

Materials	**Qty**	**Unit**	**Rate/Unit**
Plastic emulsion paint including priming coat	1.150	Litre	180.00
Labour			
Painter	1.150	Each	270.00

7. Estimate the following items of works from the figure (Fig-1) given below?
   a. Earth work excavation
   b. PCC
   c. Brickwork above & below Ground level
   d. RCC work – Beam, Slab

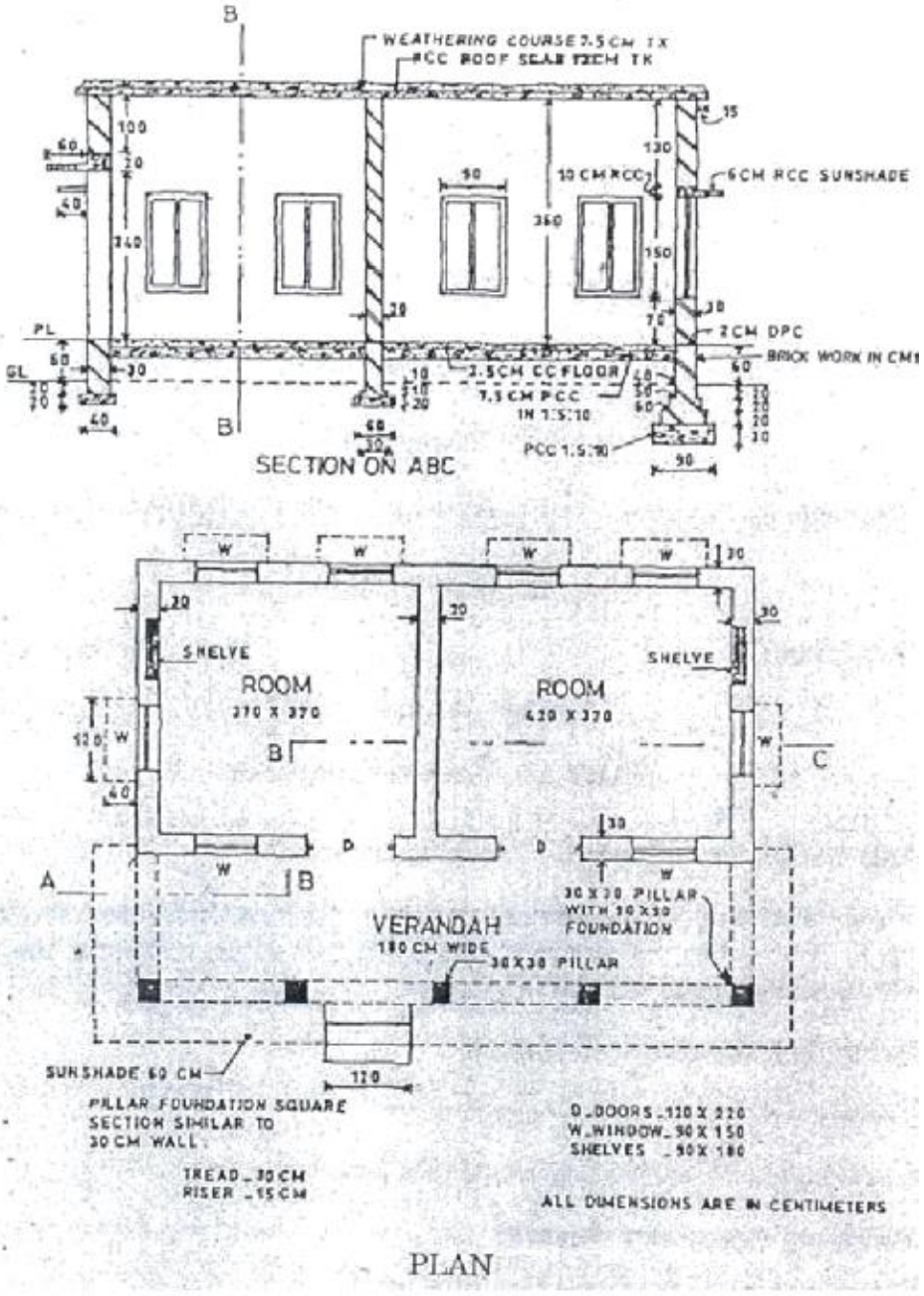
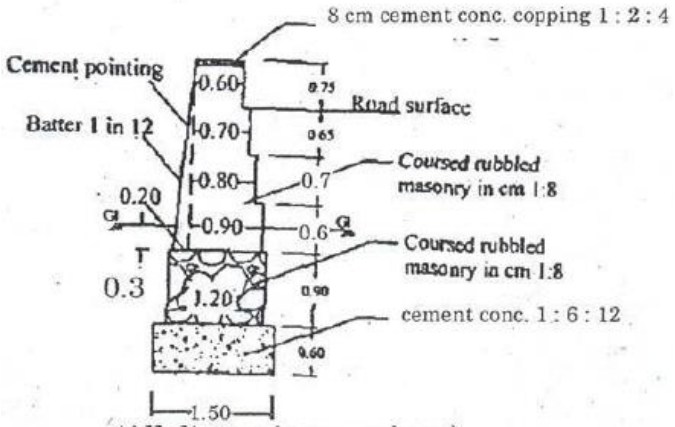


Fig-1

8. Estimate the following items of works from the figure (Fig-1).
    a. Plastering
    b. White washing & painting
9. Estimate the following items of works from the figure (Fig-1)
    a. Shuttering work/form work
    b. RCC work – slab & column
10. Analyse the rate for the following items:
    a. PCC 1:3:6 using 40 mm broken stone, 40 mm aggregate 0.95m3 @1100/ m3, Sand 0.48m3@ 2500/m3, Cement 228kg@7500/t.
    b. Rubble masonry in CM 1:6; Rubble 1m3 @900/m3, sand 0.3m3 @ Rs. 2,500/m3, Cement 72 kg @Rs. 7,500/t, Labour - 0.7 Mason @ Rs. 800 each, 0.35 Man @ Rs. 600 each, 0.70 Women @ Rs, 550 each. Unit 3

