		Walc		of Engineering			
			1	2022-23			
			Course I	nformation			
Progra	amme		M. Tech. Civil (S	tructural Engineeri	ng)		
	Semester		First Year M. Teo	<u>v</u>	<i>C</i> /		
	e Code		6ST501	,			
Cours	e Name		Research Method	ology			
Desire	d Requisi	tes:	NIL				
	Teaching	Scheme		Examination S	cheme (Marks)		
Lectur		2 Hrs/week	MSE	ISE	ESE		Total
Tutori	ial		30	20	50		100
				Cred	lits: 2		
				Objectives			
1				, identify and form		oroblen	ns, state the
1				esearch process and			
-				blem, interpret the			
2				prove the solution	adapted-logically	and a	nalytically,
		the research fin	<u> </u>	1., 1.1.	1.1 1.	<u> </u>	• 1
3	· ·	•		e literature and pub	lish research in cor	iterenc	es, journals
	and to ex		research ethics, IP		T 1		
A / /1	1 0.1		/	ith Bloom's Tax	onomy Level		
			udents will be ab				
CO1	•		•	nomic, social and l	<b>e</b> 1	Analy	
CO2				r solution logically		Evalu	
CO3	Produce	research solution	n, publication, Dis	sertation, IPR and J	patent doc.	Creati	ing
N7 - J	1.			<u> </u>			TT
Modu		· D		Contents			Hours
Ι	of solutions for research problem, data collection, analysis, interpretation,					5	
II	Necessary instrumentations.         Research Methodology Tools         Problem statement formulation, resources identification for solution, Experimental         and Analytical modelling, Numerical and Statistical methods in engineering         research, Software tools like spreadsheets, Effective literature studies approaches,         critical analysis					6	
III	Effect		idies approaches, ci	ritical analysis, Plag	giarism, Research e	ethics	3
IV	Effect	Report WritingEffective technical writing, How to write report, Research Paper. Presentation of paper/report/seminar.3					3
V	Intellectual Property Rights (IPR)           Nature of Intellectual Property: Patents, Designs, Trade and Copyright,					5	
VI		dure for grants t Rights. Licen		ting under PCT. P of technology. Ac			5

	Textbooks					
1	Melville Stuart and Goddard Wayne, "Research Methodology: An Introduction for Science &					
1	Engineering Students" Juta and Company Ltd, 2000.					
2	Goddard Wayne and Melville Stuart, "Research Methodology: An Introduction", Juta and					
	Company Ltd., 2 <sup>nd</sup> Ed2004					
3	Merges Robert, Menell Peter, Lemley Mark, "Intellectual Property in New Technological Age",					
	ASPEN Publishers, 2016.					
4	Kumar Ranjit, "Research Methodology: A Step-by-Step Guide for beginners", SAGE					
	Publications, 4 <sup>th</sup> Ed2014.					
	References					
1	Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007					
2	Mayall, "Industrial Design", McGraw Hill, 1992.					
3	Niebel, "Product Design", McGraw Hill, 1974					
4	Asimov, "Introduction to Design", Prentice Hall, 1962					
5	Ramappa T., "Intellectual Property Rights Under WTO", S. Chand, 2008					
	Useful Links					
1	NPTEL :: General - NOC:Introduction to Research					
2	Introduction to Research - Course (nptel.ac.in)					
3	Qualitative Research Methods And Research Writing - Course (nptel.ac.in)					

	CO-PO Mapping								
	Programme Outcomes (PO)								
	1	2	3	4	5	6			
CO1	3								
CO2		2		3	2				
CO3		3		2					

# Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		1	lided Autonomous I <b>Y 2022-23</b>	/			
			rse Information				
Program	ıme	-	tructural Engineer	ring)			
Class, Se		First year M. Tec					
Course (		6ST502					
Course <b>N</b>	Name	Mechanics of Str	uctures				
Desired	Requisites:	Solid Mechanics,	, Structural analys	sis, Structural Mechan	ics		
	hing Scheme		1	n Scheme (Marks)			
Lecture	3 Hrs./week	MSE	ISE	ESE	Tota		
Tutorial	1 Hr./week	30	20	50	100		
			Cr	redits: 4			
			irse Objectives				
	To impart the know	•		•			
	To provide knowled						
<b>1</b>		to develop compu	ter programs by u	sing matrix methods	of structural	1	
j a	nalysis						
		rse Outcomes (CC		<b>Faxonomy Level</b>			
	d of the course, the						
	Apply advanced m				Applyi		
	Calculate forces ar	•			Evaluat	ing	
	Formulate program	n by using matrix r	nethods of structu	Iral analysis for	Creatin	ng	
1	ield applications						
Module		Mod	ule Contents		Ц	ours	
wiouule	a) Basics in stru					Juis	
	-	e e	and methods of s	tructural analysis ene	erov		
	Types of structures, various loads and methods of structural analysis, energy theorems and application of virtual work principle. Introduction to basic						
Ι	software's for structural analysis						
	b) Influence line Diagrams for Indeterminate Structures						
	Concept of ILD, Muller-Breslau's principle and its application for continuous						
	beams. ILD for two hinged arches						
	Beams Curved						
II	Structural behaviour of curved beam. Analysis of determinate and						
	indeterminate beams curved in plan, bent beams.						
	Beam Columns						
				, governing differen			
III				o different loadings		6	
		•	•	ical and unsymmetri	ical,	U	
		rry-over factors fo	r beam-columns,	fixed end actions du	e to		
	various loads	• F 1 4•					
11.7	Beams on Elast		····· 1.4° 1.9			(	
IV	<b>x</b>		oundation, analysi	is of infinite, semi-infi	nite	6	
	and finite beams		hility Mathad				
		of analysis: Flexi		da applications to 1			
<b>V</b>	Element approach, flexibility matrix, equivalent loads, applications to beams,						
V	frames and trusses, lack of fit, temperature stresses						
V		of analysis. Ctiff.	A CAN DE CARACTER DE C				
	Matrix method	e e		le applications to bas	me		
V VI	Matrix method Element approa	e e	k, equivalent load	ls, applications to bea	ums,	7	

2	Timoshenko. S. P. & Gere. J. M., "Theory of Elastic Stability", Tata McGraw-Hill Publishing				
<u> </u>	ompany Ltd., 2 <sup>nd</sup> Edition,1985				
3	Gere. J. M. & Weaver. W., "Matrix Analysis of Framed Structures", CBS Publishers and				
5	Distributor, 2 <sup>nd</sup> Edition,2004.				
4	Krishna Raju N., "Advanced Mechanics of Solids and Structures", McGraw-Hill				
	Education, 08-Nov-2018 - Technology & Engineering				
	References				
1	Mcquire and Gallghar. R. H. "Matrix Structural Analysis", John Wiley, 2 <sup>nd</sup> Edition, 2000				
2	Beaufit F.W. et al. "Computer Methods of Structural Analysis", Prentice Hall, illustrated,				
2	1970				
3	John L. and Meek, "Matrix Structural Analysis", McGraw Hill Book Company, illustrated,				
5	1971				
4	Pandit G. and Gupta S., "Structural Analysis - A Matrix Approach2008", McGraw Hill				
	Education; 1 <sup>st</sup> edition				
Useful Links					
1	https://nptel.ac.in/courses/105/105/105105108/				
2	https://nptel.ac.in/courses/105/101/105101086/				
3	http://engineeringvideolectures.com/course/281?pn=0#videolist				
4	https://nptel.ac.in/courses/105/105/105105109/				

CO-PO Mapping								
	Programme Outcomes (PO)							
	1	2	3	4	5	6		
CO1			2	2		3		
CO2			2	2		3		
CO3	1		2			2		
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High								

### Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

	W	alchand Colle						
(Government Aided Autonomous Institute)								
			Y 2022-23					
D			rse Information					
Progra			tructural Engineerin	ng)				
	<u>Semester</u> e Code	First year M. Tec 6ST503	n., Sem. I					
	e Name	Theory of Elastic	ity & Plasticity					
	d Requisites:	Solid Mechanics	ity & I lasticity					
Desire	u Requisites.	Sond Wreenames						
Те	aching Scheme		Examination S	Scheme (Marks)				
Lectur		MSE	ISE	ESE	Total			
Tutori	ial	30	20	50	100			
			Cre	dits: 3				
			rse Objectives					
1	To impart know	ledge of various	theories of elasti	icity and apply th	em to solve 2D			
1	Cartesian and pol							
2	To impart knowle	edge of various the	eories of torsion a	nd apply them to so	olve 2D torsional			
2	problems	-						
3		edge of various the	eories of plastic be	haviour and apply	them to solve 2D			
3	problems.							
		irse Outcomes (CC		axonomy Level				
	end of the course, th							
CO1		dge of fundamental	methods of elasticit	ty for 2-D Cartesian	and Applying			
~~~	Polar problems			1.0.2.1				
CO2		problems and appr	ise various theories	s to solve 2-D torsic	Analysing			
<u>CO3</u>	problems.	f material yielding a	and alastic hohorion	an of atmustures				
CO3	Discuss concept of	i material yielding a	ind plastic benavior	ir of structures.	Evaluating			
Modu	10	Mod	ule Contents		Hours			
Muu	Introduction				IIIUIIS			
		•	force Surface fo	orce, Stress at a po	int			
Ι		Stress & Strain, Transformation of stress, Equilibrium equations in two and three dimensions in Cartesian co-ordinates, Boundary conditions,						
		Strain displacement relations, Compatibility equations, Generalized Hooke's Law, Stress invariants						
	Plane Stress a							
			rdinates Equation	ns of equilibrium	and			
II	1		· •	1				
11			_	roblems, Airy str				
		-	-	linates, Thick wal	ieu			
	Torsion	cylinder under radial pressure, Plate with stress concentration.						
		to Tomican Of	Varant' - 1	Woming for t	~			
III	Introduction 1			v, Warping functi				
III		nbrane analogy, Torsion of circular, thin rectangular and Strain energy in axial, bending and torsion. Principal of						
		OI						
		nd minimum poter	ntial energy.					
	Plasticity	11						
<b>.</b>				lids, Idealized pla				
IV				ared with elastic				
		erial behavior, Co	ulomb friction mo	odel for elasticity a	and			
	plasticity.							

<b>Hydrostatic stresses</b> Hydrostatic stresses, Deviatoric stresses, Invariants of deviatoric stresses, Yield criteria, Graphical representation of yield criteria, Flow rules, Stress-strain relation for perfectly plastic flow, Elastic-plastic analysis of beam in bending, Thick walled cylinder and circular shaft under torsion.	7			
Plastic analysis of structuresPlastic analysis of structures – plastic hinge, Moment – curvaturerelation, Shape factor, Upper bound, lower bound & uniquenesstheorems, Methods of analysis to find collapse loads for beams andframes.	7			
Taythooks				
	1st Revised			
Singh Sadhu, "Theory of Elasticity", Khanna Publishers, 4th Edition, 2012				
Singh Sadhu, "Theory of Plasticity", Khanna Publishers, 3 <sup>rd</sup> Edition, 201	3			
References				
Timoshenko. S & Goodier. J. N., "Theory of Elasticity", McGrav Company, 3 <sup>rd</sup> Edition, 2010	w-Hill book			
Chakrabarthy. J, "Theory of Plasticity", Tata McGraw-Hill P. Co. Ltd. 2007.	, 2 <sup>nd</sup> Edtion,			
Johnson W. and Mellor P. B., "Engineering Plasticity", Van Nostrand Reinhold, London, 1973.				
Useful Links				
	<ul> <li>Hydrostatic stresses, Deviatoric stresses, Invariants of deviatoric stresses, Yield criteria, Graphical representation of yield criteria, Flow rules, Stress-strain relation for perfectly plastic flow, Elastic-plastic analysis of beam in bending, Thick walled cylinder and circular shaft under torsion.</li> <li>Plastic analysis of structures</li> <li>Plastic analysis of structures – plastic hinge, Moment – curvature relation, Shape factor, Upper bound, lower bound &amp; uniqueness theorems, Methods of analysis to find collapse loads for beams and frames.</li> <li>Meen M., "Computational Elasticity", Alpha Science International, Edition, 2008</li> <li>Singh Sadhu, "Theory of Elasticity", Khanna Publishers, 4<sup>th</sup> Edition, 201</li> <li>Singh Sadhu, "Theory of Plasticity", Khanna Publishers, 3<sup>rd</sup> Edition, 201</li> <li>Company, 3<sup>rd</sup> Edition, 2010</li> <li>Chakrabarthy. J, "Theory of Plasticity", Tata McGraw-Hill P. Co. Ltd. 2007.</li> <li>Johnson W. and Mellor P. B., "Engineering Plasticity", Van Nostrar</li> </ul>			

	CO-PO Mapping Programme Outcomes (PO)							
	1	2	3	4	5	6		
CO1		3						
CO2		2						
CO3	2							
The strengt	th of mannin	a is to be writt	en as 1 · Low 2 · N	Adjum 3. High				

# Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

	W		ege of Engined					
		(Government	AY 2022-23					
		Co	urse Information					
Progra	amme	1	tural Engineering)					
<u> </u>	Semester		ech., Semester I					
	e Code	6ST504	,					
Cours	e Name	Structural Dyna	amics and Earthqua	ke Engineering				
Desire	d Requisites:		echanics, Engineeri					
	•			0 01				
Te	aching Scheme		Examination	n Scheme (Marks)				
Lectur		MSE	ISE	ESE	Tot	al		
Tutori	ial	30	20	50	10	0		
			C	redits: 3				
		1						
		C	ourse Objectives					
	To impart knowled			and its effect on Civil I	Engineeri	ng		
1	structures				C	-		
2		s to solve problem	ns on dynamics of	structures in SDOF and	MDOF	lystem		
2				esign of earthquake resi		-		
3	and implementation			esign of earthquake resi	stant stru	ctures		
		1 of same for sets						
	Corr	waa Outaamaa ((	(A) with Dloom?	Towonomy Loval				
At the	end of the course, th		CO) with Bloom's	Taxonomy Level				
$\frac{\text{At the}}{\text{CO1}}$			-	for development of				
COI	<b>U U</b>	seismology and	its characteristics	for development of	App	lying		
CO2	response spectra.							
CO2	<b>Estimate</b> response of structures subjected to earthquake loads for various building configurations. Analyzing							
CO3	Formulate method		esistant and Structu	Iral R	Cre	ating		
005	<b>Formulate</b> method	is of cartinquake f	esistant and Struct			atting		
Modu	le	Μ	Iodule Contents			Hour		
litiouu	Seismological As					mour		
				. Measurement of earth	quakes			
Ι	Characteristics of Earthquakes, Elastic rebound theory, Measurement of earthquakes, Magnitude, Intensity, magnitude relationship, Seismograph, Liquefaction.							
		Attenuation relationship, MCE and DBE, Performance of various structures in past						
	earthquake.							
	SDOF Systems a	nd Estimation o	f Forces					
				pplication in dynamic a	nalvsis.			
	Earthquake response of linear SDOF systems and its application in dynamic analysis. Concept of earthquake response spectrum, Tripartite plot of response spectrum,							
II	Construction of design response spectrum. Use of Code Spectra to find response of							
	structures. Equivalent static method to find story shear and its distribution along							
	height of building		2		C			
	MDOF Systems		nalysis					
III	•	•		analysis, Participation	factors,	6		
	Modal contribution	Earthquake response of linear MDOF systems, Modal analysis, Participation factors, Modal contributions, Dynamic analysis of Multistoried buildings.						
	ERD of Structur							
IV				Ductility and different	types of	7		
IV	ductility. Over st	rength, Response	reduction factor,	Ductile Detailing of st	ructural	/		
	components as pe	r code. lateral stit	ffness, Conceptual	design, Building config	uration.			
	Distribution of I	ateral Forces an	d Codal Provision	ns				
	Distribution of L							
				f mass and center of s	tiffness,			
V	Floor diaphragm,	Rigid floor diap	ohragm, Center of	f mass and center of s al load distribution, M		7		
V	Floor diaphragm, Torsionally un-co	Rigid floor diap oupled and coupl	ohragm, Center of led systems, Latera		inimum	7		

		Iral Control			aunation of A	tall atmistration	with			
VI				g systems, Confi						
		•		Control, Energy of	iissipating dev	lces. Retroit is	sues			
	and the	and their solutions with advanced techniques.								
				Textbooks						
1		Clough R. W. and Penziene Joseph, "Dynamics of Structures", McGraw Hill Education (ISE Editions); International 2 Revised edition August 1993.								
				ructure: Theory &		to Earthquake	Engineerin			
2	· ·	Education L		•		Ĩ	e			
3		Agarwal P. and Shrikhande M., "Earthquake Resistant Design of Structures", PHI Learning Pvt. Ltd., 2006.								
	- 1	,		References						
1	-	Key David, "Earthquake Design Practice for Buildings", Thomas Telford Publication London,								
		2nd Edition, 2006. Dowrick D. J., "Earthquake Resistant Design for Engineers & Architects", John Wiley & Sons.,								
2		ition, 1987.	iiquuke itesi	sunt Design for L		eniteets , joini	they a be			
2		Manual of "Earthquake Resistant Non-Engineering Construction", University of Roorkee								
3	2000.	1		U	8	,	0			
				Useful Links						
1				01/105101209/						
2				04/105104200/						
3				08/105108204/						
4	https://	nptel.ac.in/co	urses/105/10	07/105107204/						
		1		<b>CO-PO Mappin</b>						
				Programme	Outcomes (PC	1				
		1	2	3	4	5	6			
	01		1	2	2	2	2			
	02	2		3	2					
CO3 1 3						3				

# Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on any three modules out of six.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

Walchand College of Engineering, Sangli				
	(Government Aided Autonomous Institute)			
	AY 2022-23			
	Course Information			
Programme	M. Tech. Civil (Structural Engineering)			
Class, Semester	First Year M. Tech., Semester I			
Course Code	6ST551			
Course Name	Course Name Modern Materials & Testing Laboratory			
Desired Requisites:	Desired Requisites: Concrete Technology			
•				

Teaching Scheme			Examination	Scheme (Marks)	
Practical	4 Hrs/ Week	LA1	LA2	Lab ESE	Total
Interaction		30	30	40	100
		Credits: 2			

# **Course Objectives**

	Course Objectives	
1	To provide students the necessary knowledge of properties & techniques of Mix desig	n of
1	advanced types of concrete.	
2	To provide the technical information of modern concrete such as SCC, RMC, FRP, FI	RC and HPC
	etc.	
3	To inculcate the information of structural health monitoring for repair and rehabilitation	on structures.
4	To impart the various concepts and testing methods adopted in non-destructive testing	g of concrete.
	Course Outcomes (CO) with Bloom's Taxonomy Level	
At the	end of the course, the students will be able to,	
CO1	Study of mix design for high performance of concrete of various grades	Analyzing
CO2	Evaluate experimentally properties of various advanced concretes.	Evaluating
CO3	Design experiments for vibration measurements & data acquisition system.	Creating

# List of Experiments / Lab Activities/Topics

### List of Topics (Applicable for Interaction mode):

### List of Lab Activities:

- 1. Evaluate of static and dynamic modulus of elasticity of concrete and strain measurement.
- 2. Evaluate of flexural strength of concrete.
- 3. Evaluate Mix Design by I.S. Code method (with OPC Cement).
- 4. Evaluate Mix Design by I.S. Code method (with Slag Cement).
- 5. Evaluate Mix Design by I.S. Code method (with Admixtures Cement).
- 6. Determination of Grading curve of Mix aggregate & sieve analysis.
- 7. Non-destructive testing of concrete.
- 8. Determination of Poisson's ratio of concrete.
- 9. Determination of properties of SCC, RMC, FRP, FRC and HPC.
- 10. Experiments based on Vibration measurements and data acquisition system.

	Textbooks				
1	Gambhir M. L., "Concrete Technology", Tata McGraw Hill Publications, 3rd Edition 2004				
2	Shetty M. S., "Concrete Technology", S. Chand Publications, Latest Edition 2005				
3	Santhakumar A. R., "Concrete technology", Oxford Higher Education/Oxford University Press,				
3	1st Edition 2006				
4	Varshney R.S., "Concrete Technology", Oxford and IBH.				
	References				
1	Neville A. M., "Concrete Technology", Addision Weslley.				
2	Neville A.M., Properties of Concrete, Pitman, 1968.				
3	Lue F.M., "Chemistry of Cement and Concrete", Edward Arnold, 3rd Edition, 1970.				

4						
	Useful Links					
1						
2						
3						
4						

CO-PO Mapping								
		Programme Outcomes (PO)						
	1	2	3	4	5	6		
CO1	2	2						
CO2		3						
CO3		3		1	2			

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.

There are three	components of la		Sement LA2 and Lab ESE.	
IMP: Lab ESE	is a separate head	of passing.(min 40	%), LA1+LA2 should be min 40%	
Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)						
			1	2022-23	iie)	
Course Information						
Progr	amme		M. Tech. Civil (S	tructural Engineeri	ng)	
Class,	Semester		First Year M. Teo	ch., Semester I		
Cours	e Code		6ST552			
Cours	e Name		Dynamics of Stru	ctures Laboratory		
Desire	ed Requisi	tes:	Structural Dynam	nics and Earthquake	e Engineering	
	Teaching			Examination S	cheme (Marks)	
Practi	ical	2 Hrs/ Week	LA1	LA2	Lab ESE	Total
Intera	iction		30	30	40	100
					lits: 1	
				e Objectives		
1	To impar problems		SDOF system und	er various dynamic	loading by solving	different types of
2	2 To illustrate behavior of MDOF system under various dynamic loading by solving different types of problems by conducting experiments.					different types of
3			•	buted mass model	by conducting expe	riments.
	· •	Course	Outcomes (CO) v	vith Bloom's Taxo	nomy Level	
At the	end of the	course, the stud	lents will be able to	),		
CO1				OF and MDOF syst	ems.	Applying
CO2	Apprais	e behavior of di	screte systems.			Evaluating
CO3	<b>Evaluate</b> liquefact		continuous syste	m and <b>judge</b> eff	fect of sloshing a	and Evaluating
	-					

# List of Experiments / Lab Activities/Topics

### List of Lab Activities: (Any eight experiments in addition to assignments)

- 1. Dynamics of a three storied building frame subjected to harmonic base motion.
- 2. Dynamics of a one-storied building frame with planar asymmetry subjected to harmonic base motions.
- 3. Dynamics of a three storied building frame subjected to periodic (non-harmonic) base motion.
- 4. Vibration isolation of a secondary system.
- 5. Dynamics of a vibration absorber.

3

- 6. Dynamics of a four storied building frame with and without an open ground floor.
- 7. Dynamics of one-span and two-span beams.
- 8. Earthquake induced waves in rectangular water tanks

Publisher Pvt. Ltd., 2<sup>nd</sup> Edition, 2000.

- 9. Dynamics of free-standing rigid bodies under base motions
- 10. Seismic wave amplification, liquefaction and soil-structure Interactions.

1       Editions); International 2 Revised edition August 1993.         2       Craig Roy, "Structural Dynamics", John Willy & Sons.         3       Chopra A.K., "Dynamics of Structure: Theory & Application to Earthquake Engineering", Pearson Education Lim., 4 <sup>th</sup> Edition, 2014.         References         1       Mukhopadhyay, "Dynamics of Structures", Ane Books Pvt. Ltd., 2 <sup>nd</sup> Edition, 2010.         2       Paz Mario, "Structural Dynamics", CBS Publishers and Distributors, 5 <sup>th</sup> Edition, 2003.							
1       Editions); International 2 Revised edition August 1993.         2       Craig Roy, "Structural Dynamics", John Willy & Sons.         3       Chopra A.K., "Dynamics of Structure: Theory & Application to Earthquake Engineering", Pearson Education Lim., 4 <sup>th</sup> Edition, 2014.         References         1       Mukhopadhyay, "Dynamics of Structures", Ane Books Pvt. Ltd., 2 <sup>nd</sup> Edition, 2010.         2       Paz Mario, "Structural Dynamics", CBS Publishers and Distributors, 5 <sup>th</sup> Edition, 2003.		Textbooks					
2       Craig Roy, "Structural Dynamics", John Willy & Sons.         3       Chopra A.K., "Dynamics of Structure: Theory & Application to Earthquake Engineering", Pearson Education Lim., 4 <sup>th</sup> Edition, 2014.         References         1       Mukhopadhyay, "Dynamics of Structures", Ane Books Pvt. Ltd., 2 <sup>nd</sup> Edition, 2010.         2       Paz Mario, "Structural Dynamics", CBS Publishers and Distributors, 5 <sup>th</sup> Edition, 2003.	1	Clough R. W. and Penziene Joseph, "Dynamics of Structures", McGraw Hill Education (ISE					
3 Chopra A.K., "Dynamics of Structure: Theory & Application to Earthquake Engineering". Pearson Education Lim., 4 <sup>th</sup> Edition, 2014.         References         1       Mukhopadhyay, "Dynamics of Structures", Ane Books Pvt. Ltd., 2 <sup>nd</sup> Edition, 2010.         2       Paz Mario, "Structural Dynamics", CBS Publishers and Distributors, 5 <sup>th</sup> Edition, 2003.	1	Editions); International 2 Revised edition August 1993.					
S       Pearson Education Lim., 4 <sup>th</sup> Edition, 2014.         References         1       Mukhopadhyay, "Dynamics of Structures", Ane Books Pvt. Ltd., 2 <sup>nd</sup> Edition, 2010.         2       Paz Mario, "Structural Dynamics", CBS Publishers and Distributors, 5 <sup>th</sup> Edition, 2003.	2	Craig Roy, "Structural Dynamics", John Willy & Sons.					
Pearson Education Lim., 4 <sup>th</sup> Edition, 2014.         References         1 Mukhopadhyay, "Dynamics of Structures", Ane Books Pvt. Ltd., 2 <sup>nd</sup> Edition, 2010.         2       Paz Mario, "Structural Dynamics", CBS Publishers and Distributors, 5 <sup>th</sup> Edition, 2003.	2	Chopra A.K., "Dynamics of Structure: Theory & Application to Earthquake Engineering",					
1Mukhopadhyay, "Dynamics of Structures", Ane Books Pvt. Ltd., 2 <sup>nd</sup> Edition, 2010.2Paz Mario, "Structural Dynamics", CBS Publishers and Distributors, 5 <sup>th</sup> Edition, 2003.	5	Pearson Education Lim., 4th Edition, 2014.					
1Mukhopadhyay, "Dynamics of Structures", Ane Books Pvt. Ltd., 2 <sup>nd</sup> Edition, 2010.2Paz Mario, "Structural Dynamics", CBS Publishers and Distributors, 5 <sup>th</sup> Edition, 2003.							
2 Paz Mario, "Structural Dynamics", CBS Publishers and Distributors, 5 <sup>th</sup> Edition, 2003.		References					
	1	Mukhopadhyay, "Dynamics of Structures", Ane Books Pvt. Ltd., 2 <sup>nd</sup> Edition, 2010.					
Jaikrishna A. R. and Chandra Brijesh, "Elements of Earthquake Engineering", South Asian	2	Paz Mario, "Structural Dynamics", CBS Publishers and Distributors, 5th Edition, 2003.					
	2	Jaikrishna A. R. and Chandra Brijesh, "Elements of Earthquake Engineering", South Asian					

			CO-PO Mappi	ing		
			Programme Ou	tcomes (PO)		
	1	2	3	4	5	6
CO1				3	2	
CO2				2	3	1
CO3				3	1	1

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.

AssessmentThere are three components of lab assessment, LA1, LA2 and Lab ESE.IMP: Lab ESE is a separate head of passing. (min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

	Wa	alchand Colleg				
			ided Autonomous In Y 2022-23	isiitute)		
			se Information			
Program	mo		tructural Engineer	ing)		
Class, Sei		First year M. Tec		ing)		
Class, Sel		6ST511				
Course C			nced Design of R	einforced Concrete St	ructu	ITES
	Requisites:			Design of Concrete Str		
Desireu I	cequisites.	Design of Conere		esign of concrete Str	uotui	015 11
Teach	ning Scheme		Examination	Scheme (Marks)		
Lecture	3 Hrs./week	MSE	ISE	ESE		Total
Futorial		30	20	50		100
				edits: 3		
		Cou	rse Objectives			
1 T	o provide advance	d knowledge for a	nalyzing different	kinds of RC structura	l mei	mbers.
2 T	o impart advanced	knowledge for de	sign of different k	inds of RC structures	using	g IS codes.
Т	<u> </u>		-	ctural members desig		-
	odes.					r~
	Cou	rse Outcomes (CC	)) with Bloom's T	<b>Faxonomy Level</b>		
At the end		e students will be a		¥		
CO1 A	nalyze various rei	nforced concrete s	tructural members	5.		Analyzing
CO2 D	ecide the sizes of	various structural o	components.			Evaluating
CO3 D	esign the appropri	ate section for stru	ctural members u	sing codal provisions.		Creating
Module			ule Contents			Hours
Ι	Circular slabs.	lat slabs, Codal pr	ovisions, Analysi	s and design of flat s	lab,	7
II		ined footing, (Rec		ezoidal), Introduction gn of pile foundation, T		6
III	Introduction, M	rete Deep Beams inimum thickness g for local failures,		ements, Design of d of Corbel.	eep	6
IV	flat bottom, Desi	esign of overhead ign of staging for w		ngular and Circular v oads.	vith	7
V	•	ed concrete retai		ure, Stability of retain ntilever retaining w	<b>U</b>	7
VI		os – Classification		, Circular bunkers, Si bins, Deep bins, Des		6
			Textbooks			
1	Ramamruthm, S Edition, 2010.			tructures", Dhanpat R	ai Pu	blishing, 17
2	Shah V. and Ka Publications, 4 <sup>th</sup> E	dition, 2003.		sign of Reinforced Co		
3		Jain, A. K. and Ja on, 1 <sup>st</sup> Edition, 201		State Design of Rein	force	ed Concrete

	References				
1	Purushothaman, P. "Reinforced Concrete Structural Elements", Tata McGraw Hill, 3 <sup>rd</sup> Edition, 2004.				
2	Pillai. S. V. and Menon. D, "Reinforced Concrete Design", Tata McGraw Hill Book Co., 5 <sup>th</sup> Edition, 2005.				
3	Park. R and Paulay. T, "Reinforced Concrete Structures", John Wiley and Sons, 1975.				
4	IS 456: 2000 Indian Standard Plain and Reinforced Concrete - Code of Practice				
	Useful Links				
1	https://nptel.ac.in/courses/105/105/105105108/				
2	https://nptel.ac.in/courses/105/101/105101086/				
3	http://engineeringvideolectures.com/course/281?pn=0#videolist				
4	https://nptel.ac.in/courses/105/105/105105109/				

	CO-PO Mapping							
Programme Outcomes (PO)								
	1	2	3	4	5	6		
CO1			2	2		3		
CO2			2	2		3		
CO3	1		2			2		

# Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Walc		of Engineering Autonomous Institu		
			1	2022-23	,	
			Course l	nformation		
Programm			· · · · · · · · · · · · · · · · · · ·	tructural Engineeri	ng)	