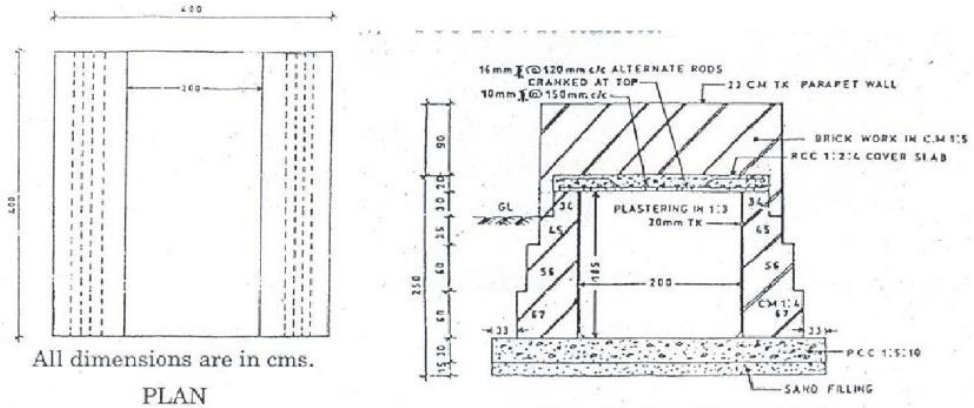
Unit 3

1. Estimate the retaining wall quantity?



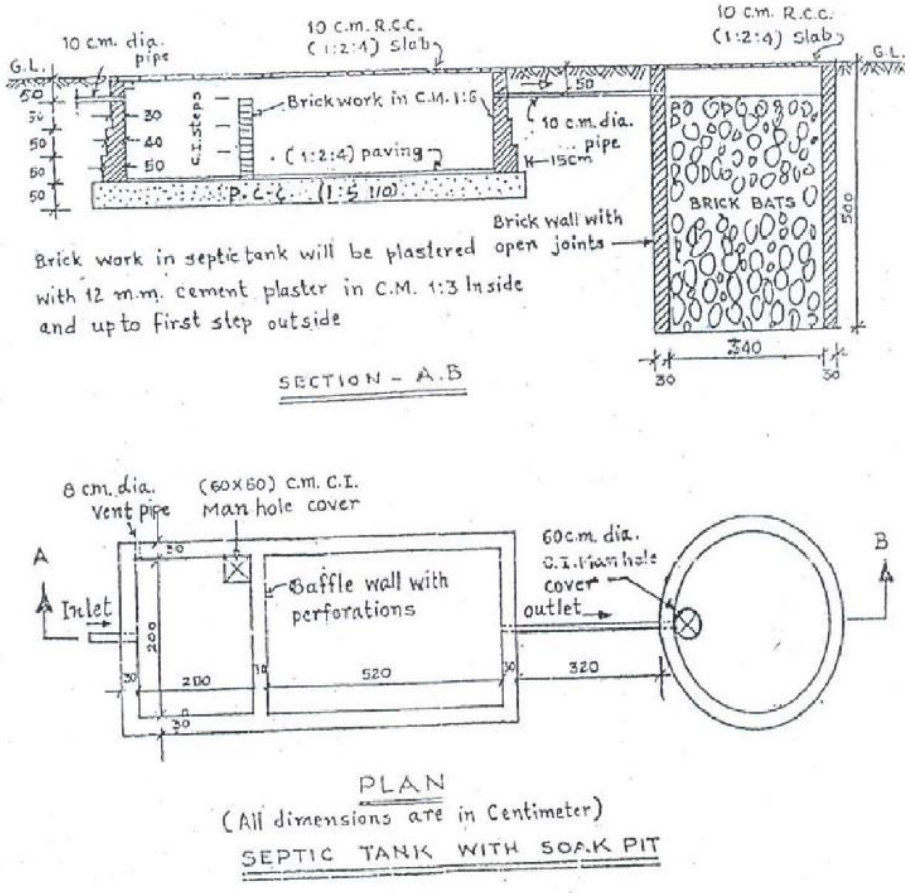
(All dimensions are in m)
Fig 13(a) Retaining wall.

2. Explain the following detailed estimate?
    a. Long wall short wall method
    b. Centre line method
3. Estimate the following quantity the figure of box culvert.
    a. Brickwork above & below Ground level
    b. RCC work
    c. Earth work excavation
    d. PCC



(fig-2)

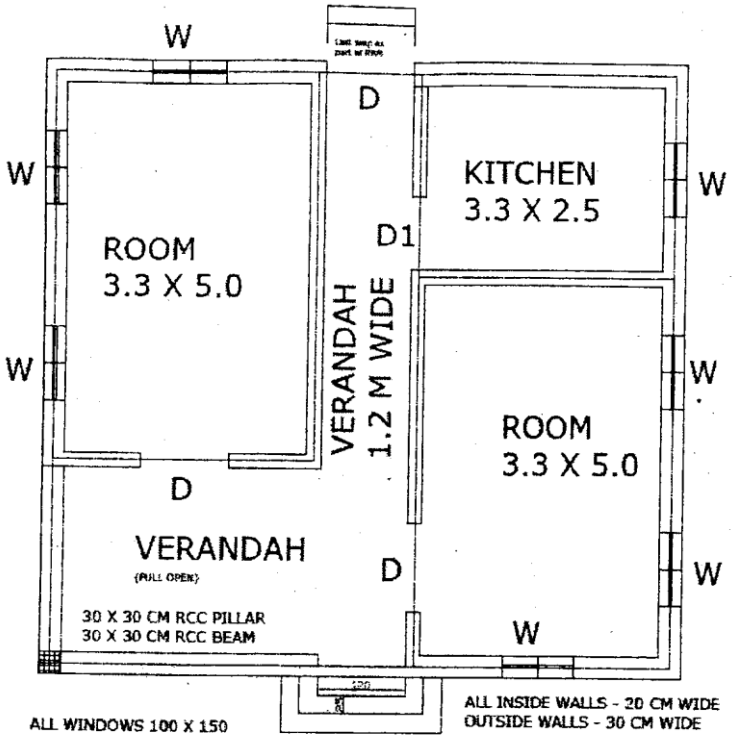
4. Estimate the following quantity from the figure of septic tank.
    a. Internal Plastering
    b. Brickwork in cm 1:6 in septic tank
    c. RCC slab cover for septic tank & soak pit



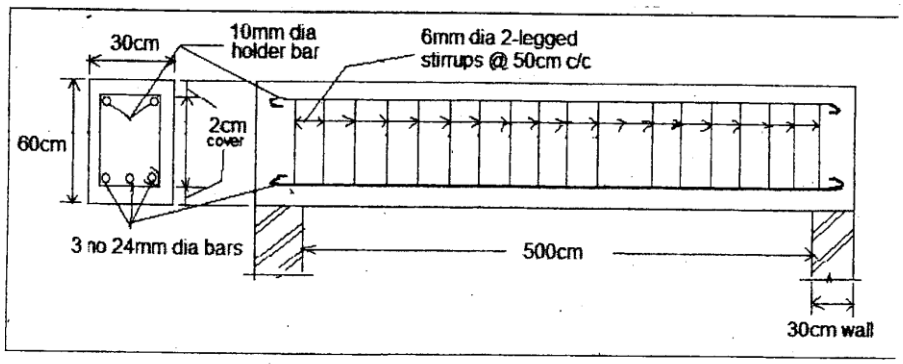
5. Briefly explain bar bending schedule. State its uses.
6. Obtain the quantity for the following items for fig. 1 and also prepare an abstract of estimate with given rates .Assume suitable missing data.
    a. Earth work excavation – rate – Rs. 350/m^3 .Excavation depth 0.9 m from ground level, width 0.9m

b. RRM in foundation and basement rate Rs. 8000/m^3 - RRM using cm 1:6, 70 cm width 80cm depth in foundation and basement 45 cm wide and 45 cm height except at front verandah column.
c. Brick work-rate – 6000/m^3 Brick work using country burnt bricks and cm 1:4,20cm thick and 3 m height. Parapet 10cm wall 60cm height
d. Cement Plastering exterior and interior – Rs 300/m^2
e. RCC M20 used in all structural elements @ Rs 10,000/m^3

All interior walls 20cm wide and exterior walls 30 cm wide .
Doors and windows D – 1.2 m x 2.1 m, D1 – 1.0 x 2.1 m; W – 1.0 x 1.5
Lintel – 0.23 x 0.15 m provided over openings with 10cm projections sunshade 60 cm projecting all around with lintel support. Assume any missing data. Front veranda consists of RCC column 30cm x 30cm with 1.2 x 1.2 x 0.5m footing size resting at 1.1 m from ground level. RCC Beam 30cm x 30cm.



7. Figure shows the longitudinal section and cross section of a simple beam of clear span 5.0m. The thickness of supporting wall is 30cm.
   a. Work out the total quantity of cement concrete and steel reinforcement. (Tor Steel)
   b. Prepare a detailed estimate of a septic tank for 20 users. Assume liquid capacity per user – 0.09m^3. Determine quantity for:
      i. Earth work in excavation
      ii. PCC 1:3:6
      iii. Brick work in CM 1:6
      iv. RCC work – M20



Unit 4

1. A property fetches a net income of Rs.900.00 deducting all outgoings. Workout the capitalized value of the property if the rate of interest is 6% per annum.
2. An old building has been purchased by a person at a cost of Rs.30,000/- excluding the cost of the land. Calculate the amount of annual sinking fund at 4% interest assuming the future life of the building as 20 years and scarp value of the building as 10% of the cost of purchase.
3. The present value of a property is 20000/- Calculate the standard rent. The rate of interest may be assumed as 6%.
4. Write the various methods of depreciation. Define the Year's purchase
5. Explain the different method of valuation?
6. The capitalized cost of a building is Rs.one lac, including all fittings of first class construction. if the rate of interest is 6%, Calculate net return from the property. Assume out goings as 15% on gross income.
7. Calculate the annual rent of a building with the following data.
   Cost of land = Rs.20000/-
   Cost of building = Rs.80000/-
   Estimate life = 80years
   Return expected = 5% on land 6% on building
   Annual repairs are expected to be 0.7% of the cost construction and other out goings will be 25% of the gross rent. There is no proposal to set up a sinking fund.
8. A building is situated on ambala –Kalka road Rs. 38000/-considered its scrap value as 10% of the cost and life as 80years.Find out depreciated value if the the life of the building is 20 year.
9. A plot measure 500sq.m.the built up area rate of this 1st class building is Rs.600/- per sq.m this rates includes cost of water supply, sanitary and electric installations. The age of the building is 40 years. The cost of the land is Rs.80/- per sq.m.
10.
    a. A building costing Rs. 8,00,000/- has been constructed on a freehold land measuring 200 sqm recently in a big city. Prevailing rate of land in the neighbourhood is Rs. 250/-per sqm. Determine the net rent of the

property,
if the expenditure on an outgoing including sinking fund is Rs. 34,000/-per annum. Work out also the gross rent of the property per month.

b. Explain how depreciation is building is worked out.

11.

a. Calculate standard rent of a building with the following data:
Cost of land - Rs 8,00,000/
Cost of building-Rs. 5,00,000/-
Expected life of building - 60 years
Annual repairs- @12% on the cost of building
Sinking fund - @30 of the return from building.

b. A real estate agent purchases a vacant land of extent 10 hectares at a cost of Rs. 300 per m2. He divides the land into building plots of 900 m2 area after leaving 25% of the land for roads, parks etc. Expenses for the development are at Rs. 1500 per m2 and technical charges at 8% of cost price, work out the selling price of each plot if the agent expects 20% profit for his investment.

F1

CE 465

GEO-ENVIRONMENTAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: CE	**DEGREE**: BTECH
COURSE: GEO-ENVIRONMENTAL ENGINEERING	**SEMESTER:** S7 **L-T-P-CREDITS**: 3-0-0-3
COURSE CODE: CE465 **REGULATION**: 2016	**COURSE TYPE**: ELECTIVE
COURSE AREA/DOMAIN: CIVIL ENGINEERING	**CONTACT HOURS**: 3 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	**LAB COURSE NAME**: NIL

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction and Soil-water-environment interaction : Introduction to geoenvironmental Engineering, Soil-water-environment interaction relating to geotechnical problems, Waste:-source, classification and management of waste, Physical, chemical and geotechnical characterization of municipal solid waste, Impact of waste dump and its remediation	6
II	Geotechnical application of waste and disposal: Geotechnical use of different types such as Thermal power plant waste, MSW, mine waste, industrial waste. Waste disposal facilities, Parameters controlling the selection of site for sanitary and industrial landfill. Site characterization. MoEF guidelines.	7
III	Landfill Components :Landfill layout and capacity, components of landfill and its functions. Types and functions of liner and cover systems, Compacted clay liner, selection of soil for liner, methodology of construction.	6
IV	Leachate, Gas Management and Geosynthetics: Management of Leachate and gas. Various components of leachate collection and removal system and its design., gas disposal/utilization. Closure and post closure monitoring system Geosynthetics- Geo membranes - geosynthetics clay liners -testing and design aspects.	6
V	Soil remediation : Investigation of contaminated soil, sampling, assessment Transport of contaminants in saturated soil. Remediation of contaminated soil- in-situ / exit remediation, bio remediation, thermal remediation, pump and treat method, phyto remediation and electro-kinetic remediation	9
VI	Change in engineering properties due to change in environment. Variation in Engineering properties of soil –atterberg limit, shear strength, permeability and swelling due to change in environment/pore fluid.	8
TOTAL HOURS		42

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	Daniel, D.E. (1993). Geotechnical Practice for Waste Disposal. Chapman, and Hall, London.
T2	Koerner, R.M. (2005). Designing with Geosynthetics. Fifth Edition. Prentice Hall, New Jersey.
T3	Reddi L.N and Inyang HI (2000) Geoenvironmental Engineering: Principles and Applications, Marcel Dekker Inc Publication
T4	R. N. Yong (2000) Geoenvironmental Engineering: Contaminated Soils, Pollutant Fate, Mitigation Lewis Publication.
T5	Dr. G V Rao and Dr. R S Sasidhar (2009) Solid waste Management and Engineered Landfills, Saimaster Geoenvironmental Services Pvt. Ltd. Publication.
T6	Ayyar TSR (2000) Soil engineering in relation to environment, LBS centre for Science and Technology, Trivandrum.
T7	Hari D. Sharma, Krishna R. Reddy (2004) Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies, Publisher: John Wiley & Sons Inc.
T8	Donald L. Wise, Debra J. Trantolo, Hilary I. Inyang, Edward J. Cichon (2000) Remediation Engineering of Contaminated Soils, Publisher: Marcel Dekker Inc.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEMESTER
CE 305	Geotechnical Engineering II	Engineering properties of soil	S6

COURSE OBJECTIVES:

1	To create a awareness in the field of Geo-Environmental Engineering
2	To impart the knowledge on Geotechnical aspects in the disposal of waste materials and the remediation of contaminated sites
3	To familiarize about landfill and clay liner design
4	To create awareness about waste collection and design of removal systems
5	To impart the knowledge on soil remediation and investigation of contaminated soil
6	To create awareness about variation in properties of soil due to change in environment

COURSE OUTCOMES:

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	The students will be able to understand the basic concepts in geo environmental engineering and soil-water-environment interaction.											
	M	L										
2	The students will be able to identify different types of wastes and provide a solution by their geotechnical application.											
	H	M	L				M		M			
3	The students will be able to understand about landfill and to construct compacted clay liner											
	M	L										
4	The students will be able to solve leachate and gas problems from wastes and the design geo synthetic clay liners											
	H	M	L									
5	The students will be able to identify contaminated soil and to select the type of remediation required for that soil.											
	H	M	L									
6	The students will be able to understand the change in engineering properties due to change in environment.											
	M	L										

JUSTIFICATION FOR CO-PO MAPPING:

CO	PO	MAPPING	JUSTIFICATION
CO1	PO1	MEDIUM	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to know about soil-water-environment interaction.
	PO2	LOW	The students will be able to identify, and analyze types of wastes and provide a solution by their geotechnical application and substantiated conclusions based on engineering sciences
CO2	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and engg. specialization to know about different types of wastes and provide a solution by their geotechnical application.
	PO2	MEDIUM	The students will be able to identify, formulate, research literature, and analyze engineering problems of waste disposal and to provide a solution by their geotechnical application.
	PO3	LOW	The students will be able to identify different types of wastes and provide a solution by their geotechnical application to

CO	PO	MAPPING	JUSTIFICATION
			meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations
	PO7	MEDIUM	The students will be able to identify different types of wastes and provide a solution by their geotechnical application, hence understanding the impact of the professional engineering solutions in societal and environmental contexts and need for sustainable development.
	PO9	MEDIUM	The students will be able to identify different types of wastes and provide a solution by their geotechnical application by functioning effectively as an individual, and as a member or leader in teams.
	PO1	MEDIUM	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and engg. specialization to understand about landfill and to construct compacted clay liner
	PO2	LOW	The students will be able to identify engineering problems of waste disposal to arrive at substantiated conclusions of understanding about landfill and to construct compacted clay liner
CO4	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and engg. specialization to solve leachate and gas problems from wastes and the design geo synthetic clay liners.
	PO2	MEDIUM	Identify and analyze engineering problems of leachate and gas problems from wastes and the design of geo synthetic clay liners
	PO3	LOW	The students will be able to solve leachate and gas problems from wastes and the design geo synthetic clay liners with consideration for the public health and safety, and the cultural, societal, and environmental considerations
CO5	PO1	HIGH	The students will be able to apply the knowledge of science, engineering fundamentals, and engg. specialization to identify contaminated soil and to select the type of remediation required for that soil.
	PO2	MEDIUM	The students will be able to identify, and analyze engineering problems of contaminated soil and to select the type of remediation required for that soil. Hence arriving at substantiated conclusions using engineering sciences
	PO3	LOW	The students will be able to identify contaminated soil and to select the type of remediation required for that soil with

CO	PO	MAPPING	JUSTIFICATION
			consideration for the public health and safety, and the cultural, societal, and environmental considerations
CO6	PO1	MEDIUM	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to understand the change in engineering properties due to change in environment.
	PO2	LOW	The students will be able to identify, and analyze engineering problems of change in environment and corresponding change in geotechnical properties.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl No	DESCRIPTION	PROPOSED ACTIONS
1	No mentions about industries which reuses non bio degradable wastes.	Assignment

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl No	DESCRIPTION
1	

WEB SOURCE REFERENCES:

Sl No	DESCRIPTION
1	www.nptel.ac.in
2	http://gen.lib.rus.ec/search.php?req=designing+with+geosynthetics&lg_topic=libgen&open=0&view=simple&res=25&phrase=0&column=def

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK	✓	**STUD. ASSIGNMENT**	✓	WEB RESOURCES	
LCD/SMART BOARDS	✓	STUD. SEMINARS		ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS	✓	STUD. SEMINARS		**TESTS/MODEL EXAMS**	✓	**UNIV. EXAMINATION**	✓
STUD. LAB PRACTICES		STUD. VIVA		MINI/MAJOR PROJECTS		CERTIFICATIONS	
ADD-ON COURSES		OTHERS					

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓	**STUDENT FEEDBACK ON FACULTY (TWICE)**	✓
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS		OTHERS	

Prepared by
Angel Sebastian

Approved by
Dr. Aysha Zeneeb Majeed

COURSE PLAN

HOUR	MODULE	TOPICS PLANNED
HOUR 1	1	Introduction and Soil-water-environment interaction : Introduction to geoenvironmental Engineering
HOUR 2		Soil-water-environment interaction relating to geotechnical problems
HOUR 3		Waste:-source, classification and management of waste
HOUR 4		Physical, chemical characterization of municipal solid waste
HOUR 5		geotechnical characterization of municipal solid waste
HOUR 6		Impact of waste dump and its remediation
HOUR 7	2	Static indeterminacy
HOUR 8		Geotechnical application of waste and disposal
HOUR 9		Geotechnical use of different types such as Thermal power plant waste
HOUR 10		MSW, mine waste, industrial waste
HOUR 11		Parameters controlling the selection of site for sanitary and industrial landfill.
HOUR 12		Site characterization.
HOUR 13		Waste disposal facilities MoEF guidelines
HOUR 14	3	Landfill Components :Landfill layout and capacity,
HOUR 15		Components of landfill and its functions.
HOUR 16		Types and functions of liner
HOUR 17		Types and functions of cover systems,
HOUR 18		Compacted clay liner
HOUR 19		Selection of soil for liner, methodology of construction.
HOUR 20	4	Various components of leachate collection
HOUR 21		Management of Leachate and gas.
HOUR 22		Leachate removal system and its design., gas disposal/utilization.
HOUR 23		Closure and post closure monitoring system
HOUR 24		Geo membranes - geosynthetics
HOUR 25		Clay liners -testing and design aspects.
HOUR 26		Soil remediation
HOUR 27	5	Investigation of contaminated soil
HOUR 28		assessment, sampling
HOUR 29		Transport of contaminants in saturated soil.
HOUR 30		Remediation of contaminated soil- in-situ / exit remediation
HOUR 31		bio remediation
HOUR 32		thermal remediation
HOUR 33		pump and treat method
HOUR 34		phyto remediation and electro-kinetic remediation
HOUR 35	6	Change in engineering properties due to change in environment.
HOUR 36		Variation in Engineering properties of soil
HOUR 37		Variation in atterberg limit
HOUR 38		Variation in shear strength

HOUR 39		Variation in permeability
HOUR 40		swelling due to change in environment/pore fluid.
HOUR 41		Discussion
HOUR 42		Discussion

ASSIGNMENT – I

All questions are compulsory

1. Explain various geotechnical applications of the following types of wastes:
    a. Thermal power plant waste
    b. MSW
    c. Mine waste
    d. Industrial waste
2. Explain about the type of wastes produced in a nearby industry and their disposal techniques. Examine its geotechnical application.
3. Explain the physical, chemical and geotechnical characterisation of MSW.

ASSIGNMENT – II

All questions are compulsory

1. Explain landfill components and their functions.
2. Explain the various remediation techniques adopted for contaminated soil.
3. Explain the variation in the following engineering properties of soil due to change in environment:
    a. Atterberg limits, shear strength, permeability and swelling

QUESTION BANK

MODULE I

1. Explain the sources of ground water contamination
2. Explain the transport mechanisms in ground water contamination
3. List out the moisture content percentages and density values for various material in MSW.
4. Exlpain the impact of waste dump and its remediation
5. Explain the various sources of waste
6. Explain on the various classification of waste

MODULE II

1. Explain the parameters controlling the selection of site for sanitary and industrial landfill.
2. Explain MoEF guidelines and site characterisation.

MODULE III

1. What is a landfill. Explain on its layout, capacity, components.
2. Write a note on compacted clay liner, its selection of soil and methodology of construction.

MODULE IV

1. What is a Leachate. Explain Management of Leachate and gas.
2. Write a note on various components of leachate collection and removal system and its design.
3. Geo membranes and geosynthetic clay liners -testing and design aspects.

MODULE V

1. Explain on investigation of contaminated soil
2. Write a note on Remediation of contaminated soil

MODULE VI

1. Write a note on engineering properties of soil
2. Explain Change in engineering properties due to change in environment

F2

CE 469
ENVIRONMENTAL IMPACT ASSESSMENT

COURSE INFORMATION SHEET

PROGRAMME: CE	**DEGREE**: BTECH
COURSE: ENVIRONMENTAL IMPACT ASSESSMENT	**SEMESTER:** S7 **L-T-P-CREDITS**: 3-0-0-3
COURSE CODE: CE469 **REGULATION**: 2016	**COURSE TYPE**: ELECTIVE
COURSE AREA/DOMAIN: CIVIL ENGINEERING	**CONTACT HOURS**: 3 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	**LAB COURSE NAME**: NIL

SYLLABUS:

UNIT	DETAILS	HOURS
I	INTRODUCTION: Classification of Pollution and Pollutants, – Evolution of EIA (Global and Indian Scenario)- Elements of EIA–– Screening – Scoping - Public Consultation - Environmental Clearance process in India - Key Elements in 2006 EIA(Govt. of India)Notification	6
II	AIR POLLUTION: Primary and Secondary Types of Pollutants, sulfur dioxide- nitrogen dioxide, carbon monoxide, WATER POLLUTION: Point and Non-point Source of Pollution, Major Pollutants of Water, Impact of pollutants	6
III	SOLID WASTE: Classification and sources of Solid Waste, Characteristics, effects, e waste, : Effects of urbanization on land degradation, pesticide pollution NOISE POLLUTION: Sources of Noise, Effects of Noise, control measures	7
IV	Impacts of pollutants, types, scale of impact-Global, local pollutants. Climate change, Ozone layer depletion, Deforestation, land degradation , Impact of development on vegetation and wildlife	7
V	Socio-economic impacts - Impact assessment Methodologies- Overlays, Checklist, Matrices, Fault Tree Analysis, Event Tree Analysis- Role of an Environmental Engineer- Public Participation	8
VI	Standards for Water, Air and Noise Quality - Environmental Management Plan- EIA- Case studies of EIA	8
TOTAL HOURS		42

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	A K Srivastava, Environment impact Assessment, APH Publishing, 2014
T2	John Glasson, Riki Therivel & S Andrew Chadwick “Introduction to EIA” University College London Press Limited, 2011
T3	Larry W Canter, “Environmental Impact Assessment”, McGraw Hill Inc. , New York, 1995.