Class, Sem			First Year M. Teo	ch., Semester I		
Course Co			6ST512			
Course Na					oring and Smart Mater	ials
Desired Re	equisites	•	Strength of Mater	ials, Structural Me	chanics	
Теас	hing Sc	heme		Examination S	cheme (Marks)	
Lecture		3 Hr/week	MSE	ISE	ESE	Total
Tutorial			30	20	50	100
					lits: 3	100
1 7		1.1.0		Objectives		
	<u>.</u>	<u>U</u>	smart materials.			
		<u> </u>	structural health n	<u> </u>	loss a system undergo	as ofter
			r hazardous events		loss a system undergo	es allei
nati	arar arsa			ith Bloom's Taxo	nomv Level	
At the end o	of the co		ents will be able to			
CO1 Ap	<b>ply</b> knov	wledge of sma	rt materials and te	chniques to SHM		Applying
CO2 Ap	praise st	tructural cond	itions by various te	echniques of SHM.		Analyzing
CO3 Ass	sess civil	lengineering	structures by SHM	techniques and sir	nulation.	Evaluating
16.1.1				<b>a</b>		TT
Module				Contents	tions: Emerging SHM	Hours
Ι	Piezoele Electron Electros merit), N of merit Shape	ectric materia nechanical co strictive mat Magnetostricti ) Memory All v effect, psedu	als (Constitutive re efficient, resonance erials (Constitutive ive materials (Cons oys (Constitutive oelasticity, sensor,	lation, unimorph, b e/anti-resonance) ve relation, sensor stitutive relation, se relation, transitior	r, actuator, figures of ensor, actuator, figures n temperatures, shape	
II	Introdu motivati bio mim SHM, S SHM an	iction to St ion for SHM, netic - analog SHM as a par ad NDECS, ba	ructural Health SHM - a way for s between the nervo t of system manag usic components of	Monitoring (SH smart materials and ous system of a ma ement, Passive an SHM, materials for	IM) : Definition & d structures, SHM and n and a structure with d Active SHM, NDE, or sensor design	7
III	Conditionand Tess concreted structured structured Non Do Situation visual I Hammen Testing, radio iso	on survey, sta sting stages), e structures - I es, NDT as ar es, case studie estructive Te ns and contex (nspection, har r Test, resisti , ultrasonic te ptope gauges,	ges of condition so possible defects in Definition and need a optionfor Non-De sof a few NDT pr <b>esting of Concre</b> ts, where NDT is n alf-Cell electrical vity measurement, esting, Infra-Red th other methods.	arvey (Preliminary n concrete structur l,Quality control ap estructive Evaluatio ocedures on concre te Structures: In eeded, classification potential method electromagnetic n hermography, grou	troduction to NDT - on of NDT procedures, s, Schmidt Rebound methods, radiographic and penetrating radar,	6
IV	in struct	ural Industry.	Learning from fai	lures. Various kind	s and their applications ls of damage detection site structures, damage	7

	assessment of composites structures, Case studies.	
V	<b>Introduction to FE Simulations of various SHM techniques:</b> Introduction to FE analysis of typical smart materials. Applications of FE	6
v	simulation technique, case studies 1) Metallic structures 2) Composite structures.	0
	Advanced Signal processing methods for Data processing and Result	
VI	interpretation.	6
	Wavelet, Neural networks, Vector support machine.	
	Textbooks	
1	Daniel Balageas, Claus - Peter FritzenamI Alfredo Guemes, Structural Health	Monitoring,
1	Published by ISTE Ltd., U.K. 2006.	
2	Guide Book on Non-destructive Testing of Concrete Structures, Training course s	eries No. 17,
2	International Atomic Energy Agency, Vienna, 2002.	
3	Gandhi, M.V., Thompson B. D., Smart Materials and Structures, ISBN 978-0-412-	-37010-6
	References	
1	Hand book on "Repair and Rehabilitation of RCC Buildings", Published by Dire	ctor General,
1	CPWD, Govt. of India, 2002.	
2	Hand Book on Seismic Retrofitting of Buildings, Published by CPWD & Ind	lian Building
Z	Congress in Association with IIT, Madras, Narosa Publishing House, 2008.	
	Useful Links	
1		
2		

CO-PO Mapping							
Programme Outcomes (PO)							
1	2	3	4	5	6		
		1					
		2					
		3					
	1	1 2		•• •			

### Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Walc	hand College (Government Aided	0	0, 0		
			1	2022-23	uuc)		
				Information			
Progra	amme		M. Tech. Civil (S	tructural Engine	ering)		
Class,	Semester		First Year M. Teo	ch., Semester II			
Cours	e Code		6ST521				
Course	e Name		Theory of plates	& Shells			
Desire	d Requisi	tes:	Theory of Elastic	ity and Plasticity			
,	Teaching	Scheme		Examination	Scheme (Marks)		
Lectur	<u> </u>	3 Hrs/week	MSE	ISE	ESE	Total	
Tutori	ial	1 Hr/week	30	20	50	100	
				Cr	edits: 4		
			C				
1	To impo	t knowledge of		<b>Objectives</b>	rent loading and boundar	w conditions	
2					ods to solve plate and sh		
<u>2</u> 3			plate and shell mo		<u>+</u>	en problems.	
5	10 01000	de kilowiedge of		defing for practic			
		Course	Outcomes (CO) w	ith Bloom's Tax	conomy Level		
	1		ents will be able to				
CO1			f various plates and			Applying	
CO2		•	s using different m			Analyzing	
CO3	Evaluate	e structural actio	ns for practical app	plications of plate	es and shells.	Evaluating	
Modu	le		Module	Contents		Hours	
WIUUU		ing of Circular		Contents		liouis	
		0		rge deflection t	heory of thin plates -		
Ι		assumptions, moment-curvature relations, stress resultants, governing differential					
		Equation for bending of plates, various boundary conditions. Bending of Circular					
	· ·	s: Symmetrical I	<b>A</b> · ·	2	C		
		ing of Rectang					
II					angular plates of various	6	
			and subjected to va	rious types of loa	ads.		
			ethod for plates				
		Finite Difference Method Solution of plate problems derivation of delta/ pattern/					
III		stencil for biharmonic form for a rectangular mesh, two stage solutions, solution					
		for various loadings and boundary conditions, use of symmetry & anti-symmetry, extrapolation formula, introduction to improved Finite Difference Technique					
		duction formula		iproved Finite D	merence recnnique		
				geometry this	kness and loading. Thin		
IV					nts, stress-displacement		
		<b>•</b> · <b>1</b>	ty and equilibrium	·	nts, stress-displacement		
			hells by Membra				
	Mem	brane Analysis	·	·			
	Equa	tion of equilibriu	Im for synclastic ar	nd anticlastic shel	lls under self-weight and		
V					dinate system. Spherical		
					rical shells-equation of		
				shells with close	ed ends. Cylindrical and		
	Нуре	rbolic paraboloi	d roofs.				
	Cvlir	drical shell roo	fs				
	•			drived Shall Day	rivation of Governing		
	Svmr	netricaliv loade		ancal snen-Dei		1	
<b>.</b>						-	
VI	Diffe	rential Equation	, resembling that	for beam on el	lastic foundation, beam		
VI	Diffe theor	rential Équation y. Finsterwalder	, resembling that 's Theory-Derivation	for beam on el ion of governing		0	

	Textbooks						
1	1 Timoshenko. S.P. And Krieger. S.W, "Theory of Plates & Shells", Tata McGraw-Hill Publishing Company Limited, 2nd Edition, 1985.						
2	2 Ramaswamy G. S., "Design and Construction of Concrete Shell Roofs", CBS Publishers and Disributors, 1st revised Edition, 1984.						
	References						
1	Chandrashekhara K., "Analysis of Thin Concrete shells", Tata McGraw-Hill Publishing Company Limited, 2nd Revised Edition, 2011.						
2	Flugge. W., "Stresses in Shells", 2 <sup>nd</sup> Edition, Springer, Berlin, 1990.						
	Useful Links						
1	https://nptel.ac.in/courses/105/103/105103209/						
2	https://nptel.ac.in/courses/105/105/105105177/						
3	https://nptel.ac.in/courses/105/105/105105108/						
4							

	CO-PO Mapping						
	Programme Outcomes (PO)						
	1	2	3	4	5	6	
CO1		1	2				
CO2		3				2	
CO3		2				2	
The streng	gth of mapping is	s to be written	as 1: Low, 2: Med	ium, 3: High	-		

#### Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

	W	alchand Colle				
		1	lided Autonomous In: <b>Y 2022-23</b>	stitute)		
			rse Information			
Progra	mme		tructural Engineeri	na)		
	Semester	First year. M. Teo		ng)		
Course		6ST522				
	e Name	Finite Element M	[ethod			
	d Requisites:	Mechanics of Str				
Desire	a requisites.	incentances of Sur				
Te	aching Scheme		Examination	Scheme (Marks)		
Lectur		MSE	ISE	ESE	To	tal
Tutori		30	20	50	10	
			Cre	dits: 3		
		1				
		Cou	rse Objectives			
1	To impart knowled			-D,3-D elements		
2	To discuss finite ele	ement method in st	ructural engineerin	g		
3	To illustrate applica			<u> </u>		
	uppnot	i i i i i i i i i i i i i i i i i	, 2			
	Сон	rse Outcomes (CC	)) with Bloom's T	axonomv Level		
At the	end of the course, the					
CO1	Implement finite			1-D, 2-D, 3-D	A 1	
	problems		0, 0	, ,	Appl	yıng
CO2	Analyse nodal degr	rees of freedom and	l stress resultants		Analy	sing
CO3	Create finite eleme	ent model for soluti	on of various field	problems	Crea	
				- · ·		
Modul	le	Mod	ule Contents		]	Hours
Ι	element incident polynomials, ap subjected to axi principle, develo truss, beam and	ces, displacement r pplication to bars al forces. Principl opment of element	nodel, shape functi with constant and e of minimum pot stiffness matrix ar ents, Transformation	s, Discretization, no on, selection of ord variable cross sec tential energy, vari- nd nodal load vecto on of matrices, rele	er of tions ation r for	8
2-D Elements         2-D Elements 2-D elements of triangular and quadrilateral shapes for plane         II       stress and plane strain problems. Pascal's triangle, convergence requirements and compatibility conditions, shape functions, boundary conditions, element aspect ratio, applications to a continuum.					nents	6
III	<b>3-D Elements</b> 3-D Elements D for Tetrahedron,	evelopment of eler	nent stiffness matri nts, Ax symmetric l	ix and nodal load v Elements - Develop		6
IV	coordinate syst	tric Element Isoperimetric Elements Shape function, Natural systems, classification of isoperimetric- subprarmatric, super elements, 1-D & 2-D isoperimetric elements,				6
V	Plate and Shell Plate and Shell elements of triar	Elements Elements Format ngular and quadrilat	teral shapes, cylind	atrix for plate ben rical thin shell elem		7
VI	Finite Element A		uctural Dynamics F	es Formulation, Hamil values and eigenvec		6
			Textbooks			
			I CALDUURS			

1	Seshu P. N., "Finite Element Analysis", 2003.					
2	Reddy J. N., "An Introduction to the Finite Element Method" McGraw Hill, 3rd Edition, New					
2	York, 2006.					
3	Cook Robert D., Malkus David S., Plesha Michael E., and Witt Robert J., "Concepts and					
5	Applications of Finite Element Analysis", 2003					
	References					
1	Bathe Klaus-Jurgen, "Finite Element Procedures in Engineering Analysis",1982.					
2	Chandrupatla T. R. and Belegundu A. D., "Introduction to Finite Element in Engineering",					
Z	Prentice.					
3	Zienkiewicz. O. C. & Taylor. R. L., "The Finite Element Method- Vol I & Vol II Tata					
5	McGraw-Hill Publishing Company Limited, 1989, 4th Edition.					
	Useful Links					
1	https://nptel.ac.in/courses/105/107/105107209/					
2	https://nptel.ac.in/courses/105/106/105106051/					
3	https://nptel.ac.in/courses/112/104/112104116/					

CO-PO Mapping Programme Outcomes (PO)							
	1	2	3	4	5	6	
CO1	1	2		2			
CO2		3		2		2	
CO3	1		2			3	
	I th of manning	a is to be writ	ten as 1 · Low 2 · M	edium 3. High		3	

# Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

	Wale	chand College (Government Aide					
			2022-23				
			Information				
Programme		M. Tech. Civil (S		ering)			
Class, Seme	ster	First Year M. Te	<b>-</b>				
Course Cod	2	6ST571	,				
Course Nam	e	Structural Health	Monitoring Lab	oratory			
Desired Req	uisites:						
	ing Scheme		1	n Scheme (Marks)			
Practical	2 Hrs/ Week	LA1	LA2	Lab ESE	Total		
Interaction		30	30	40	100		
			C	redits: 1			
		Course	Objectives				
1 To ir	npart knowledge of		e Objectives				
	ustrate principles of		monitoring				
Ton	<u> </u>			ity loss a system unde	ergoes after natural		
	ters and other hazar		suuciurai miegi	ity 1055 a System unde	Agoes and hatural		
uisas		Outcomes (CO) v	vith Bloom's Ta	xonomv Level			
At the end of	the course, the stu						
	y knowledge of sm			N	Applying		
	aise structural con				Evaluating		
	ss civil engineering				Evaluating		
	CC		ľ				
		List of ]	Experiments				
<ol> <li>stren</li> <li>Dete vario</li> <li>Dam plate</li> <li>Dete mate</li> <li>Dete de mate</li> <li>Dete mate</li> <li>Dete mate</li> <li>Dete mate</li> </ol>	gth. rmination and simu us materials a) Cor age detection of fol d) HCSS plate rmination of mode rials using accelero rmination of mode rials using accelero rmination of defle	lation of character crete b) metallic p lowing materials ar e shapes for undar meters (piezo) a) n e shapes for dama meters (piezo) a) n ection and bendir	istics of ultrason late c) Composite ad simulation a) maged cantileve netallic plate b) ( aged cantilever netallic plate b) ( ng stresses of	on with destructive te ic guided waves usin e plate d) HCSS plate Concrete b) metallic r beams and simulat Composite plate c) HC beams and simulati Composite plate c) HC the simply supporte g LVDT transducers	ag Piezo sensors in plate c) Composite tion for following CSS plate. ons for following CSS plate. ed concrete beam		
			xtbooks				
1 N	lonitoring, Publishe	d by ISTE Ltd., U	.K. 2006.	nes, Structural Health			
2 1	<ul> <li>Guide Book on Non-destructive Testing of Concrete Structures, Training course series No.</li> <li>17, International Atomic Energy Agency, Vienna, 2002. Gandhi, M.V., Thompson B. D., Smart Materials and Structures, ISBN 978-0-412-37010-6</li> </ul>						
1			ferences	-			
I C	Hand book on "Repair and Rehabilitation of RCC Buildings, "Published by Director General, CPWD, Govt. of India, 2002.						
				hed by CPWD & Ind shing House, 2008.	ian Building		
		Use	ful Links				
1							

2	
3	
4	

CO-PO Mapping							
			Programme	Outcomes (PO)			
	1	2	3	4	5	6	
CO1			1				
CO2			2				
CO3			3				

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.

			ssment	
			LA2 and Lab ESE. %), LA1+LA2 should be min 40%	
Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
experiments, m	ini-project, preser irement of the lab	ntations, drawings, j	ctivities/Lab performance shall include performance shall include performance shall include performance suitable activities, a mental lab shall have typically 8-10 experimental shall have 8-	s per the

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)					
		1	2022-23		
		Course	Information		
Programme		M. Tech. Civil (S	tructural Engine	ering)	
Class, Semester		First Year M. Te		6)	
Course Code		6ST572			
Course Name		Finite Element L	aboratory		
Desired Requisi	tes:	Finite Element M	ethod		
<b>Teaching</b>		T A 1		n Scheme (Marks)	T-4-1
Practical	2 Hrs/ Week	LA1	LA2	Lab ESE	Total
Interaction		30	30	40	100
		Course	Objectives		
1 To impai	t knowledge to			y using finite element	-based software's.
		ing and interpretat			
		rofessional FE soft			
· •	Course	Outcomes (CO) v	vith Bloom's Ta	xonomy Level	
		lents will be able to			
		art materials and te			Applying
		ditions by various t			Analyzing
CO3 Assess c	ivil engineering	structures by SHN	I techniques and	simulation.	Evaluating
			Experiments		
<ul> <li>ultrasoni strength.</li> <li>2. Determin various n</li> <li>3. Damage plate d) 1</li> <li>4. Determin materials</li> <li>5. Determin materials</li> <li>6. Determin</li> </ul>	c pulse velocity nation and simu naterials a) Con detection of foll HCSS plate nation of mode s using acceleron nation of mode s using acceleron nation of defle atic and dynar	b) rebound hamm lation of character crete b) metallic p owing materials ar shapes for undar meters (piezo) a) n e shapes for dama meters (piezo) a) n ection and bendir nic loading and	er test c) validati istics of ultrason late c) Composite ad simulation a) maged cantilever netallic plate b) C aged cantilever netallic plate b) C ag stresses of t	oncrete elements usir on with destructive te ic guided waves usin e plate d) HCSS plate Concrete b) metallic p r beams and simulat Composite plate c) HC beams and simulatic Composite plate c) HC the simply supporte g LVDT transducers	st for compressive g Piezo sensors in plate c) Composite tion for following CSS plate. ons for following CSS plate. d concrete beam
. Danie	el Balageas, Cla			nes. Structural Health	
I Moni Guid 2 17, It					
Materials and Structures, ISBN 978-0-412-37010-6					
		Re	ferences		
	book on "Repa D, Govt. of Indi	ir and Rehabilitation		ings, "Published by D	Director General,
2 Hand	Book on Seism	ic Retrofitting of H		hed by CPWD & Indi shing House, 2008.	an Building
		T	ful I intra		
1		Use	ful Links		
1 2					
<u> </u>					

3	
4	

CO-PO Mapping							
			Programme (	<b>Dutcomes (PO)</b>			
	1 2 3 4 5 6						
CO1			1				
CO2			2				
CO3			3				
The streng	oth of manni	ng is to be writt	en as 1 2 3. where	1 · Low 2· Medium	3. High		

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.

			ssment	
	<b>A</b>	· · · · ·	LA2 and Lab ESE. %), LA1+LA2 should be min 40%	
Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
experiments, m	ini-project, presen irement of the lab	tations, drawings, p	ctivities/Lab performance shall include performance shall include performance shall include performance activities, a mental lab shall have typically 8-10 experimental shally 8-10 expe	s per the

Walchand College of Engineering, Sangli				
	(Government Aided Autonomous Institute)			
	AY 2022-23			
Course Information				
Programme	M.Tech. (Structural Engineering)			
Class, Semester	First year M. Tech., Sem. II			
Course Code	6ST574			
Course Name Predissertation Work and Seminar				
Desired Requisites: Research Methodology				

Teaching Scheme			Examination	Scheme (Marks)	
Practical	2 Hrs/week	LA1	LA2	Lab ESE	Total
		30	30	40	100
		Credits: 1			

1	To help in	identifying p	otential rece	arch areas in	n the field (	of structural	engineering
1	10 neip m	i ucini ying p	otenniai rese	aren areas n	ii uic neiu (	Ji su uctural	engineering.

- 2 To guide the students for acquiring necessary knowledge about selected research topic.
- 3 To enhance knowledge by interaction with students during presentation.

### Course Outcomes (CO) with Bloom's Taxonomy Level

At the	At the end of the course, the students will be able to,					
CO1	<b>Identify</b> the literature available on the selected topic.	Analysing				
CO2	Analyse and breakdown the latest information of selected research topic	Analysing				
<b>CO3</b>	Appraise and conclude predissertation work and seminar work effectively	Evaluating				

### Lab Activities

Predissertation work and seminar shall be delivered on one of the advanced topics after carrying out rigorous literature review on various potential areas by identifying appropriate research gaps in consultation with the guide. Proposed scope of the research work should be presented during seminar along with case study and same may be extended as dissertation topic. All modern methods of presentation are to be used by the student. A hard copy of the report (25 - 30 pages as per prescribed format) should be submitted to the guide before delivering the seminar. A PDF copy of the report along with all the referred research material must be submitted to the guide.

	References					
1	National and International journals, Conference Proceedings in Structural Engineering.					
2	Technical Reports of Professional societies.					
3	International and national codes of Practices and Handbooks.					
4	Internet sources and Distance Learning.					
5	Published Ph.D. and M. Tech Thesis of Reputed Institutes.					
	Useful Links					

			CO-PO Map	ping				
	Programme Outcomes (PO)							
	1	2	3	4	5	6		
CO1			2	2		3		
CO2			2	2		3		
CO3	1		2			2		
	gth of mapping		n as 1: Low, 2: M	edium, 3: High				

Each CO of the course must map to at least one PO.

AssessmentThere are three components of lab assessment, LA1, LA2 and Lab ESE.IMP: Lab ESE is a separate head of passing (min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
	Lab activities,		During Week 1 to Week 8	
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30
	journal		Week 8	
	Lab activities,		During Week 9 to Week 16	
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30
	journal		Week 16	
	Lab activities,	Lab Course Faculty	During Week 18 to Week 19	
Lab ESE	· · · · · · · · · · · · · · · · · · ·	and External	Marks Submission at the end of	40
Lao ESE	journal/	Examiner as	Week 19	40
	performance	applicable		
Week 1 indicat	es starting week o	f a semester. Lab activi	ties/Lab performance shall include per	rforming
			ramming, and other suitable activities	

nature and requirement of the lab course.

	W		ge of Engineer		
			lided Autonomous Ins	stitute)	
			AY 2022-23		
P		-	rse Information		
Program			tructural Engineerin	ng)	
	Semester	First year M. Tec	h., Semester II		
Course		6ST531	· · · · · · · · ·	D 11	
Course			lysis and Design of	Bridges	
Desired	l Requisites:	Design of Concre	ete Structures		
T	1. 01		<b>F</b> • • •		
	Teaching Scheme         Examination Scheme (Marks)				
Lecture		MSE	ISE	ESE	Total
Tutoria	ll	30	20	50	100
			Cre	dits: 3	
		C	ma Ohiastina		
1	To morride 1		Irse Objectives	mont try og af hul 1-	
	1	0		erent types of bridg	
2	-		different types of	bridges including	substructures
2	with relevant code	es.			
3	To provide knowled	dge for construction	n, inspection and m	aintenance of bridge	5.
		8	, I		
I	Cou	rse Outcomes (CC	)) with Bloom's Ta	axonomy Level	
At the e	end of the course, the	·		<i>v</i>	
	Illustrate types of		,	on of bridge site.	Applying
CO2	Analyze various ty	·		¥	Analyzing
	<b>Design</b> bridges and	· · · · · ·	** *		Creating
		8_			8
Module	ρ	3.6.3			
		Mod	ule Contents		Hours
	Introduction to	Bridge			
Т	Introduction to Components of	Bridge bridge, Importance	e of bridge, Types	of bridges, Selection	of 7