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T4	Ministry of Environment & Forests, Govt. of India 2006 EIA Notification
R1	Rau G J and Wooten C.D "EIA Analysis Hand Book" Mc Graw Hill
R2	Robert A Corbett "Standard Handbook of Environmental Engineering" McGraw Hill, 1999

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEMESTER
	NIL		

COURSE OBJECTIVES:

1	To know the various types of environmental pollution
2	To make aware the impact due to various types of pollutants and their assessment technique

COURSE OUTCOMES:

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	The students will be able classify different types of pollution and pollutants and to understand different EIA clearance procedures and key elements in 2006 EIA.											
	H	L					H					
2	The students should be able to understand the various types of air pollution, distinguish the major air pollutants as primary and secondary, understand the various sources of water pollution, major pollutants of water and impact of these pollutants.											
						M						
3	The students should be able to classify solid waste, understand its sources, characteristics and types, able to understand the land/soil pollution, effects of urbanization on land degradation, assess impact of modern agriculture on soil, pesticide pollution and its effect on environment,understand sources and effects of noise pollution and the control measures											
	M			L	M	L	H	M				
4	The students should be able to understand the impacts of pollutants, types, scale of impact, climate change, ozone layer depletion, deforestation, land degradation and impact of development on vegetation and wildlife											
						L	H					
5	The students should be able to understand socio-economic impacts and apply Impact assessment Methodologies. The student should discover the role of an Environmental Engineer and contribute to Public Participation.											
	H			L		M	H	H				

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
6	The students should be able to understand ambient air, water and noise quality standards, understand Environmental Management Plan and apply the impact analysis in case studies of EIA.											
	H			L			H					

JUSTIFICATION FOR CO-PO MAPPING:

CO	PO	MAPPING	JUSTIFICATION
CO1	PO1	HIGH	Students will be able to apply the knowledge of mathematics, science fundamentals to know the different methods of measurement of EIA.
	PO2	LOW	Students will be able to review literature on key elements of EIA 2006
	PO7	HIGH	Students will be able to understand the impact of the environmental problems and need for sustainable development.
CO2	PO6	MEDIUM	Students will be able to assess societal health and safety issues of air pollution and water pollution.
CO3	PO1	MEDIUM	Students will be able to apply the knowledge of mathematics, science fundamentals to know the different methods of measurement of noise.
	PO4	LOW	Students will be able to analyze and interpret admissible noise levels
	PO5	MEDIUM	Students will be able to select appropriate techniques for disposal of solid waste based on their composition
	PO6	LOW	Students will be able to apply knowledge to assess the effects of soil pollutants on societal and health effects
	PO7	HIGH	Students will be able to understand the impact due to effects of urbanization on land degradation and pesticide pollution and need for sustainable development.
	PO8	MEDIUM	Students could apply ethical principles and commit to professional ethics by abiding to the standards of Central Pollution Control Board
CO4	PO6	LOW	Students will be able to apply knowledge to assess the impacts of pollutants on societal and health effects
	PO7	HIGH	Students will be able to understand the impact of pollutants on climate change, ozone layer depletion, deforestation, land degradation and also impacts of development on vegetation and wildlife and need for sustainable development.

CO	PO	MAPPING	JUSTIFICATION
CO5	PO1	HIGH	Students will be able to apply the knowledge of mathematics, science fundamentals to know the different methods of measurement of EIA.
	PO4	LOW	Students will be able to analyze and interpret EIA
	PO6	MEDIUM	Students will be able to apply knowledge of EIA to assess societal and health effects
	PO7	HIGH	Students will be able to understand the impact of the environmental problems and need for sustainable development.
	PO8	HIGH	Students could apply ethical principles and commit to professional ethics by discovering his role as a n environmental engineer
CO6	PO1	HIGH	The students will be able to analyze and interpret air quality standards, water quality standards and ambient noise quality.
	PO4	LOW	Students will be able to analyze and interpret EIA
	PO7	HIGH	Students will be able to understand the impact of the environmental problems and need for sustainable development.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl No	DESCRIPTION	PROPOSED ACTIONS
1	Components of Environment – Man and Environment – Health and Environment – Environmental Ethics – Interdisciplinary nature of Environment – Sustainable development – Social, economical and environmental dimensions	Assignment

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl No	DESCRIPTION
1	Strategic Environmental Assessment (SEA)

WEB SOURCE REFERENCES:

Sl No	DESCRIPTION
1	http://nptel.ac.in/courses/120108004/5

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK	✓	**STUD. ASSIGNMENT**	✓	**WEB RESOURCES**	✓
LCD/SMART BOARDS		STUD. SEMINARS		ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS	✓	STUD. SEMINARS		**TESTS/MODEL EXAMS**	✓	**UNIV. EXAMINATION**	✓
STUD. LAB PRACTICES		STUD. VIVA		MINI/MAJOR PROJECTS		CERTIFICATIONS	
ADD-ON COURSES		OTHERS					

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓	**STUDENT FEEDBACK ON FACULTY (TWICE)**	✓
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS		OTHERS	

Prepared by
Dr. Asha Viswanath

Approved by
Dr. Aysha Zeneeb Majeed

COURSE PLAN

HOUR	MODULE	TOPICS PLANNED
HOUR 1	1	Classification of Pollution and Pollutants
HOUR 2		Evolution of EIA (Global and Indian Scenario)
HOUR 3		Elements of EIA - Screening, Scoping
HOUR 4		Public Consultation
HOUR 5		Environmental Clearance process in India
HOUR 6		Key Elements in 2006 EIA(Govt. of India)Notification
HOUR 7	2	AIR POLLUTION: Primary and Secondary Types of Pollutants
HOUR 8		sulfur dioxide, nitrogen dioxide, carbon monoxide
HOUR 9		WATER POLLUTION: Point Source of Pollution
HOUR 10		Non-point Source of Water Pollution
HOUR 11		Major Pollutants of Water
HOUR 12		Impact of pollutants
HOUR 13	3	SOLID WASTE: Classification and sources of Solid Waste
HOUR 14		Characteristics and effects of solid waste, e- waste
HOUR 15		Effects of urbanization on land degradation
HOUR 16		pesticide pollution
HOUR 17		NOISE POLLUTION: Sources of Noise
HOUR 18		Effects of Noise pollution
HOUR 19		Noise control measures
HOUR 20	4	Impacts of pollutants and types
HOUR 21		scale of impact-Global and local pollutants
HOUR 22		Climate change
HOUR 23		Ozone layer depletion
HOUR 24		Deforestation, land degradation
HOUR 25		Impact of development on vegetation and wildlife
HOUR 26	5	Socio-economic impacts
HOUR 27		Impact assessment Methodologies - Overlays
HOUR 28		Checklist
HOUR 29		Matrices
HOUR 30		Fault Tree Analysis
HOUR 31		Event Tree Analysis
HOUR 32		Role of an Environmental Engineer
HOUR 33		Public Participation
HOUR 34	6	Standards for Water Quality
HOUR 35		Air Quality
HOUR 36		Noise Quality
HOUR 37		Environmental Management Plan
HOUR 38		EIA
HOUR 39		Case studies of EIA
HOUR 40		Case studies of EIA
HOUR 41		Revision
HOUR 42		Tutorials

QUESTION BANK

Short answer questions

Module 1

1. Define and briefly discuss EIA outlining its importance.
2. Write a short note on Screening.
3. Discuss the role of consultation and public /stakeholder participation in an EIA process. At what stages of an EIA is the public involved/ consulted?
4. Highlight the advantages and disadvantages of public participation in the overall environmental clearance process of any project.

Module 2

5. What are types and sources of particulate matter causing air pollution.
6. Identify the various pollution sources of following air contaminants:
    a. Sulphur Dioxide
    b. Nitrogen Dioxide
    c. Carbon Monoxide
7. What is 'Smog'? Discuss cause and effects.
8.
    a. Distinguish between primary and secondary air pollutants.
    b. What is difference between a point source and a dispersed source of pollutants? Give example of each.
9. Is groundwater naturally pure? Why?

Module 3

10. What are solid wastes? How solid wastes are disposed ultimately?
11. What is meant by low level Radioactive wastes?
12. Write short notes on e-waste generation.
13. Which do you think is a greater danger to man
    a. Pesticides used by farmers and householders or
    b. Toxic substances used by industrial plants.
14. What does the term 'Hertz' refer to? How is it related to pitch?
15. What is sound exposure level(SEL)? Explain its application.
16. What are the four basic ways in which noise can be controlled or reduced? Which is most effective way?
17. Write a short note on detrimental effects of noise.

Module 4

18. Briefly explain the impact of development on vegetation and wild life.
19. Clearly point out the Abatement measures opted against land degradation.
20. Write a short note on ozone layer depletion.

Module 5

21. Write a short note on fault-tree analysis.

22. Explain the checklist method of impact assessment.
23. Briefly explain the various types of Socio-economic impacts.
24. Enlist the drawbacks of Matrix method of EIA.

Module 6

25. Write a short note on standards for noise quality.
26. Give the Indian air quality standards for residential, industrial and sensitive areas.
27. Write a note on emission standards.
28. Differentiate the water quality characteristics between surface water and groundwater sources.
29. Mention typical values of acceptable levels of sound as per IS codes for:
    a. Rural areas
    b. Urban residential areas
    c. City areas
    d. Industrial areas

Long answer questions

Module 1

30. Explain briefly the evolution of EIA.
31. Explain in general the environmental clearance process in India.
32. Differentiate between screening and scoping in the EIA process.
33. Summarize the purpose and Benefits of the EIA process.