Ι	<b>Introduction to</b> Components of bridge type and	<b>Bridge</b> bridge, Importance site, Economic sp	e of bridge, Types an, Superstructure	– Alignment, Draina	of 7
Ι	Introduction to Components of bridge type and Clearance, Road	Bridge bridge, Importance site, Economic sp l curb, Design load	e of bridge, Types	– Alignment, Draina	of 7
	Introduction toComponents ofbridge type andClearance, RoadAnalysis of Cul	Bridge bridge, Importance site, Economic sp curb, Design load verts	e of bridge, Types an, Superstructure s for bridges, IRC I	– Alignment, Draina	of ge, 7
I	Introduction to Components of bridge type and Clearance, Road Analysis of Cul Design of RC C	Bridge bridge, Importance site, Economic sp l curb, Design load	e of bridge, Types an, Superstructure s for bridges, IRC I	– Alignment, Draina	of 7
II	Introduction to Components of bridge type and Clearance, RoadAnalysis of Cul Design of RC CulRC Deck Slabs	Bridge bridge, Importance site, Economic sp curb, Design load verts ulvert, Pipe culvert	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert.	– Alignment, Draina Loading	of ge, 7 6
	Introduction toComponents ofbridge type andClearance, RoadAnalysis of CulDesign of RC CulRC Deck SlabsDesign of RC d	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br	– Alignment, Draina	of ge, 7 6
II	Introduction toComponents ofbridge type andClearance, RoadAnalysis of CulDesign of RC CulRC Deck SlabsDesign of RC dCorbon's theory	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantilev	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br	– Alignment, Draina Loading	of ge, 7 6
II	Introduction to Components of bridge type and Clearance, RoadAnalysis of Cul Design of RC Cul RC Deck Slabs Design of RC d Corbon's theoryPrestressed Con	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantilev ncrete Bridges	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br ver bridge.	– Alignment, Draina Loading idge, Pigeaud's theo	of ge, 7 6 ry, 6
II	Introduction to Components of bridge type and Clearance, RoadAnalysis of Cul Design of RC Cul Besign of RC Cul Corbon's theoryPrestressed Com Prestressed Com	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantilev ncrete Bridges crete Bridges – Ge	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br ver bridge. eneral aspects, Adv	– Alignment, Draina Loading	of ge, 7 6 ry, 6
II	Introduction to Components of bridge type and Clearance, RoadAnalysis of Cul Design of RC Cul BC Deck Slabs Design of RC d Corbon's theoryPrestressed Con Prestressed Con tensioned and point	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantilev ncrete Bridges crete Bridges – Ge pst-tensioned concr	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br ver bridge. eneral aspects, Adv	– Alignment, Draina Loading idge, Pigeaud's theo	of ge, 7 6 ry, 6
II III IV	Introduction to Components of bridge type and Clearance, RoadAnalysis of Cul Design of RC Cul Design of RC Cul Corbon's theoryPrestressed Con Prestressed Con tensioned and poDesign of Component Design of Component	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantilev ncrete Bridges crete Bridges – Ge ost-tensioned concer posite Bridges	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br ver bridge. eneral aspects, Adv rete bridge decks.	– Alignment, Draina Loading idge, Pigeaud's theo antages, Design of p	of ge, 7 6 ry, 6 re- 7
II	Introduction to Components of bridge type and Clearance, RoadAnalysis of Cul Design of RC Cul Design of RC Cul Corbon's theoryPrestressed Con Prestressed Con tensioned and poDesign of Comp Design of comp	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantilev ncrete Bridges crete Bridges – Ge ost-tensioned concr posite Bridges, Reir	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br yer bridge. eneral aspects, Adv rete bridge decks.	– Alignment, Draina Loading idge, Pigeaud's theo	of ge, 7 6 ry, 6 re- 7
II III IV	Introduction to Components of bridge type and Clearance, RoadAnalysis of Cul Design of RC Cul Besign of RC Cul Corbon's theoryPrestressed Con Prestressed Con tensioned and poDesign of Comp Stiffeners, Shear	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantilev ncrete Bridges crete Bridges – Ge ost-tensioned concer posite Bridges, Reir r connectors, Conn	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br yer bridge. eneral aspects, Adv rete bridge decks.	– Alignment, Draina Loading idge, Pigeaud's theo antages, Design of p	of ge, 7 6 rry, 6 re- 7
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II III IV	Introduction to Components of bridge type and Clearance, RoadAnalysis of Cul Design of RC Cul Design of RC Cul RC Deck Slabs Design of RC du Corbon's theoryPrestressed Con Prestressed Con tensioned and poDesign of Comp Design of comp Stiffeners, Shear Design of subst Design of subst	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantilev ncrete Bridges crete Bridges – Ge ost-tensioned concr posite Bridges, Rein connectors, Connectors, Conne	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br ver bridge. eneral aspects, Adv rete bridge decks. nforced concrete sla ections.	– Alignment, Draina Loading idge, Pigeaud's theo antages, Design of p	of ge,         7           6           rry,         6           rre-         7           ler,         7
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II III IV V	Introduction to         Components of         bridge type and         Clearance, Road         Analysis of Cul         Design of RC Cul         Prestressed Components         Prestressed Component         Design of Component         Design of Component         Design of Component         Design of Subst         Design of Subst         Design of subst         foundation. Bear         Krishna Raju N.	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantilev ncrete Bridges crete Bridges – Ge ost-tensioned concr posite Bridges posite bridges, Reir connectors, Conne tructure tructure – Abutm rings and expansion	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br ver bridge. eneral aspects, Adv rete bridge decks. nforced concrete sla ections. enent, Pier, Approac n joints. <b>Textbooks</b>	- Alignment, Draina Loading idge, Pigeaud's theo antages, Design of p ab on steel plate gird	of ge,       7         6         ary,       6         are-       7         ler,       7         vell       6
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II III IV V VI	Introduction to         Components of         bridge type and         Clearance, Road         Analysis of Cul         Design of RC Cul         Design of RC Cul         RC Deck Slabs         Design of RC du         Corbon's theory         Prestressed Con         Prestressed Con         Prestressed Con         Design of Comp         Design of Comp         Stiffeners, Shear         Design of Subst         Design of Subst         Design of subst         Krishna Raju N.         Kolkata, 2001.         Jagdeesh T. R., J	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantiley ncrete Bridges crete Bridges – Ge ost-tensioned concr posite Bridges posite bridges, Reir connectors, Conm tructure tructure – Abutm rings and expansion , "Design of Bridge	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br yer bridge. eneral aspects, Adv rete bridge decks. nforced concrete sla ections. nent, Pier, Approad n joints. <b>Textbooks</b> ges, Oxford and IBH	- Alignment, Draina Loading idge, Pigeaud's theo antages, Design of p ab on steel plate girc ch slab, Pile and w	of ge, 7 6 rry, 6 re- 7 ler, 7 rell 6 ", New Delhi and
II III IV V VI	Introduction to         Components of         bridge type and         Clearance, Road         Analysis of Cul         Design of RC Cr         RC Deck Slabs         Design of RC dr         Corbon's theory         Prestressed Con         Prestressed Con         Design of Comp         Design of Comp         Stiffeners, Shear         Design of Subst         Design of Subst         Design of subst         foundation. Bear         Krishna Raju N.         Kolkata, 2001.         Jagdeesh T. R., J         New Delhi, 2002	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantilev ncrete Bridges crete Bridges – Ge ost-tensioned concr posite Bridges tosite bridges, Reir connectors, Connectors, Co	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br ver bridge. eneral aspects, Adv rete bridge decks. nforced concrete sla ections. ent, Pier, Approac n joints. <b>Textbooks</b> ges, Oxford and IBF resign of Bridge Structure	<ul> <li>Alignment, Draina Loading</li> <li>idge, Pigeaud's theorem</li> <li>antages, Design of period</li> <li>ab on steel plate girce</li> <li>ch slab, Pile and we</li> <li>H Publishing Co. Ltd.</li> <li>ctures, Prentice Hall of</li> </ul>	of ge, 7 6 rry, 6 re- 7 ler, 7 rell 6 ", New Delhi and of India Pvt. Ltd."
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II III IV V VI	Introduction to         Components of         bridge type and         Clearance, Road         Analysis of Cul         Design of RC Cr         RC Deck Slabs         Design of RC dr         Corbon's theory         Prestressed Con         Prestressed Con         Design of Comp         Design of Comp         Stiffeners, Shear         Design of Subst         Design of Subst         Design of subst         foundation. Bear         Krishna Raju N.         Kolkata, 2001.         Jagdeesh T. R., J         New Delhi, 2002	Bridge bridge, Importance site, Economic sp l curb, Design load verts ulvert, Pipe culvert leck slab, Beam an , Balanced cantilev ncrete Bridges crete Bridges – Ge ost-tensioned concr posite Bridges mosite bridges, Rein connectors, Conne tructure tructure – Abutm rings and expansion , "Design of Bridg fayaram M. A., "De 3. "Essentials of Bridg	e of bridge, Types an, Superstructure s for bridges, IRC I t, Box culvert. nd slab, T-beam br ver bridge. eneral aspects, Adv rete bridge decks. nforced concrete sla ections. ent, Pier, Approac n joints. <b>Textbooks</b> ges, Oxford and IBF resign of Bridge Structure	<ul> <li>Alignment, Draina Loading</li> <li>idge, Pigeaud's theorem</li> <li>antages, Design of period</li> <li>ab on steel plate girce</li> <li>ch slab, Pile and we</li> <li>H Publishing Co. Ltd.</li> <li>ctures, Prentice Hall of</li> </ul>	of ge, 7 6 rry, 6 re- 7 ler, 7 rell 6 ", New Delhi and of India Pvt. Ltd."

1	Raina V. K., "Concrete Bridge Practice: Construction and maintenance and rehabilitation", Tata Mc Graw Hill Publishing Company, New Delhi.
2	Raina V. K., "Concrete Bridge Practice: Analysis, design and economics", Tata Mc Graw Hill Publishing Company, New Delhi.
3	IRC Codes.
	Useful Links
1	Reinforced Concrete Road Bridges - Course (nptel.ac.in)
2	NPTEL :: Civil Engineering - NOC: Reinforced Concrete Road Bridges

	CO-PO Mapping Programme Outcomes (PO)								
	1	2	3	4	5	6			
CO1			2			3			
CO2				2					
CO3	1		2						
CO2 CO3	1 ath of manning	rie to he writt	$\frac{2}{2}$	2 Andium 2: High					

#### Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		1	lided Autonomous Ins				
			rse Information				
Progr	amme		tructural Engineerir	ıσ)			
	Semester	First year M. Tec		18)			
<u>/</u>	e Code	6ST532					
	e Name		anced Earthquake E	Ingineering			
	d Requisites:	Dynamics of Stru					
		Dynamies of Sur	*********				
Те	aching Scheme		Examination S	Scheme (Marks)			
Lectur		MSE	ISE	ESE		Total	
lutor		30	20	50		100	
				dits: 3			
		Cou	irse Objectives				
1	To provide knowled		V	resistant design of s	tructu	res.	
	-		<u> </u>	uctures for displace			
2	design.		5	actures for anspiace			
		a habariana and aa	dal marriaiana fan d	lesign of various ear	th ava	Ira magistam	
3	structures.	c benaviour and co	dal provisions for d	lesign of various ear	inqua	ke resistan	
	511 40141 55.						
	Cou	rea Autoomae (CC	ם) with Bloom's Ta	wanamy Laval			
t tha	end of the course, the			axonomy Level			
CO1	Illustrate various c			of structures		Applying	
CO1				performance-based	1	Applying	
	design.	e of structures for	displacement and	performance-based		Evaluating	
C <b>O3</b>	<b>Design</b> earthquake	resistant structures	based on its perfor	mance		Creating	
	Design cartinquake		bused on his perior			creating	
Modu	le	Mod	ule Contents			Hours	
		rthquake Resistar					
т				ormance-based des	ign,	6	
Ι	seismic input characteristics and their effect on seismic design, comparative						
	study of different national codes.						
	Modelling and	Analysis of Struct	tures for Displacen	nent Based Design			
II	Back-bone curve, Idealized component models, estimation and modelling of						
11	stiffness, strength and ductility of RC, steel and masonry structures, nonlinear						
	static and dynamic analyses.						
		ement Based Desig					
III				and limit states; P-D	elta	6	
111			or direct displaceme	ent-based design.			
		ased Design and H	e				
	Structural and	non-structural per	· 1	cation of performa		6	
IV		1	es services and equi	inment Pier analysis	s for	~	
IV		aluation of structure	es, services and equi	ipinent. I fer undryst.			
IV	shear wall and n	nasonry structures					
	shear wall and n Overhead Wate	nasonry structures er Tanks	· · ·		1	7	
IV V	shear wall and n Overhead Wate Modelling and	nasonry structures er Tanks 1 analysis of o	verhead water ta	inks, hydrostatic	and	7	
	shear wall and n Overhead Wate Modelling and hydrodynamic e	nasonry structures er Tanks analysis of o ffects, earthquake	· · ·	inks, hydrostatic	and	7	
	shear wall and n Overhead Wate Modelling and hydrodynamic e Seismic Risk As	nasonry structures er Tanks 1 analysis of o effects, earthquake a ssessment	verhead water ta resistant provisions.	inks, hydrostatic		7	
	shear wall and n Overhead Wate Modelling and hydrodynamic e Seismic Risk A Seismic vulnera	nasonry structures er Tanks 1 analysis of or effects, earthquake r ssessment bility assessment, 1	verhead water ta resistant provisions. HAZUS, Different t	unks, hydrostatic	ility	7	
V	Shear wall and n Overhead Wate Modelling and hydrodynamic e Seismic Risk As Seismic vulnera curve, DPM, Sin	nasonry structures er Tanks l analysis of o effects, earthquake ssessment bility assessment, l mplified Vulnerabi	verhead water ta resistant provisions. HAZUS, Different t	inks, hydrostatic	ility		
V	shear wall and n Overhead Wate Modelling and hydrodynamic e Seismic Risk A Seismic vulnera	nasonry structures er Tanks l analysis of o effects, earthquake ssessment bility assessment, l mplified Vulnerabi	verhead water ta resistant provisions. HAZUS, Different t	unks, hydrostatic	ility		
V	Shear wall and n Overhead Wate Modelling and hydrodynamic e Seismic Risk As Seismic vulnera curve, DPM, Sin	nasonry structures er Tanks 1 analysis of or effects, earthquake r ssessment bility assessment, 1 mplified Vulnerabi NDT results	verhead water ta resistant provisions. HAZUS, Different t lity assessment as p	unks, hydrostatic	ility		
V	shear wall and n Overhead Wate Modelling and hydrodynamic e Seismic Risk As Seismic vulnera curve, DPM, Sin procedures of N	nasonry structures er Tanks analysis of or effects, earthquake ssessment bility assessment, l mplified Vulnerabi NDT results	verhead water ta resistant provisions. HAZUS, Different t lity assessment as p <b>Textbooks</b>	unks, hydrostatic	ility nent	7	

2	Key David, "Earthquake Design Practice for Buildings", Thomas Telford Publication,
2	London,2nd Edition, 2006.
3	Paulay, T. and Priestley, M.J.N. "Seismic Design of Reinforced Concrete and Masonry
	Buildings," John Wiley & Sons, 1992.
	References
1	Kelly James M., "Earthquake Resistant Design with Rubber", Springer-Verlag Publication,
1	London, 2nd Edition, 2012.
2	George G. Penelis and Andreas J. Kappos, "Earthquake Resistant Concrete Structures," E &
2	FN Spon, 1997.
2	FEMA-356, "Prestandard and Commentary for the Seismic Rehabilitation of Buildings,"
3	Federal Emergency management Agency, 2000.
	Useful Links
1	https://nptel.ac.in/courses/105/101/105101209/
2	https://nptel.ac.in/courses/105/104/105104200/
3	https://nptel.ac.in/courses/105/108/105108204/
4	https://nptel.ac.in/courses/105/107/105107204/
5	https://nptel.ac.in/courses/105/101/105101004/

			CO-PO Ma					
	Programme Outcomes (PO)							
	1	2	3	4	5	6		
CO1		1	2			3		
CO2			3	2	3			
CO3	1		2		3	2		

#### Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on any three modules out of six.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Walc	hand College (Government Aided	of Engineerin Autonomous Institu				
				2022-23				
				Information				
Program	nme			tructural Engineer	ring)			
<u> </u>	emester		First Year M. Teo					
Course			6ST533					
Course	Name		Elective 2 - Num	erical Methods in	Structural Engineering			
Desired	Requisit	es:	Applied Mathema	atics, Structural E	ngineering			
Т	eaching	Scheme		Examination S	Scheme (Marks)			
Lecture		3 Hrs/week	MSE	ISE	ESE	Total		
Tutoria			30	20	50	100		
	-				dits: 3	100		
			~					
1 /	T			Objectives	for a shution of much low			
					for solution of problem			
		l approximation		nation, integration	, root finding, curve fit	ling and other		
				numerical method	s in structural engineer	ing.		
		<b>^</b>			<u> </u>			
			Outcomes (CO) w		onomy Level			
			ents will be able to					
			es for problem solv			Applying		
			rical tools for solut	¥¥	2 .	Analyzing		
<b>CO3</b>	Discuss r	numerical schem	es for modelling a	nd solving field ap	oplications.	Evaluating		
Module			Module	Contents		Hours		
		ng Linear Alge	braic Equations a		is			
					existence of solution,			
	Classi	Classification of solution approaches as direct and iterative, solution by matrix						
		decomposition, Introduction to methods for solving Block-diagonal, triangular,						
Ι	block	block-triangular systems. Introduction to sparse linear systems: Thomas						
	-	algorithm for tridiagonal and block tridiagonal matrices, Iterative methods:						
		Jacobi, Gauss-Siedel and successive over relaxation methods, Convergence of						
		iterative solution schemes. Ill conditioning of equations. Eigen Analysis by Jacobi						
		ther Methods.						
			lgebraic Equation					
TT					ve solution approaches,			
II		Secant method, regulafalsi method, Modified Newton's method and qausi-						
		Newton method with Broyden's update, Optimization based formulations and Leverberg-Marquardt method						
			fferential Equation	ons and Annrovir	nations			
					methods, Taylor series			
			ta methods, Multi-					
III		•		A A A .	iomial approximations,	6		
					mples, Polynomial and			
					s, Model Parameter			
			ar least squares me					
			s, Reliability Ana					
IV					Statistical parameters,			
IV					analysis in structural			
	engin	eering.		-				
		Numerical Integration						
 \	Nume	en car integratio	011					
V		U	es, Romberg, Gaus	s-quadrature, Mul	ltiple Integrals.	7		
V	Newto	on-Cotes schem tural Engineer	es, Romberg, Gaus					
V VI	Newto	on-Cotes schem tural Engineer	es, Romberg, Gaus		ltiple Integrals. tructural dynamics and			

	Textbooks
1	Chapra Steven and Canale Raymond, "Numerical Methods for Engineers", Mc-Graw Hill, 7th Edition, 2012.
2	Gourdin A. and Boumhrat M., "Applied Numerical Methods", Prentice Hall India, New Delhi, 2000.
3	Joe D Hoffman, "Numerical Methods for Engineers and Scientists", Marcel Dekker, 2nd Edition, 2001.
	References
1	Gilbert Strang, "Computational Science and Engineering", Wellesley-Cambridge Press.
2	Gilbert Strang, "Linear Algebra and Its Applications", Wellesley Cambridge Press, 4th Edition, 2009.
3	Philips, G. M., and Taylor P. J. "Theory and Applications of Numerical Analysis", Academic Press, 2nd Edition, 1996.
	Useful Links
1	https://nptel.ac.in/courses/105/105/105105043/
2	https://nptel.ac.in/courses/111/107/111107107/
3	https://nptel.ac.in/courses/111/107/111107105/

CO-PO Mapping								
	Programme Outcomes (PO)							
	1	2	3	4	5	6		
CO1	1		2					
CO2	1		2					
CO3	1			3		3		

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

	W		ege of Engineerin Aided Autonomous Institu						
			Alded Autonomous Institu AY 2022-23						
			rse Information						
Program	mme	1	Structural Engineering)						
	Semester	First year M. Te							
Course		6ST534							
Course	Name	Elective 3 - Adv	anced Prestressed Con	crete					
Desired	Requisites:	Design of Concr	ete Structurers I, Desig	gn of Concret	e Structur	ers II			
	ching Scheme		Examination Sch		5)				
Lecture		MSE	ISE	ESE		Total			
Tutoria	il	30	20	50		100			
			Credit	s: 3					
		C							
1	T . :11 1		urse Objectives						
		1 ,	stems of prestressing	-					
			of Prestressed concret						
3	To provide knowled	lge for design of I	Prestressed concrete str	uctures using	relevant	IS codes.			
			O) with Bloom's Taxo	onomy Level					
	nd of the course, the		/						
	Estimate losses of	•			An	alyzing			
CO2			flexure, shear, torsio	nal design	Ev	aluating			
	approach for Prestr				C				
CO3	Design Prestressed	concrete compone	ents and structures.			reating			
Module		Μοά	lule Contents			Hours			
Wibuun	Introduction	11100				IIUUIS			
_		tressed concrete.	stress concept. streng	th concept a	nd load	7			
Ι	Basics of pre-stressed concrete, stress concept, strength concept and load balancing concept, systems of prestressing, loss of prestress, Material								
			s, relaxation, fatigue. S						
		tions under flexu			U				
	Analysis of rectangular sections under flexure at ultimate loads: equations of								
II	equilibrium and compatibility and constitutive models, stress block for								
11	concrete, solution procedure, minimum and maximum amount of prestressed								