Module 2

34. Describe the various air pollution sources in an industrialised city like Bombay.
35. Are ocean waters immune to pollution problems? Briefly discuss your answer.

Module 3

36. Discuss the effects of urbanization on land degradation.
37. What are the effects of distance on sound levels from a point source and a line source? Why do they differ?

Module 4

38. Discuss the types and scale of impacts of various pollutants.
39. What is climate change? Discuss the detrimental effects of land degradation.

Module 5

40. Explain the role of public participation in EIA and write a short note on overlay and matrix method of impact assessment.
41. Explain the role of environmental engineer in EIA and write a short note on Event tree analysis.

Module 6

42. Write a short note on water quality analysis and explain the standards for water quality.
43. Explain briefly the preparation of Environmental Management plan for a hydroelectric power project.

Beyond syllabus questions

44. Suggest possible mitigation measures for the following environmental impacts from an irrigation and drainage scheme:
    a. Water quality problems for downstream users caused by irrigation return flow.
    b. Ground water depletion.
    c. Increase incidence of water related disease. (6 marks)
45. Explain how EIA fits in the concept of sustainable development.
46. Outline the key areas required during an EIA. (14 marks)
47. Define and briefly explain the role of each of the following participant in an EIA process
    a. Proponent
    b. Licensing authority
    c. Lead expert
    d. The local community
48. Discuss the problems and challenges that are associated with EIA in developing countries. (10 marks)
49. Discuss the social impacts that could be associated with constructing a huge dam in a typical rural environment. (10 marks)
50. EIA is an art cum science skill. Give your comments

ASSIGNMENT – I

Questions 3, 5, 7, 31 and 34.

To be submitted on September 7th, 2018

ASSIGNMENT – II

Questions 13, 15, 20,24,29,36,41 and 43.

To be submitted on November 14th, 2018

F3

CE 473

ADVANCED COMPUTATIONAL TECHNIQUES AND OPTIMISATION

COURSE INFORMATION SHEET

PROGRAMME: CE	**DEGREE**: BTECH
COURSE: ADVANCED COMPUTATIONAL TECHNIQUES AND OPTIMIZATION	**SEMESTER:** S7 **L-T-P-CREDITS**: 3-0-0-3
COURSE CODE: CE473 **REGULATION**: 2016	**COURSE TYPE**: Elective
COURSE AREA/DOMAIN: MATHEMATICS	**CONTACT HOURS**: 3 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	**LAB COURSE NAME**: NIL

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to numerical methods – errors in numerical methods – Systems of linear algebraic equations – Elimination and factorization methods – Gauss Seidel iteration. Eigen Value problems – power method.	6
II	General Optimisation procedures – and features of mathematical programming as applicable to Civil engineering problems. Unconstrained and constrained optimization problems – Formulation of objective function and constraints	6
III	Lagrangian interpolation – Quadratic and Cubic splines (Problems on quadratic splines only) – Data smoothing by least squares criterion – Non-polynomial models like exponential model and power equation – Multiple linear regression. Numerical integration – Newton – Cotes open quadrature	7
IV	Linear Programming – Simplex method standard form – Simplex algorithm – Two phase solution by simplex method – Duality of linear programming Formulation of geometric programming	7
V	Ordinary differential equations – 1st order equations – Solution by use of Taylor series – Runge-kutta method – Ordinary differential equations of the boundary value type – Finite difference solution – Partial differential equations in two dimensions – Parabolic equations – Explicit finite difference method – Crank-Nicholson implicit method – Elipse equations	8
VI	Non-Linear Programming problems – one dimensional minimisation. Unconstrained optimization Techniques Direct search method. Random search Univariate pattern search. Descent methods.	8
TOTAL HOURS		42

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	Grewal B.S. "Numerical Methods in Engineering and Science" Khanna
T2	Chapra S.C. and Canale R.P. "Numerical Methods for Engineers" McGraw Hill 2006.

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T3	Smith G.D. "Numerical solutions for Differential Equations" McGraw Hill
T4	Ketter and Prawel "Modern Methods for Engineering Computations" McGraw Hill
R1	Rajasekharan S. "Numerical Methods in Science and Engineering"S Chand & company 2003
R2	Terrence .J.Akai "Applied Numerical Methods for Engineers", Wiley publishers 1994.
R3	R.L. Fox , Optimisation methods in Engineering Design, Addison Wesely
R4	Rajasekharan S. "Numerical Methods for Initial and Boundary value problems," Khanna publishers 1989
R5	S.S. Rao , Optimisation Theory and applications , ,Wiley Eastern. Belegundu., Optimisation concepts and Applications Engineering

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEMESTER
MA202	Probability distribution, Transforms and Numerical methods	Fundamentals of Numerical method	S4
CE306	Computer programming and Computational Techniques	Fundamentals of application of programming	S5

COURSE OBJECTIVES:

1	To introduce different numerical solutions and importance of optimization
2	To impart ability to apply mathematics and optimizing techniques for finding solutions to real time problems

COURSE OUTCOMES:

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	The students will be able to find different numerical solutions of complicated problems											
	H	M	M									
2	The students should be able to determine solutions of real time problems applying numerical methods in Mathematical concept											
		L		M								
3	Students will be able to understand the importance of optimization and apply optimization techniques in real time problems											
	H		L									
4	The students should be able to formulate different type of optimization problems.											
		H	M									

JUSTIFICATION FOR CO-PO MAPPING:

CO	PO	MAPPING	JUSTIFICATION
CO1	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of Numerical problems
	PO2	MEDIUM	The students will be able to identify and analyse different type of errors in real time problems
	PO3	MEDIUM	The students will be able to find appropriate methods and solve linear system of algebraic equation.
CO2	PO2	LOW	The students will be able to identify appropriate method to solve partial differential equation in numerical method.
	PO4	MEDIUM	The students will be able to identify and solve multi variable optimisation with and without constraints.
CO3	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization in nonlinear programming.
	PO3	LOW	The students will be able to identify and formulate algorithms to solve multivariable nonlinear programming without constraints.
CO4	PO2	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of Interpolation methods.
	PO3	MEDIUM	The students will be able to solve cubic and quadratic interpolation

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl No	DESCRIPTION	PROPOSED ACTIONS
1	Solution of transcendental equations	Assignment

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl No	DESCRIPTION	PROPOSED ACTIONS
1	Developing a C++ program to solve linear programming problem.	1. Lab sessions 2. Assignment 3. Seminar

WEB SOURCE REFERENCES:

Sl No	DESCRIPTION
1	www.nptel.ac.in

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK	✓	**STUD. ASSIGNMENT**	✓	WEB RESOURCES	
LCD/SMART BOARDS		STUD. SEMINARS		ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS	✓	STUD. SEMINARS		**TESTS/MODEL EXAMS**	✓	**UNIV. EXAMINATION**	✓
STUD. LAB PRACTICES		STUD. VIVA		MINI/MAJOR PROJECTS		CERTIFICATIONS	
ADD-ON COURSES		OTHERS					

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓	**STUDENT FEEDBACK ON FACULTY (TWICE)**	✓
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS		OTHERS	

Prepared by
Binu R

Approved by
Dr. Antony V Varghese

COURSE PLAN

HOUR	MODULE	TOPICS PLANNED
HOUR 1	1	Introduction
HOUR 2		Errors
HOUR 3		Problems
HOUR 4		Solution of linear systems
HOUR 5		Elimination and factorization methods-.
HOUR 6		Gauss Seidel iteration
HOUR 7		Eigen Value problems-power method.
HOUR 8	2	General Optimisation procedures - and features of mathematical programming
HOUR 9		Features of mathematical programming as applicable to Civil engineering problems
HOUR 10		Unconstrained and constrained optimization problems
HOUR 11		Unconstrained and constrained optimization problems
HOUR 12		Formulation of objective function and constraints
HOUR 13		Problems
HOUR 14	3	Lagrangian interpolation
HOUR 15		Quadratic and Cubic splines (Problems on quadratic splines only)
HOUR 16		Problems
HOUR 17		Data smoothing by least squares criterion
HOUR 18		Non-polynomial models, exponential model and power equation
HOUR 19		Numerical integration
HOUR 20		Newton – Cotes open quadrature
HOUR 21	4	Ordinary differential equations- 1st order equations
HOUR 22		Solution by use of Taylor series
HOUR 23		Runge- kutta method
HOUR 24		Ordinary differential equations of the boundary value type
HOUR 25		Finite difference solution
HOUR 26		problems
HOUR 27		problems
HOUR 28	5	Partial differential equations in two dimensions
HOUR 29		Parabolic equations
HOUR 30		Explicit finite difference method-
HOUR 31		Crank-Nicholson implicit method-
HOUR 32		Ellipse equations
HOUR 33		Problems
HOUR 34		Problems
HOUR 35		Problems
HOUR 36	6	Non- Linear Programming problems –
HOUR 37		One dimensional minimisation.
HOUR 38		Unconstrained optimization Techniques
HOUR 39		Direct search method.
HOUR 40		Random search Univariate pattern search
HOUR 41		Descent methods

HOUR 42		Problems
HOUR 43		problems

ASSIGNMENT – I

All questions are compulsory

1. Prepare a note on different type of errors in numerical method
2. Prepare a flow chart and algorithm for cubic and quadratic interpolation
3. Derive Newton quadrature formula.
4. Derive Simpsons formula for numerical integration from the above formula.

To be submitted on September 4th, 2018

ASSIGNMENT – II

All questions are compulsory

1. Explain Simplex algorithm to solve linear programming problem
2. Explain nonlinear unconstrained optimization
3. Maximize $Z = 3x_1 + 2x_2 + 5x_3$ subject to $x_1 + 4x_2 \leq 420, 3x_1 + 2x_3 \leq 460, x_1 + 2x_2 + x_3 \leq 430$; $x_1, x_2, x_3 \geq 0$

To be submitted on November 5th, 2018

S

CE 451

SEMINAR AND PROJECT PRELIMINARY

COURSE INFORMATION SHEET

PROGRAMME: CE	**DEGREE**: BTECH
COURSE: SEMINAR AND PROJECT PRELIMINARY	**SEMESTER:** S7 **L-T-P-CREDITS**: 0-1-4-2
COURSE CODE: CE451 **REGULATION**: 2016	**COURSE TYPE**: CORE
COURSE AREA/DOMAIN: CIVIL ENGINEERING	**CONTACT HOURS**: 5 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	**LAB COURSE NAME**: NIL

SYLLABUS:

UNIT	DETAILS
Seminar:	Each student shall identify a topic of current relevance in his/her branch of engineering, get approval of faculty concerned, collect sufficient literature on the topic, study it thoroughly, prepare own report and present in the class
Project:	Identify suitable project relevant to the branch of study. Form project tea (not exceeding four students). The students can do the project individually also. Identify a project supervisor. Present the project proposal before the assessment board (excluding the external expert) and get it approved by the board. The preliminary work to be completed: 1. Literature Survey 2. Formulation of objectives 3. Formulation of hypothesis/design/methodology 4. Formulation of work plan 5. Seeking funds 6. Preparation of preliminary report

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	Michael Luchs, Scott Swan, Abbie Griffin, 2015. Design Thinking. 405 pages, John Wiley & Sons, Inc

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEMESTER
BE102	DESIGN AND ENGINEERING	FUNDAMENTAL KNOWLEDGE CREATIVE DESIGN	FIRST
CE341	DESIGN PROJECT	KNOWLEDGE CREATIVE DEIGN	FIFTH

COURSE OBJECTIVES:

1	To develop skills in doing literature survey, technical presentation and report preparation
2	To enable project identification and execution of preliminary works on final semester project

COURSE OUTCOMES:

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Students will develop skills in doing literature survey, technical presentation and report preparation											
	H	M		M								
2	Students will be able to analyse a current topic of professional interest and present it before an audience											
	H	H	H	H								
3	Students will be able determine an engineering problem, analyse it and propose a work plan to solve it											
	H	M	M	M					M			
4	Students will be able to identify a project and execute its preliminary works on final semester project											
	H	M	M	M					M			

JUSTIFICATION FOR CO-PO MAPPING:

CO	PO	MAPPING	JUSTIFICATION
CO1	PO1	HIGH	Students could apply the knowledge of various engineering fundamentals to develop skills in doing literature survey, technical presentation and report preparation.
	PO2	MEDIUM	Students could review research literature for technical presentation and report preparation.
	PO4	MEDIUM	Students could use research-based knowledge to identify a project and execute its preliminary works on final semester project.
CO2	PO1	HIGH	Students could apply the knowledge of various engineering fundamentals to analyse a current topic of professional interest
	PO2	HIGH	Students could review research literature to analyse a current topic of professional interest and present it before an audience
	PO4	HIGH	Students could use research-based knowledge to analyse a current topic of professional interest.
CO3	PO1	HIGH	Students could apply the knowledge of various engineering fundamentals to identify an engineering problem and analyse it and propose a work plan

CO	PO	MAPPING	JUSTIFICATION
	PO2	MEDIUM	Students could review research literature to analyse a problem and prepare work plan.
	PO3	HIGH	Use research-based knowledge and research methods including analysis and interpretation of data to analyse a problem.
	PO4	MEDIUM	Students could use research-based knowledge to analyse a problem and prepare work pan.
	PO9	HIGH	Students could function effectively as an individual, and as a member or leader in diverse teams to prepare work plan.
CO4	PO1	HIGH	Students could apply the knowledge of various engineering fundamentals
	PO2	HIGH	Students could review research literature to identify a problem and execute its preliminary works
	PO3	MEDIUM	Use research-based knowledge and research methods including analysis and interpretation of data to identify a problem.
	PO4	HIGH	Students could use research-based knowledge to identify a problem and prepare preliminary works..
	PO9	HIGH	Function effectively as an individual, and as a member or leader in diverse teams to start preliminary works.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl No	DESCRIPTION	PROPOSED ACTIONS
1	NIL	

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK		STUD. ASSIGNMENT		WEB RESOURCES	
LCD/SMART BOARDS		**STUD. SEMINARS**	✓	ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS		**STUD. SEMINARS**	✓	TESTS/MODEL EXAMS		UNIV. EXAMINATION	
STUD. LAB PRACTICES	✓	**STUD. VIVA**	✓	**MINI/MAJOR PROJECTS**	✓	CERTIFICATIONS	
ADD-ON COURSES		OTHERS					

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓	**STUDENT FEEDBACK ON FACULTY (TWICE)**	✓
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS		OTHERS	

Prepared by
Deepthi I Gopinath

Approved by
Dr. Aysha Zeneeb Majeed

COURSE PLAN

DAY	TOPICS PLANNED
DAY 1	Selection of topics for seminar
DAY 2	Study of topics for seminar
DAY 3	Study of topics for seminar
DAY 4	Presentation of seminar topics
DAY 5	Presentation of seminar topics
DAY 6	Report preparation of seminar
DAY 7	Report submission of Seminar and Project Topic selection
DAY 8	Study and discussion of project preliminary works
DAY 9	Study and discussion of project preliminary works
DAY 10	Study and discussion of project preliminary works
DAY 11	Project Preliminary presentation

EVALUATION

SEMINAR

1. Presentation: 40%
2. Ability to answer questions: 30%
3. Report: 30%

PROJECT PRELIMINARY

1. Progress evaluation by the supervisor: 40%
2. Progress evaluation by the assessment board excluding external expert: 60%

T

CE 431
ENVIRONMENTAL ENGINEERING LAB

COURSE INFORMATION SHEET

PROGRAMME: CE	**DEGREE**: BTECH
COURSE: ENVIRONMENTAL ENGINEERING LAB	**SEMESTER:** S7 **L-T-P-CREDITS**: 0-0-3-1
COURSE CODE: CE431 **REGULATION**: 2016	**COURSE TYPE**: REGULAR
COURSE AREA/DOMAIN: CIVIL ENGINEERING	**CONTACT HOURS**: 3 hours/Week.