	reinforcement. Analysis of flanged sections under flexure at ultimate loads.								
	Introduction of software for prestressed sections.								
		on- Limit state m		1 1 7 ~	. <i>.</i> .				
117	- C		eams and slabs, rectan	•		6			
III	choice of cross section: flexural efficiency; determination of limiting zone;								
	post-tension in stress. Magnel's graphical method. Design based on ultimate loads. Detailing requirement. Thermal stresses in prestressed slab.								
	Shear and Tors		mai suesses in prestres	sseu siad.					
			torsion, Analysis for s	hear nrincin	al stress				
			crack patterns, modes						
IV			eb shear cracking capa			7			
1 1		· ·	<b>e</b> 1	•		'			
	cracking. Design of shear reinforcement detailing requirements, design steps. Analysis for torsion behavior of linear elastic beams, crack pattern. Modes of								
	÷.	ents of torsion resi		1 1.					
	Design of anchorage zone								
	Calculations for deflection and crack-width, Pretensioned members: Hoyer								
V			ength, development leng		e tensile				
V	effect, transmiss	ion length, bond le		gth, transvers		7			
V	effect, transmiss stresses, end zo	ion length, bond le ne reinforcement reinforcement, be	ength, development leng	gth, transvers bers: Burstin	g force,	7			

VI	<b>Design of continuous beams</b> Cantilever beams and Continuous beams, Cantilever beams: choice of cable profile, determination of limiting zone. Continuous beams: advantages and disadvantages, choice of cable profile, analysis for bending moment. Principle of linear transformation, principle of concordant cable.	6				
	Textbooks	<u> </u>				
1	Krishna Raju N., "Prestressed Concrete", McGraw Hill Education (ISE Editions); 5 <sup>th</sup> Edition 2014.					
	Ramamrutham S. "Design of reinforced concrete structures", Dhanpat Rai publishing					
2	company, 17 <sup>th</sup> Edition 2010.					
3	Nagarajan Praveen, "Prestressed concrete designs", Pearson publications, 2013.					
	References					
1	Lin T. Y. and Burns N. H. "Design of Prestressed concrete structures", Wiley publications, 3 <sup>rd</sup> Edition, 2010.					
2	Arthur H. Nilson, "Design of Prestressed concrete", John Wiley publications, 2 <sup>nd</sup> Edition.					
3	IS: 1343 Indian standard code of practice for Prestressed concrete BIS New Delhi					
4	•					
	Useful Links					
1	https://nptel.ac.in/courses/105/106/105106117/					
2	https://www.youtube.com/watch?v=4KYPltsNAWs					

CO-PO Mapping							
	Programme Outcomes (PO)						
	1	2	3	4	5	6	
CO1			2	2		3	
CO2			2	2		3	
CO3	1		2			2	
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High							

### Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

1		Walc	hand College				
			(	l Autonomous Institut	te)		
				2022-23			
Duogra	ammo			Information	ng)		
Programme Class, Semester			M. Tech. Civil (Structural Engineering) First Year M. Tech., Semester II				
Class, Semester Course Code			6ST535				
Course Name			Elective 3 - Desig	on Optimization			
	d Requisit	tes:			Analysis and Desig	n	
	<b>B</b>			,	<u>/</u>	, 	
	Teaching			Examination S	cheme (Marks)		
Lectur		3 Hrs/week	MSE ISE ESE			Tota	
Tutorial -		30 20 50			100	100	
				Cred	its: 3		
			0				
1	Tame			<b>Objectives</b>	a of ortinization		
1	-	<u> </u>	<u> </u>	U	ce of optimization. required for analys	na and -	alvin ~
2			d other engineering		required for analys	ing and s	orving
			<u> </u>	2	nization for design	optimizati	ion of
3			gineering field in ge			Punnzau	01
		<u>_</u>			<u> </u>		
	·	Course	Outcomes (CO) w	ith Bloom's Taxor	nomy Level		
At the	1	/	lents will be able to	· · · · · · · · · · · · · · · · · · ·			
CO1			tion techniques for	solution of linear,	nonlinear, and gene	eral Apr	olying
~~~		ion problems.					
CO2			ation problems in e		1.1.		lyzing
CO3				igns of structural	and other engineer	<sup>ing</sup> Cre	eating
	Tacinities	having differen	t complexity.				-
J							
	1						
Modu	ıle		Module	Contents		He	ours
Modu		ical Optimizati	Module ion Techniques	Contents		He	ours
Modu	Class Relev	ance and Signi	ion Techniques ificance of optimiz	zation, Various op	timization problems	in	ours
	Class Relev differ	ance and Signi ent fields of o	ion Techniques ificance of optimizengineering, Introd	zation, Various op duction to optimiz	zation theory-object	in tive	
<b>Modu</b> I	Class Relev differ functi	ance and Signi ent fields of o on/design varia	ion Techniques ificance of optimiz engineering, Introc bles/constraints, C	zation, Various op duction to optimiz lassification of opti	zation theory-objectimization problems	in tive and	<b>ours</b>
	Class Relev differ functi optim	ance and Signi ent fields of o on/design varia ization techniq	ion Techniques ificance of optimiz engineering, Introd bles/constraints, Cl ues, Formulation	zation, Various op duction to optimiz lassification of opti of Various optimiz	zation theory-object mization problems zation problems, lir	in ive and ear	
	Class Relev differ functi optim progra	ance and Signi ent fields of o on/design varia ization techniq amming and s	ion Techniques ificance of optimiz engineering, Introd bles/constraints, C ues, Formulation o simplex algorithm,	zation, Various op duction to optimiz lassification of opti of Various optimiz , Nonlinear progr	zation theory-objectimization problems	in ive and ear	
	Class Relev differ functi optim progra Multi	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal	ion Techniques ificance of optimiz engineering, Introd bles/constraints, Cl ues, Formulation simplex algorithm, ity and inequality c	zation, Various op duction to optimiz lassification of opti of Various optimiz , Nonlinear progr constraints.	zation theory-object mization problems zation problems, lir	in ive and ear	
Ι	Class Relev differ functi optim progra Multi <b>Optin</b>	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b>	ion Techniques ificance of optimizengineering, Introductor bles/constraints, Clues, Formulation of simplex algorithm, ity and inequality cusses and Structur	zation, Various op duction to optimiz lassification of opti of Various optimiz , Nonlinear progr constraints. al Components	zation theory-object mization problems zation problems, lir amming by Lagra	in ive and lear nge	7
	Class Relev differ functi optim progra Multi <b>Optir</b> Minir	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cr	ion Techniques ificance of optimizengineering, Introduction bles/constraints, Clues, Formulation of simplex algorithm, ity and inequality clusses and Structur riteria, fully stress	zation, Various op duction to optimiz lassification of opti of Various optimiz , Nonlinear progr constraints. al Components ed design and dis	zation theory-object imization problems zation problems, lin amming by Lagra splacement constrai	a in tive and lear nge nts,	
Ι	Class Relev differ functi optim progra Multi <b>Optir</b> Minir optim	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cr ization of truss,	ion Techniques ificance of optimizengineering, Introduction bles/constraints, Clues, Formulation of simplex algorithm, ity and inequality clusses and Structur riteria, fully stress	zation, Various op duction to optimiz lassification of opti of Various optimiz , Nonlinear progr constraints. al Components ed design and dis ctures, optimization	zation theory-objec imization problems zation problems, lir amming by Lagra splacement constrain of beams and colun	a in tive and lear nge nts,	7
I	Class Relev differ functi optim progra Multi <b>Optir</b> Minir optim <b>Cons</b>	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cr ization of truss, trained Optimi	ion Techniques ificance of optimiz engineering, Introd bles/constraints, Cl ues, Formulation of simplex algorithm, ity and inequality c usses and Structur riteria, fully stress cable and arch struct ization and Multi-	zation, Various op duction to optimiz lassification of opti of Various optimiz , Nonlinear progr constraints. al Components ed design and dis ctures, optimization Objective Optimiz	zation theory-objec imization problems zation problems, lir amming by Lagra splacement constrain of beams and colun	in ive and lear nge nts, ins.	7 6
Ι	Class Relev differ functi optim progra Multi <b>Optir</b> Minir optim <b>Cons</b>	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cr ization of truss, trained Optimi nality criterion	ion Techniques ificance of optimizengineering, Intro- bles/constraints, Clues, Formulation of simplex algorithm, ity and inequality clusses and Structur iteria, fully stress cable and arch struct ization and Multi- methods. Seque	zation, Various op duction to optimiz lassification of opti of Various optimiz , Nonlinear progr constraints. <b>al Components</b> ed design and dis ctures, optimization <b>Objective Optimiz</b> ential Quadratic	zation theory-object imization problems zation problems, lin amming by Lagra splacement constraint of beams and colum zation	i in ive and lear nge nts, ins.	7
I II	Class Relev differ functi optim progra Multi Optin Minir optim Consi Optin Metho optim	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cr ization of truss, <b>trained Optimi</b> nality criterion ods, Sensitivit izations, Multi-	ion Techniques ificance of optimizengineering, Introductor bles/constraints, Clues, Formulation of simplex algorithm, ity and inequality constraints, fully stress cable and arch structur ization and Multi- methods. Seque y of optimum	zation, Various op duction to optimiz lassification of opti of Various optimiz of Various optimiz onstraints. <b>al Components</b> ed design and dis ctures, optimization <b>Objective Optimiz</b> ential Quadratic solution, Aspect tion techniques.	zation theory-object imization problems zation problems, lin amming by Lagra splacement constrain of beams and colum zation Programming, Pen	i in ive and lear nge nts, ins.	7 6
I II	Class Relev differ functi optim progra Multi Optim Optim Cons Optim Methe optim	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cr ization of truss, <b>trained Optimi</b> nality criterion ods, Sensitiviti izations, Multi- <b>nization by Sto</b>	ion Techniques ificance of optimiz engineering, Introd bles/constraints, Cl ues, Formulation of simplex algorithm, ity and inequality cl usses and Structur riteria, fully stress cable and arch struct ization and Multi- methods. Seque y of optimum objective optimizat ochastic and Heuri	zation, Various op duction to optimiz lassification of opti of Various optimiz on Nonlinear progression constraints. <b>al Components</b> ed design and dis ctures, optimization <b>Objective Optimiz</b> ential Quadratic solution, Aspect tion techniques. <b>istic Algorithms I</b>	zation theory-object mization problems zation problems, lin amming by Lagra splacement constrain of beams and colum zation Programming, Pens s of Multi-object	a in ive and lear nge nts, ms. alty ive	7 6
I II III	Class Relev differ functi optim progra Multi Optim Optim Cons Optim Metho optim Partic	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cr ization of truss, trained Optimi nality criterion ods, Sensitivit izations, Multi- nization by Sto le Swarm Op	ion Techniques ificance of optimiz engineering, Intro- bles/constraints, Cl- ues, Formulation of simplex algorithm, ity and inequality cl- usses and Structur riteria, fully stress cable and arch struc- ization and Multi- methods. Seque y of optimum objective optimization chastic and Heuri otimization, Intro-	zation, Various op duction to optimiz lassification of opti of Various optimiz of Various optimiz onstraints. <b>al Components</b> ed design and dis ctures, optimization <b>Objective Optimiz</b> ential Quadratic solution, Aspect tion techniques. <b>istic Algorithms I</b> duction, Computat	zation theory-object imization problems zation problems, lin amming by Lagra splacement constrain of beams and colum zation Programming, Pen- s of Multi-object ional Implementat	a in ive and lear nge nts, ms. alty ive	7 6 7
I	Class Relev differ functi optim progra Multi Optin Minir optim Cons Optin Metho optim Partic Soluti	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cr ization of truss, trained Optimi nality criterion ods, Sensitivit izations, Multi- nization by Sto le Swarm Option on of the Constr	ion Techniques ificance of optimiz engineering, Introd bles/constraints, Cl ues, Formulation of simplex algorithm, ity and inequality cl usses and Structur riteria, fully stress cable and arch structur iteria, fully stress cable and the structur iteria, fully structur iteria, full	zation, Various op duction to optimiz lassification of opti- of Various optimiz onstraints. <b>al Components</b> ed design and dis ctures, optimization <b>Objective Optimiz</b> ential Quadratic solution, Aspect tion techniques. <b>istic Algorithms I</b> fuction, Computat n Problem, Ant Colo	zation theory-object imization problems zation problems, lin amming by Lagra splacement constrain of beams and colum zation Programming, Pens s of Multi-object ional Implementation, Ba	a in ive and lear nge nts, ms. alty ive on, asic	7
I II III	Class Relev differ functi optim progra Multi Optim Optim Metho optim Partic Soluti Conce	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight er ization of truss, <b>trained Optimi</b> nality criterion ods, Sensitiviti izations, Multi- <b>nization by Sto</b> le Swarm Op- tion of the Constri- ept, Ant Search	ion Techniques ificance of optimiz engineering, Introd bles/constraints, Cl ues, Formulation of simplex algorithm, ity and inequality c isses and Structur riteria, fully stress cable and arch structur ization and Multi- methods. Seque y of optimization objective optimization chastic and Heuri otimization, Introd rained Optimization hing Behavior, Pa	zation, Various op duction to optimiz lassification of opti of Various optimiz of Various optimiz onstraints. <b>al Components</b> ed design and dis ctures, optimization <b>Objective Optimiz</b> ential Quadratic solution, Aspect tion techniques. <b>istic Algorithms I</b> duction, Computat of Problem, Ant Color th Retracing and	zation theory-object imization problems zation problems, lin amming by Lagra splacement constrain of beams and colum zation Programming, Pen- s of Multi-object ional Implementat	a in ive and lear nge nts, ms. alty ive on, asic	7 6 7
I II III	Class Relev differ functi optim progra Multi Optim Optim Metha optim Partic Soluti Conce Phero	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cri ization of truss, <b>trained Optimi</b> nality criterion ods, Sensitiviti izations, Multi- <b>nization by Sto</b> le Swarm Option of the Constri- ept, Ant Search mone Trail Eva	ion Techniques ificance of optimiz engineering, Introd bles/constraints, Cl ues, Formulation of simplex algorithm, ity and inequality cl usses and Structur riteria, fully stress cable and arch structur iteria, fully stress cable and the structur iteria, fully structur iteria	zation, Various op duction to optimiz lassification of opti of Various optimiz of Various optimiz onstraints. <b>al Components</b> ed design and dis ctures, optimization <b>Objective Optimiz</b> ential Quadratic solution, Aspect tion techniques. <b>istic Algorithms I</b> fuction, Computat n Problem, Ant Colo th Retracing and n. Examples.	zation theory-object imization problems zation problems, lin amming by Lagra splacement constrain of beams and colum zation Programming, Pen- s of Multi-object ional Implementation pheromone, Updat	a in ive and lear nge nts, ms. alty ive on, asic	7 6 7
I II III	Class Relev differ functi optim progra Multi Optim Minir optim Cons Optim Methe optim Partic Soluti Conce Phero	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cr ization of truss, trained Optimi hality criterion ods, Sensitiviti izations, Multi- nization by Sto le Swarm Option of the Constr ept, Ant Search mone Trail Eva <b>nization by Sto</b>	ion Techniques ificance of optimiz engineering, Intro- bles/constraints, Cl- ues, Formulation of simplex algorithm, ity and inequality cl- usses and Structur riteria, fully stress cable and arch struc- ization and Multi- methods. Seque y of optimum objective optimization chastic and Heuri otimization, Intro- rained Optimization hing Behavior, Pa poration, Algorithr ochastic and Heuri	zation, Various op duction to optimiz lassification of opti- of Various optimiz of Various optimiz onstraints. <b>al Components</b> ed design and dis ctures, optimization <b>Objective Optimiz</b> ential Quadratic solution, Aspect tion techniques. <b>istic Algorithms I</b> duction, Computat n Problem, Ant Colo th Retracing and n. Examples. <b>istic Algorithms II</b>	zation theory-object imization problems zation problems, lin amming by Lagra splacement constrain of beams and colum zation Programming, Pen- s of Multi-object ional Implementation ony Optimization, Ba Pheromone, Updat	a in ive and lear nge nts, ms. alty ive on, asic ng,	7 6 7
I II III IV	Class Relev differ functi optim progra Multi Optin Minir optim Cons Optin Metho optim Partic Soluti Conce Phero	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cri ization of truss, trained Optimi nality criterion ods, Sensitiviti izations, Multi- nization by Sto le Swarm Option of the Constri- ept, Ant Search mone Trail Eva nization by Sto ated annealing,	ion Techniques ificance of optimiz engineering, Introd bles/constraints, Cl ues, Formulation of simplex algorithm, ity and inequality cl usses and Structur iteria, fully stress cable and arch structur objective optimization potimization, Introd rained Optimization hing Behavior, Pa poration, Algorithr Procedure, Algorith	zation, Various op duction to optimiz lassification of opti- of Various optimiz on Various optimiz on straints. <b>al Components</b> ed design and dis ctures, optimization <b>Objective Optimiz</b> ential Quadratic solution, Aspect tion techniques. <b>istic Algorithms I</b> duction, Computat n Problem, Ant Colo th Retracing and n. Examples. <b>istic Algorithms II</b> thm, Features of the	zation theory-object imization problems zation problems, lin amming by Lagra splacement constrain of beams and colum zation Programming, Pen s of Multi-object ional Implementation ony Optimization, Ba Pheromone, Updation	a in ive and lear nge nts, ms. alty ive on, asic ng, ion	7 6 7 6
I	Class Relev differ functi optim progra Multi Optin Minir optim Cons Optin Metho optim Partic Soluti Conce Phero Optin Simul soluti	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight en ization of truss, <b>trained Optimi</b> nality criterion ods, Sensitiviti izations, Multi- <b>nization by Sto</b> le Swarm Option of the Constri- ept, Ant Search mone Trail Eva <b>nization by Sto</b> lated annealing, ons. Response	ion Techniques ificance of optimiz engineering, Introd bles/constraints, Cl ues, Formulation of simplex algorithm, ity and inequality cl usses and Structur riteria, fully stress cable and arch structur riteria, fully stress cable and arch structur ization and Multi- methods. Seque y of optimum objective optimization chastic and Heuri poration, Algorithr pchastic and Heuri Procedure, Algorit surface methodol	zation, Various op duction to optimiz lassification of opti- of Various optimiz on Nonlinear progre- constraints. <b>al Components</b> ed design and dis- ctures, optimization <b>Objective Optimiz</b> ential Quadratic solution, Aspect- tion techniques. <b>istic Algorithms I</b> fuction, Computat n Problem, Ant Colo th Retracing and n. Examples. <b>istic Algorithms II</b> thm, Features of the ogy, Three-level	zation theory-object imization problems zation problems, lin amming by Lagra splacement constrain of beams and colum zation Programming, Pents of Multi-object ional Implementation ony Optimization, Ba Pheromone, Updation factorial design, Ba	in in ive and lear nge nts, ins. alty ive son, asic ng, ion ox-	7 6 7
I II III IV	Class Relev differ functi optim progra Multi Optin Minir optim Cons Optin Metho optim Partic Soluti Conce Phero Optin Simul soluti	ance and Signi ent fields of o on/design varia ization techniq amming and s plier with equal <b>nization of Tru</b> num weight cri ization of truss, <b>trained Optimi</b> nality criterion ods, Sensitiviti izations, Multi- <b>nization by Sto</b> le Swarm Option of the Constri- con of the Constri- ept, Ant Search mone Trail Eva <b>nization by Sto</b> lated annealing, ons. Response cen design, Cen	ion Techniques ificance of optimiz engineering, Introd bles/constraints, Cl ues, Formulation of simplex algorithm, ity and inequality cl usses and Structur riteria, fully stress cable and arch structur riteria, fully stress cable and arch structur ization and Multi- methods. Seque y of optimum objective optimization chastic and Heuri poration, Algorithr pchastic and Heuri Procedure, Algorit surface methodol	zation, Various op duction to optimiz lassification of opti- of Various optimiz on Nonlinear progre- constraints. <b>al Components</b> ed design and dis- ctures, optimization <b>Objective Optimiz</b> ential Quadratic solution, Aspect- tion techniques. <b>istic Algorithms I</b> fuction, Computat n Problem, Ant Colo th Retracing and n. Examples. <b>istic Algorithms II</b> thm, Features of the ogy, Three-level	zation theory-object imization problems zation problems, lin amming by Lagra splacement constrain of beams and colum zation Programming, Pen s of Multi-object ional Implementation ony Optimization, Ba Pheromone, Updation	in in ive and lear nge nts, ins. alty ive son, asic ng, ion ox-	7 6 7 6

	Genetic algorithm, Representation of design variables, Representation of Objective7Function and Constraints, Genetic Operators, Algorithm flowchart, Design7examples. Fuzzy Set Theory, Optimization of Fuzzy Systems, Computational7Procedure, Numerical Example, Neural-Network-Based Optimization. Taguchi7Method.7					
	Textbooks					
1	Singiresu S. Rao, "Engineering Optimization-Theory and Practice", New Age International Publishers, 2013, 4th Edition.					
2	Uri Kirsh, "Optimum Structural Design", McGraw Hill, 1988.					
3	R. Fletcher, "Practical Optimization", John Wiley & Sons, New York, 2nd Edition, 1987.					
	References					
1	Edgar, Himmelblau and Lasdon, "Optimization of Chemical ProcessesMc", Graw Hill International Edition, 2nd Edition, 2001.					
2	M.S. Bazaraa, H.D. Sherali and C. Shetty, "Non-Linear Programming-Theory and Algorithms", John Wiley and Sons, New York, 1993.					
3	Richard Vinter, "Optimal Control", Springer, 2010.					
4	Du, Ke-Lin, Swamy, M. N. S., "Search and Optimization by Metaheuristics", Birkhäuser Basel Springer International, 1st Edition, 2016					
1	Useful Links					
1	https://nptel.ac.in/courses/105/108/105108127/					
2	https://nptel.ac.in/courses/103/103/103103164/					