LIST OF EXERCISES:

Sl. No.	DETAILS
1.	To analyse the physical characteristics viz. colour, turbidity, and conductivity of a given water sample and to determine its suitability for drinking purposes
2.	To analyse the chemical characteristics of a given water sample viz. pH, acidity, alkalinity for assessing its potability
3.	To analyse the chemical characteristics of a given water sample viz. chlorides and sulphates content to assess its suitability for drinking purposes and building construction
4.	To determine the Dissolved Oxygen content of a given water sample for checking its potability
5.	To determine the available chlorine in a sample of bleaching powder
6.	To analyse the various types of solids in a given water sample
7.	To determine the BOD of a given wastewater sample
8.	To determine the COD of a given wastewater sample
9.	To determine the optimum dosage of alum using Jar test
10.	To determine the Nitrates / Phosphates in a water sample
11.	To determine the iron content of a water sample
12.	To determine the MPN content in a water sample and assess the suitability for potability

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	S.K.Garg, "Water Supply Engineering", Khanna Publishers. 2010
T2	B.C Punmia, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., 2
R1	"Standard methods for the examination of water and wastewater" 1995, ALPHA, AWWA, WPCF Publication
R2	"Chemistry for Environmental Engineering"- Sawer and McCarty, McGraw Hill.
R3	"Manual of standards of quality for Drinking Water Supplies"- Indian Council of Medical Research, New Delhi.
R4	"International Standards of Drinking Water" – W.H.O.

T/R	BOOK TITLE/AUTHORS/PUBLICATION
R5	"IS 2490-1981, IS 3306- 1974, IS 3307-1977, IS 7968-1976, IS 2296-1974, IS 10500- 1991" Bureau of Indian Standards, New Delhi, Effluent Standard KSPCB

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEMESTER
CE203	FLUID MECHANICS- I	Basic knowledge of pipe flow and Bernoulli's Equation	S3
CY100	ENGINEERING CHEMISTRY	Basic concepts of chemical reactions and mass balance	S1

COURSE OBJECTIVES:

1	To equip the students in doing analysis of water and waste water

COURSE OUTCOMES:

Sl No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	The students will be able to understand the importance of water quality standards											
	M											
2	The student will be able to analyse the Dissolved oxygen content in water											
	H	H		H								
3	The student will be able to determine the Biological Oxygen Demand and Chemical Oxygen Demand in waste water											
	H		H									
4	The student will be able to analyse the chemical characteristics of a given water sample viz. pH, acidity, alkalinity											
	H	H	M									
5	The student will be able to analyse the physical characteristics viz. colour, turbidity, and conductivity of a given water sample											
	H	H										
6	The student will be able to determine the optimum dosage of alum using Jar test											
	H	H										
7	To analyse the chemical characteristics of a given water sample viz. chlorides, Iron, Available Chlorine and sulphates content to assess its suitability for drinking purposes											
	H	H										

JUSTIFICATION FOR CO-PO MAPPING:

CO	PO	MAPPING	JUSTIFICATION
CO1	PO1	MEDIUM	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals inferring the quality of water

CO	PO	MAPPING	JUSTIFICATION
CO2	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals for dissolved oxygen content in water.
	PO2	HIGH	The students will be able to identify, formulate and review research literature for dissolved oxygen content in water reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
	PO4	HIGH	The students will be able to use research-based knowledge and research methods including design of experiments, analysis and interpretation of dissolved oxygen content.
CO3	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals for BOD and COD.
	PO3	HIGH	The students will be able to initiate the design solutions water quality indicators like BOD and COD and suggest remedial measures that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
CO4	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals for finding out chemical parameters like pH, acidity, alkalinity
	PO2	HIGH	The students will be able to identify, formulate, review research literature, and analyse pH, acidity, alkalinity using Indian standard methods in reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
	PO3	MEDIUM	The students will be able to design solutions for making the pH, acidity, alkalinity within the standard levels
CO5	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals for finding out the physical characteristics viz. colour, turbidity, and conductivity of a given water sample
	PO2	HIGH	The students will be able to identify and examine physical characteristics viz. colour, turbidity, and conductivity of a given water sample using natural sciences, and engineering sciences
CO6	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to find the optimum dosage of alum using Jar test
	PO2	HIGH	The students will be able to identify, formulate, review research literature, and analyse the optimum dosage of alum using Jar test reaching substantiated conclusions natural sciences, and engineering sciences
CO7	PO1	HIGH	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals to examine the chemical characteristics viz. chlorides, Iron, Available

CO	PO	MAPPING	JUSTIFICATION
			Chlorine and sulphates content to assess its suitability for drinking purposes.
	PO2	HIGH	The students will be able to identify, formulate, review research literature, and analyse chemical characteristics viz. chlorides, Iron, Available Chlorine and sulphates content using first principles of mathematics, natural sciences, and engineering sciences

WEB SOURCE REFERENCES:

Sl No	DESCRIPTION
1	www.nptel.ac.in

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK	✓	**STUD. ASSIGNMENT**	✓	WEB RESOURCES	
LCD/SMART BOARDS		STUD. SEMINARS		ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS	✓	STUD. SEMINARS		**TESTS/MODEL EXAMS**	✓	**UNIV. EXAMINATION**	✓
STUD. LAB PRACTICES		**STUD. VIVA**		MINI/MAJOR PROJECTS		CERTIFICATIONS	
ADD-ON COURSES		OTHERS					

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓	**STUDENT FEEDBACK ON FACULTY (TWICE)**	✓
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS		OTHERS	

Prepared by
Arun B

Approved by
Dr.AyshaZeneebMajeed

COURSE PLAN

DAY	CYCLE	TOPICS PLANNED
DAY 1	1	To analyse the physical characteristics viz. colour, turbidity, and conductivity of a given water sample and to determine its suitability for drinking purposes
DAY 2		To analyse the chemical characteristics of a given water sample viz. pH, acidity, alkalinity for assessing its potability
DAY 3		To analyse the chemical characteristics of a given water sample viz. chlorides and sulphates content to assess its suitability for drinking purposes and building construction
DAY 4		To determine the Dissolved Oxygen content of a given water sample for checking its potability
DAY 5		To determine the available chlorine in a sample of bleaching powder
DAY 6		To analyse the various types of solids in a given water sample
DAY 7		To determine the BOD of a given wastewater sample
DAY 8	2	To determine the COD of a given wastewater sample
DAY 9		To determine the optimum dosage of alum using Jar test
DAY 10		To determine the iron content of a water sample
DAY 11		Quick revision of all the experiments
DAY 12		Exam

OPEN QUESTIONS

1. Explain the process involved in the analysis of nitrate using spectrophotometer
2. Explain the principle of turbidity meter
3. What is the importance of indicators in acidity and alkalinity determination of water
4. Differentiate between the quality of drinking water and construction water using respective standard codes
5. How alum can act as a coagulant in turbid water?
6. What is the reason for blue colour during DO experiment
7. Differentiate between COD and BOD
8. Explain Beer-Lamberts Law
9. How conductivity is related with dissolved solid concentration?
10. What is meant by sludge volume index, explain its significance?

ADVANCED QUESTIONS

Objective Questions

1. The turbidity is measured based on the
   - Light absorbing properties
   - Light scattering properties
   - Particle size
   - Particle mass
2. Using a conductivity meter we can measure
   - Specific conductance
   - Equivalent conductance
   - Specific resistance
   - Concentration
3. The measurement of conductivity may lead to the estimation of
   - Total solids
   - Total dissolved solids
   - Colloidal solids
   - Suspended solids
4. The limit of chlorides in drinking water as per IS code is
   - 200 ppm
   - 225 ppm
   - 250 ppm
   - 500 ppm
5. Silver nitrate is stored in brown bottle
   - To avoid decomposition by sunlight
   - Because it is dark in colour
   - Because the solution is colourless
   - To avoid heat
6. Alkalinity of water is an indication of

- Base neutralizing capacity
- Acid neutralizing capacity
- Quantity of base present
- Quality of base present

7. A standard solution is a
   - Solution of accurately known strength
   - Solution of accurately known pH
   - Coloured solution
   - Colourless solution
8. To prepare 100 ml of 0.02 N of NaOH from 1 N NaOH , dilute ……. of NaOH
   - 20 ml
   - 2 ml
   - 0.2 ml
   - 0.02 ml
9. The methyl orange acidity is at pH
   - 8.3
   - 9.3
   - 4.3
   - 7.3
10. A calibration curve is a plot of
    - Absorbance against concentration of solutions
    - Absorbance of solutions against time
    - Time against concentration of solutions
    - Concentration of solution against time