CO-PO Mapping							
	Programme Outcomes (PO)						
	1	2	3	4	5	6	
CO1	2					2	
CO2			2	3		1	
CO3	1			3		2	

#### Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

AY 2022-23           Course Information           Programme         M. Tech. Semester II           Course Cole           GST Course Cole           GST Course Cole           GST Course Cole           Course Objectives           Course Objectives           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to,           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of formed sections and composite beams.           Faulating           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to,           COURSE Concepts of design of steel structures to multistorey buildings and portal frames.         <	AY 2022-23           Course Information           Programme         M. Tech. Civil (Structural Engineering)           Class, Semester         First Year M. Tech, Semester II           Course Code         GSTS36           Course Name         Flective 3 - Advanced Design of Steel Structures           Design of Steel Structures           Design of Steel Structures           Course Objectives           Total Tatorial         Course Objectives           Total frames.           Course Objectives           To impart the knowledge of cold formed sections and composite beams.           3         To impart the knowledge of cold formed sections and composite beams.           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to.           COU         Evaluate cold formed sections and composite beams.           Foot Bridges           Analysis and design of footbridges, Deck of through type bridges, Flooring system.           Course Objectives           Analysis and design of footbridges, Deck of through type bridges, Flooring system.		Walc	hand College of (Government Aided Au			
Course Information           Programme         M. Tech. Civil (Structural Engineering)         Class, Semester         First Year M. Tech., Semester II           Course Code         651536         Course Name         Elective 3 - Advanced Design of Steel Structures           Desired Requisites:         Design of Steel Structures         Image: Structures         Total           Teaching Scheme         Examination Scheme (Marks)         Examination Scheme (Marks)           Lecture         3 Hr/week         MSE         ISE         FSE         Total           Tutorial          30         20         50         100           Portal frames.         Course Objectives         To illustrate plastic analysis and design of steel structures such as bridges, multistory buildings and portal frames.         Apply ing frames.           COURCe Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,         COURCenter CO         Apply ing frames.           CO3         Design steel frames considering plastic analysis.         Creating         To allustrate cold formed sections and composite beams.         Evaluating           Od         Apply basic concepts of design of fortbridges, Deck of through type bridges, Flooring resystem, Bracing system.         Creating         Analysis and design of structural steel and concrete, Composite beams, Shear connectors, Composite decks usin	Course Information           Programme         M. Tech. Civil (Structural Engineering)         Class. Semester         First Year M. Tech. Semester II           Course Code         65T536         Course Name         Elective 3 - Advanced Design of Steel Structures           Desired Requisites:         Design of Steel Structures         Image: Structure 3         Hr/week         MSE         ISE         ESE         Total           Lecture         3 Hr/week         MSE         ISE         ESE         Total           Tutorial          30         20         50         100           To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.						
Programme         M. Tech. Civil (Structural Engineering)           Class, Semester         First Year M. Tech., Semester II           Course Code         6ST536           Course Code         1           Desired Requisites:         Design of Steel Structures           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hr/weck           To inpart the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.           To impart the knowledge of cold formed sections and composite beams.           3         To impart the knowledge of steel structures to multistorey buildings and portal frames.           COI         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.           COI         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.           COI         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.           COI         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.           COI         Apply basic concepts of footbridges, Deck of through type bridges, Flooring system.           COI         Foot Bridges           Analysis and design of forthridges, Place of an concrete, Composite beams.           I         Analysis, Plastic bending of beam, Plastic hinge, Shape factor of cr	Programme         M. Tech. Civil (Structural Engineering)           Class, Semester         First Year M. Tech., Semester II           Course Code         6ST356           Course Code         1           Desired Requisites:         Design of Steel Structures           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hr/week           Tutorial            30         20           50         100           Course Objectives            To impart the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.           2         To impart the knowledge of steel structures to multistorey buildings and portal frames.           COURSEQUATE cold formed sections and composite beams.            3         To illustrate plastic analysis and design of steel structures to multistorey buildings and portal frames.           COU         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.						
Class, Semester         First Year M. Tech., Semester II           Course Code         6ST536           Course Name         Elective 3 - Advanced Design of Steel Structures           Desired Requisites:         Design of Steel Structures           Tatorial	Class, Semester         First Year M. Tech., Semester II           Course Code         68T536           Course Name         Elective 3 - Advanced Design of Steel Structures           Desired Requisites:         Design of Steel Structures           Tatorial	Program	nme	1		ng)	
Course Code         65T336           Course Name         Elective 3 - Advanced Design of Steel Structures           Desired Requisites:         Design of Steel Structures           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hr/week         MSE         ISE         ESE         Total           Totorial          30         20         50         100           Course Objectives           To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.         To inpart the knowledge of cold formed sections and composite beams.         3         To illustrate plastic analysis and design of steel frames.         Evaluation frames.           COURS Ourse Outcomes (CO) with Bloom's Taxonomy Level         Atthe end of the course, the students will be able to,         Evaluating frames.         Evaluating frames.           COI         Apply basic concepts of design of footbridges, Deck of through type bridges, Flooring system, Bracing system.         Foot Bridges         Hours           Module         Module Contents         Hours         Foot Bridges         7           III         Cold Formed Sections         Stiffened and unstiffened desertions, Composite section consisting of structural steel and concrete, Composite section consisting of structural steel and concrete, Composite columns, IS code provisions.         7 <tr< td=""><td>Course Code         65T336           Course Name         Elective 3 - Advanced Design of Steel Structures           Desired Requisites:         Design of Steel Structures           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hr/week         MSE         ISE         ESE         Total           International        </td><td></td><td></td><td>· · · · ·</td><td></td><td></td><td></td></tr<>	Course Code         65T336           Course Name         Elective 3 - Advanced Design of Steel Structures           Desired Requisites:         Design of Steel Structures           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hr/week         MSE         ISE         ESE         Total           International			· · · · ·			
Course Name         Elective 3 - Advanced Design of Steel Structures           Design of Steel Structures           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hr/week         MSE         ISE         ESE         Total           Tutorial          30         20         50         100           Course Objectives          30         20         50         100           To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.	Course Name         Elective 3 - Advanced Design of Steel Structures           Design of Steel Structures           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hr/week         MSE         ISE         ESE         Total           Tutorial          30         20         50         100         Credits: 3           Course Objectives           To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.           2         To impart the knowledge of cold formed sections and composite beams.         3         To illustrate plastic analysis and design of steel frames.         Course Outcomes (CO) with Bloon's Taxonomy Level           At the end of the course, the students will be able to,         COI         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         Creating           CO3         Design steel frames considering plastic analysis.         Creating         Creating           Module         Module Contents         Hours         Foot Bridges         Hours           1         Analysis and design of footbridges, Deck of through type bridges, Flooring system.         7         Cold formed Sections           10         Cold Formed Sections         Introduction to Plastic Analysis         Feast connectors, Composite gectores, Composite decks				Semester II		
Design of Steel Structures           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hr/week         MSE         ISE         ESE         Total           Tutorial          30         20         50         100           Credits: 3          30         20         50         100           To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.         7         7         7         7           2         To inpart the knowledge of cold formed sections and composite beams.         3         7         7         1           3         To illustrate plastic analysis and design of steel structures to multistorey buildings and portal frames.         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         Applying           CO2         Evaluate cold formed sections and composite beams.         Evaluating         Creating           CO3         Design steel frames considering plastic analysis.         Creating         7           Co4         Module Contents         Hours         4           GO4         Foot Bridges         Analysis and design of footbridges, Deck of through type bridges, Flooring 7         5           System, Bracing system.         Codl Formed Sections	Design of Steel Structures           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hr/weck         MSE         ISE         ESE         Total           Tutorial          30         20         50         100           Credits: 3          30         20         50         100           To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.         7         7         7           2         To input the knowledge of cold formed sections and composite beams.         3         7         7           3         To illustrate plastic analysis and design of steel frames.         Evaluation         Applying           COU         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         Evaluating           CO2         Evaluate cold formed sections and composite beams.         Evaluating           CO3         Design steel frames considering plastic analysis.         Creating           Module         Module Contents         Hours           Foot Bridges         Analysis and design of footbridges, Deck of through type bridges, Flooring system.         7           1         Analysis and design of structural steel and concrete, Composite beams, foe sections, Roof sheeting, Purlins, Flexure and				ed Design of Ste	el Structures	
Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hr/week         MSE         ISE         ESE         Total           Tutorial	Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hr/week         MSE         ISE         ESE         Total           Tutorial						
Lecture         3 Hr/weck         MSE         ISE         ESE         Total           Tutorial          30         20         50         100           Credits: 3          30         20         50         100           To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.	Lecture         3 Hr/weck         MSE         ISE         ESE         Total           Tutorial          30         20         50         100           Credits: 3          30         20         50         100           To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.	Desireu	requisites.	Design of Steel Stud			
Lecture         3 Hr/weck         MSE         ISE         ESE         Total           Tutorial          30         20         50         100           Credits: 3          30         20         50         100           To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.	Lecture         3 Hr/weck         MSE         ISE         ESE         Total           Tutorial          30         20         50         100           Credits: 3          30         20         50         100           To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.	Т	eaching Scheme		Examination S	cheme (Marks)	
Tutorial          30         20         50         100           Credits: 3           Course Objectives           1         portal frames.         7           2         To impart the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.         7           3         To illustrate plastic analysis and design of steel structures to multistorey buildings and portal frames.         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         Evaluating           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to,         COI         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         Evaluating           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to,         COI         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         Evaluating           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to,           COI           Course Outcomes (CO) with Bloom's Taxonomy Level           At analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system, Bracing sys	Tutorial        30       20       50       100         Credits: 3         Course Objectives         To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,         COurse Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,         CO1       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Evaluating         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,         CO2       Evaluatic cold formed sections and composite beams.       Evaluating         Gourse Outcomes       Hours         Hourse       Hours         Foot Bridges         I       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing systems, Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Roof sheeting, Purins, Flexure and counme behavior, IS c					· · · · · · · · · · · · · · · · · · ·	Total
Credits: 3           Course Objectives           1         To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.           2         To impart the knowledge of cold formed sections and composite beams.           3         To illustrate plastic analysis and design of steel frames.           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to,           CO1         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.           CO2         Evaluate cold formed sections and composite beams.           CO3         Design steel frames considering plastic analysis.           Module         Module Contents           Hours         Foot Bridges           1         Analysis and design of footbridges, Deck of through type bridges, Flooring system.           Cold Formed Sections         Cold Formed Sections           III         Schear connectors, Composite decks using light gauge steel and concrete, Composite beams, Bacer connectors, Composite decks using light gauge steel and concrete, Composite beams, Bacer connectors, Composite decks using light gauge steel and concrete, Composite analysis and design of proped cantilever, fixed beam and continuous beams.           IV         Introduction to Plastic Analysis           IWuitistory Buildings         Multistory Buildings	Credits: 3           Course Objectives           1         To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.           2         To impart the knowledge of cold formed sections and composite beams.           3         To illustrate plastic analysis and design of steel frames.           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to,           CO1         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.           CO2         Evaluate cold formed sections and composite beams.           CO3         Design steel frames considering plastic analysis.           Co1         Apply basic concepts of design of footbridges, Deck of through type bridges, Flooring system.           Co3         Design steel frames considering plastic analysis.           II         Scientors, Composite sections, Various profiles, Stiffened and unstiffened sections, Narious profiles, Stiffened and unstiffened sections, Scientos, Scientos, Stear connectors, Composite decks using light gauge steel and concrete, Composite beams, Searconnectors, Composite decks using light gauge steel and concrete, Composite beams, Searconnectors, Composite decks using light gauge steel and concrete, Composite analysis and design of propeid cantilever, fixed beam and continuous beams.           IV         Introduction to Plastic Analysis           IV         Introduction to Plastic Analysis, P						
Course Objectives           1         To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.           2         To impart the knowledge of cold formed sections and composite beams.         3           3         To illustrate plastic analysis and design of steel frames.         Applying           COUT         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         Applying           COO         Evaluatic cold formed sections and composite beams.         Evaluating           CO3         Design steel frames considering plastic analysis.         Evaluating           Module         Module Contents         Hours           Foot Bridges         Hours         Foot Bridges           I         Analysis and design of footbridges, Deck of through type bridges, Flooring 7 system, Bracing system.         7           Cold Formed Sections         Cold Formed Sections         7           II         Cold Formed Sections         7           III         Cold Formed Sections         7           Composite section consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.         7           INTroduction to Plastic Analysis         Introduction to Plastic Analysis         6	Course Objectives           1         To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.           2         To impart the knowledge of cold formed sections and composite beams.         3           3         To illustrate plastic analysis and design of steel frames.         Applying           COUT         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         Applying           CO2         Evaluatic cold formed sections and composite beams.         Evaluatic cold formed sections and composite beams.         Evaluatic cold formed sections and composite beams.         Creating           Module         Module Contents         Hours         Foot Bridges         I           I         Analysis and design of footbridges, Deck of through type bridges, Flooring system.         7         Cold Formed Sections         6           II         Cold Formed Sections         Course Composite Sections, Various profiles, Stiffened and unstiffened sections, Scote forms, Scote provisions.         7           III         Cold Formed Sections         7         2           Composite section consisting of structural steel and concrete, Composite beams, Scale arouncetors, Composite decks using light gauge steel and concrete, Composite sections Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.         7           INTroduction to Plastic Analysis	Tutoria	•	50			100
1       To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.         2       To impart the knowledge of cold formed sections and composite beams.         3       To illustrate plastic analysis and design of steel frames.         Course Outcomes (CO) with Bloon's Taxonomy Level         At the end of the course, the students will be able to,       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         CO3       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Evaluate cold formed sections and composite beams.       Creating         Module       Module Contents       Hours         Foot Bridges       Analysis and design of footbridges, Deck of through type bridges, Flooring 7 system, Bracing system.       7         II       Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened 6 sections. Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       7         III       Cold formed is propoints dealts on analysis, Plastic analysis, Plastic analysis and design of propode cantilever, fixed beam and continuous beams.       7         IV       Introduction to Plastic Analysis       6       6         Nutristory buildings, Lateral load resisting systems, Types of bracing systems, Shear connectors, Composite deam	1       To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.         2       To impart the knowledge of cold formed sections and composite beams.         3       To illustrate plastic analysis and design of steel frames.         Course Outcomes (CO) with Blom's Taxonomy Level         At the end of the course, the students will be able to.       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         CO3       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         Foot Bridges       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         II       Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections (Composite Sections       6         III       Cold formed is purlins, Flexure and column behavior, IS code provisions.       7         Composite section consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         Introduction to Plastic Analysis       Introduction to Plastic Analysis, Plastic bending of beam, Plastic hinge, S					11.5. 0	
1       To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.         2       To impart the knowledge of cold formed sections and composite beams.         3       To illustrate plastic analysis and design of steel frames.         Course Outcomes (CO) with Bloon's Taxonomy Level         At the end of the course, the students will be able to,       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         CO3       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Evaluate cold formed sections and composite beams.       Creating         Module       Module Contents       Hours         Foot Bridges       Analysis and design of footbridges, Deck of through type bridges, Flooring 7 system, Bracing system.       7         II       Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened 6 sections. Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       7         III       Cold formed is propoints dealts on analysis, Plastic analysis, Plastic analysis and design of propode cantilever, fixed beam and continuous beams.       7         IV       Introduction to Plastic Analysis       6       6         Nutristory buildings, Lateral load resisting systems, Types of bracing systems, Shear connectors, Composite deam	1       To provide the knowledge of design of steel structures such as bridges, multistory buildings and portal frames.         2       To impart the knowledge of cold formed sections and composite beams.         3       To illustrate plastic analysis and design of steel frames.         Course Outcomes (CO) with Blom's Taxonomy Level         At the end of the course, the students will be able to.       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         CO3       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         Foot Bridges       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         II       Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections (Composite Sections       6         III       Cold formed is purlins, Flexure and column behavior, IS code provisions.       7         Composite section consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         Introduction to Plastic Analysis       Introduction to Plastic Analysis, Plastic bending of beam, Plastic hinge, S			Course Ob	viectives		
1       portal frames.         2       To impart the knowledge of cold formed sections and composite beams.         3       To ilustrate plastic analysis and design of steel frames.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Applying         CO2       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         Foot Bridges       I       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         II       Cold Formed Sections       Courposite section consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         III       Composite section consisting of structural steel and concrete, Composite columns, IS code provisions.       6         Introduction to Plastic Analysis, Plastic bending of beam, Plastic hinge, Shape factor of cross section, Static and kinematic methods of analysis, Plastic analysis and design of propped cantilever, fixed beam and continuous beams.       7         VI       Multistorey Buildings       7       Shear conleast	Image: second state in the image of the second section is and composite beams.         Image: second se	r	To provide the knowledge			bridges multistory b	uildings and
2       To impart the knowledge of cold formed sections and composite beams.         3       To illustrate plastic analysis and design of steel frames.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Course Outcomes (CO) with Bloom's Taxonomy Level         CODE Evaluate cold formed sections and composite beams.       Evaluating         Concepts of design of steel structures to multistorey buildings and portal frames.         Course Outcomes (CO) with Bloom's Taxonomy Level         Module       Module Contents       Hours         Module Contents       Hours         Introduction considering plastic analysis.         Cold formed Sections         III       Cold formed Sections       Cold formed Sections       7         Composite Sections consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite section consisting of propeid cantilever, fixed beam and continuous beams.       7	2       To impart the knowledge of cold formed sections and composite beams.         3       To illustrate plastic analysis and design of steel frames.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Applying         C01       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Applying         C03       Design steel frames considering plastic analysis.       Evaluating         C04       Foot Bridges       Hours         Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         Cold Formed Sections       Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened 6 sections, Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       7         III       Cold formed columns, IS code provisions.       7         Composite Sections       7       6         IIII       Cold formed contents, Staff analysis, Plastic bending of beam, Plastic hinge, Shape factor of cross section, Static and kinematic methods of analysis, Plastic analysis and design of propped cantilever, fixed beam and continuous beams.       7         V       Multistorey Buildings       6       6         Nultistory Buildings, Lateral load resisting systems, Types o	1	nortal frames	e of design of steel su	detailes such as	orages, mutistory o	unungs and
To illustrate plastic analysis and design of steel frames.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,       COI         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Applying         COI       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         Foot Bridges       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         Cold Formed Sections       Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened 6 sections, Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       7         III       Cold formed Sections       7       7         III       Cold formed section consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite sections, Static analysis, Plastic bending of beam, Plastic hinge, Shape factor of cross section, Static and kinematic methods of analysis, Plastic analysis and design of propped cantilever, fixed beam and continuous beams.       7         Wultistory buildings.       Multistory buildings.       7       8         V       Multistory buildings, Lateral load resisting systems, Types	To illustrate plastic analysis and design of steel frames.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,       COI         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Applying         COI       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         Foot Bridges       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         Cold Formed Sections       Cold Formed Sections       7         III       Cold formed sections, Partins, Flexure and column behavior, IS code provisions.       7         Shear connectors, Composite decks using light gauge steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       6         Introduction to Plastic Analysis       Introduction to Plastic Analysis of multistory, multi-bay frames.       7         V       Multistory Buildings       9       9       9       6         Introduction to Plastic Analysis of multistory, multi-bay frames.       7       7         IV       Introduction to Plastic Analysis of multistory, multi-bay f	1		of cold formed section	ns and composi	te heams	
Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to,           CO1         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         Applying           CO2         Evaluate cold formed sections and composite beams.         Evaluating           CO3         Design steel frames considering plastic analysis.         Creating           Module         Module Contents         Hours           Foot Bridges         Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.         7           Cold Formed Sections         Cold Formed Sections         7           System, Bracing system.         7         7           Cold Formed Sections         Cold Formed Sections         7           Cold Formed Sections         Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Composite sections, Composite decks using light gauge steel and concrete, Composite sections, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.         7           III         Introduction to Plastic Analysis         7           Keator of cross section, Static and kinematic methods of analysis, Plastic analysis and design of propped cantilever, fixed beam and continuous beams.         7           V         Multistory buildings, Lateral load resisting systems, Types of bracing systems, Sh	Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to,         Apply basic concepts of design of steel structures to multistorey buildings and portal frames.         Applying           CO2         Evaluate cold formed sections and composite beams.         Evaluating           CO3         Design steel frames considering plastic analysis.         Creating           Module         Module Contents         Hours           Foot Bridges         Hours         7           System, Bracing system.         7         7           Cold Formed Sections         Cold Formed Sections         7           III         Cold Formed Sections         7           Cold Formed Sections         7         7           III         Cold Formed Sections         7           Composite section         Consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.         7           III         Introduction to Plastic Analysis         1         6           IV         Introduction to Plastic Analysis, Plastic bending of beam, Plastic hinge, Shape factor of cross section, Static and kinematic methods of analysis, Plastic analysis and design of propped cantilever, fixed beam and continuous beams.         7           V         Multistory buildings						
At the end of the course, the students will be able to,       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Applying         CO2       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         Foot Bridges       I       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         I       Cold Formed Sections       Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       6         III       Composite section consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         IV       Introduction to Plastic Analysis       1       1         IV       Multistory Buildings       7         V       Multistory buildings, Lateral load resisting systems, Types of bracing system, Shear wall, Inelastic analysis of multistory, multi-bay frames.       7         VI       Analysis of low rise rectangular and gable portal frames, Various basic mechanisms, Combination of mechanisms, Limit state design of frames, Haunches and column bases.       6         I       Vazirani V. N., and Ratwani M. M., "Stee	At the end of the course, the students will be able to,       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Applying         CO2       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         Foot Bridges       I       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         I       Cold Formed Sections       Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       6         III       Composite section consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         IV       Introduction to Plastic Analysis       1       1         IV       Multistory buildings       7         V       Multistory buildings, Lateral load resisting systems, Types of bracing system, Shear wall, Inelastic analysis of multistory, multi-bay frames.       7         VI       Analysis of low rise rectangular and gable portal frames, Various basic mechanisms, Combination of mechanisms, Limit state design of frames, Haunches and column bases.       6         I       Vazirani V. N., and Ratwani M. M., "Stee	0				nomv Level	
CO1       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Applying         CO2       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         Foot Bridges       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         II       Cold Formed Sections       Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Conf sheeting, Purlins, Flexure and column behavior, IS code provisions.       7         III       Conposite Section       Composite decks using light gauge steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         III       Introduction to Plastic Analysis       Plastic bending of beam, Plastic hinge, Shape factor of cross section, Static and kinematic methods of analysis, Plastic analysis and design of propped cantilever, fixed beam and continuous beams.       7         VI       Multistory buildings, Lateral load resisting systems, Types of bracing systems, Shear wall, Inelastic analysis of multistory, multi-bay frames.       6         VI       Low Rise Portal Frames       Analysis of low rise rectangular and gable portal frames, Various basic mechanisms, Combination of mechanisms, Limit state design of frames, Haunehsand column bases.	CO1       Apply basic concepts of design of steel structures to multistorey buildings and portal frames.       Applying         CO2       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         Foot Bridges       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         II       Cold Formed Sections       Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Conf sheeting, Purlins, Flexure and column behavior, IS code provisions.       7         III       Consposite Section       Composite decks using light gauge steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         IIII       Introduction to Plastic Analysis       Plastic bending of beam, Plastic hinge, Shape factor of cross section, Static and kinematic methods of analysis, Plastic analysis and design of propped cantilever, fixed beam and continuous beams.       7         VI       Multistory buildings, Lateral load resisting systems, Types of bracing systems, Shear wall, Inelastic analysis of multistory, multi-bay frames.       6         VI       Low Rise Portal Frames/ Analysis of low rise rectangular and gable portal frames, Various basic mechanisms, Combination of mechanisms, Limit state design of frames, Haunches and column bases.       6 </td <td>At the er</td> <td></td> <td></td> <td>Diooni 5 1 axo</td> <td></td> <td></td>	At the er			Diooni 5 1 axo		
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CO2       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         Foot Bridges       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         II       Cold Formed Sections       Cold Formed Sections       6         Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       7         III       Composite Sections       7       7         Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         INTroduction to Plastic Analysis       Plastic bending of beam, Plastic hinge, Shape factor of ross section, Static and kinematic methods of analysis, Plastic analysis and design of propped cantilever, fixed beam and continuous beams.       7         V       Multistory Buildings       Qualitistory, multi-bay frames.       7         VI       Analysis of low rise rectangular and gable portal frames, Various basic mechanisms, Combination of mechanisms, Limit state design of frames, Haunches and column bases.       6         III       Vazirani V. N., and Ratwani M. M., "Steel Structures and Timber Structures", Khann Publishers, Delhi.       6         III       Vazirani V. N.,	CO2       Evaluate cold formed sections and composite beams.       Evaluating         CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         Foot Bridges       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         II       Cold Formed Sections       Cold Formed Sections       7         Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       7         III       Composite Sections       7       7         Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         INTroduction to Plastic Analysis       Plastic bending of beam, Plastic hinge, Shape factor of ross section, Static and kinematic methods of analysis, Plastic analysis and design of propped cantilever, fixed beam and continuous beams.       7         V       Multistory Buildings       7       Shear vontal canalysis of multistory, multi-bay frames.       6         VI       Analysis of low rise rectangular and gable portal frames, Various basic mechanisms, Combination of mechanisms, Limit state design of frames, Haunches and column bases.       6         III       Vazirani V. N., and Ratwani M. M., "Steel Structures and Timber Structures", Khama Publishers, Delhi.       7			design of steel structu		y bundings and porta	Applying
CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         I       Foot Bridges Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         II       Cold Formed Sections Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       6         III       Composite Sections Composite section consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         IV       Introduction to Plastic Analysis and design of propped cantilever, fixed beam and continuous beams.       6         V       Multistorey Buildings W       Multistorey Buildings, Lateral load resisting systems, Types of bracing systems, Shear wall, Inelastic analysis of multistory, multi-bay frames.       6         VI       Analysis of low rise rectangular and gable portal frames, Various basic mechanisms, Combination of mechanisms, Limit state design of frames, Haunches and column bases.       6         1       Vazirani V. N., and Ratwani M. M., "Steel Structures and Timber Structures", Khann Publishers, Delhi.       7         2       Ramchandran, "Design of Steel Structures – Vol. If", Standard Book House, Delhi.       7         3       Punmia B. C., Jain A. K. and Jain A. K. "Design of Steel Structures", Firewell Media	CO3       Design steel frames considering plastic analysis.       Creating         Module       Module Contents       Hours         I       Foot Bridges Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         II       Cold Formed Sections Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       6         III       Composite Sections Composite section consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         IV       Introduction to Plastic Analysis and design of propped cantilever, fixed beam and continuous beams.       6         V       Multistorey Buildings W       Multistorey Buildings, Lateral load resisting systems, Types of bracing systems, Shear wall, Inelastic analysis of multistory, multi-bay frames.       6         VI       Analysis of low rise rectangular and gable portal frames, Various basic mechanisms, Combination of mechanisms, Limit state design of frames, Haunches and column bases.       6         1       Vazirani V. N., and Ratwani M. M., "Steel Structures and Timber Structures", Khann Publishers, Delhi.       6         2       Ramchandran, "Design of Steel Structures – Vol. II", Standard Book House, Delhi.       7         3       Punmia B. C., Jain A. K. and Jain A. K. "Design of Steel Structures", Firewell Media			ctions and composite	heams		Evaluating
Module       Module Contents       Hours         I       Foot Bridges       7         I       Analysis and design of footbridges, Deck of through type bridges, Flooring system, Bracing system.       7         II       Cold Formed Sections       7         Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       6         Composite Sections       Composite section consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         IV       Introduction to Plastic Analysis       Plastic hinge, Shape factor of cross section, Static and kinematic methods of analysis, Plastic analysis and design of propped cantilever, fixed beam and continuous beams.       6         W       Multistorey Buildings       8         VI       Analysis of low rise rectangular and gable portal frames, Various basic mechanisms, Combination of mechanisms, Limit state design of frames, Haunches and column bases.       6         VI       Vazirani V. N., and Ratwani M. M., "Steel Structures and Timber Structures", Khann Publishers, Delhi.       2         2       Ramchandran, "Design of Steel Structures – Vol. II", Standard Book House, Delhi.       3         3       Punmia B. C., Jain A. K. and Jain A. K. "Design of Steel Structures", Firewell Media.	Module       Module Contents       Hours         I       Foot Bridges       1       Analysis and design of footbridges, Deck of through type bridges, Flooring ystem, Bracing system.       7         II       Cold Formed Sections       7       7         Cold formed light gauge steel sections, Various profiles, Stiffened and unstiffened sections, Roof sheeting, Purlins, Flexure and column behavior, IS code provisions.       6         Composite Sections       Composite section consisting of structural steel and concrete, Composite beams, Shear connectors, Composite decks using light gauge steel and concrete, Composite columns, IS code provisions.       7         IV       Introduction to Plastic Analysis       1       6         Introduction to Plastic Analysis, Plastic bending of beam, Plastic hinge, Shape factor of cross section, Static and kinematic methods of analysis, Plastic analysis and design of propped cantilever, fixed beam and continuous beams.       7         V       Multistorey Buildings       8         V       Multistorey Buildings (alteral load resisting systems, Types of bracing system, Plastic analysis of low rise rectangular and gable portal frames, Various basic mechanisms, Combination of mechanisms, Limit state design of frames, Haunches and column bases.       6         VI       Analysis of low rise rectangular and gable portal frames, Various basic mechanisms, Combination of mechanisms, Limit state design of frames, Haunches and column bases.       6         I       Vazirani V. N., and Ratwani M. M., "Steel						
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			Publishers, Delhi.	m of Steel Structures	-Vol II" Store	Jard Book House Da	lhi
	References	2	Publishers, Delhi. Ramchandran, "Desi	-			
	References	2	Publishers, Delhi. Ramchandran, "Desi	-			

1	Taranath B. S., "Structural Analysis and Design of Tall Buildings", McGrawhill.
2	Bekar J. F., Horne M. R., Heyman J., "Steel Skeleton Vol. II Plastic Behavior& Design", ELBS
3	Neal B. G., "Plastic Methods of Structural Analysis", Chapter & Hall.
	Useful Links
1	https://nptel.ac.in/courses/105/105/105105162/
2	https://nptel.ac.in/courses/105/106/105106112/
3	https://nptel.ac.in/courses/105/106/105106113/

			СО-РО М	lapping		
			Programm	e Outcomes (I	PO)	
	1	2	3	4	5	6
CO1	1		2	3		
CO2	1		2	3		
CO3				3	2	2

## Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing).

		Wa		ge of Engineer		
				<b>Y 2023-24</b>		
				rse Information		
Progra	amm	e	M.Tech. (Structu	ral Engineering)		
Class,	Sem	ester	Second year M.	Tech., Semester III		
Cours	e Coo	le	6ST645			
Cours		-	Dissertation Phas			
Desire	d Re	quisites:	Courses of Seme	ster I and II of F. Y	. M. Tech (Civil-Stru	ictures)
			1			
		ng Scheme		1	Scheme (Marks)	
Practi	cal	6 Hrs/week	LA1	LA2	ESE	Total
			100			100
				Cre	dits: 3	
			0			
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1			l dissertation topi		y carrying out ext	ensive literature
2		develop me lytical/experim		execute the pr	oposed research	work through
3	Тоа	analyse, interpre	et, debate, and class	sify the findings of	the work.	
				) with Bloom's Ta	axonomy Level	
	1	· · · · · ·	e students will be a	/		
CO1				understand researc	h developments and	Applying
		up research hype				
CO2			<u>v</u> .	valuate the research	hypothesis	Analysing
<b>CO3</b>	Ass	ess research ide	a with perspective	scope.		Evaluating
				Contents		

The dissertation work will start in semester III, and should involve scientific research, design, collection, and analysis of data, determining solutions and must bring out the individual's contribution. Dissertation Phase 1 will have presentation and report submission (synopsis). The presentation will include identification of the research problem based on the extensive literature review on the topic referring to latest literature available, defining objectives of the work, and the methodology to be adopted.

			References			
1	National and In	ternational jour	rnals, Conference	Proceedings in	Structural Er	ngineering.
2	Technical Repo	orts of Professio	onal societies.			
3	International ar	nd national code	es of Practices and	l Handbooks.		
4	Internet sources	s and Distance	Learning.			
5	Published Ph.D	and M. Tech	Thesis of Reputed	l Institutes.		
			<b>CO-PO</b> Mappir	ıg		
			Programme	<b>Outcomes</b> (PC	<b>D</b> )	
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CO	2		2	2		3
CO	3 1		2			2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.

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2	expe	erimental work.					
3	Тос	document the r	esearch work	in the prescribe	d format a	nd present it e	effectively.
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				research material	•		•
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				References			
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3	To document the r	research work in	the prescribed format and present it ef	ffectively.
	Cou	rse Outcomes (CC	D) with Bloom's Taxonomy Level	
At the	end of the course, the	e students will be a	ble to,	
CO1	Apprise analytical problem.	/experimental wor	rk in detail for the selected research	Applying
CO2	Classify and assess	research outcomes	s critically.	Analysing
CO3	•		for presentation and dissertation report	Evaluating
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			References	
1	National and Inte	ernational journals	, Conference Proceedings in Structural En	ngineering.
2	Technical Repor	ts of Professional	rocieties	

- Technical Reports of Professional societies. International and national codes of Practices and Handbooks. Published Ph D, and M. Tech Thesis of Reputed Institutes 2
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Each CO of the course must map to at least one PO.

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CO3	Create va Algor Basica proble Varial develo PYTH Matri Matri analys Nume Analy Algor Comp Analy Analy for ea Comp Desig of Or structo Comp	ithm Developm s of computer em analysis an obles, data type opment units, In ION. x Methods and x operations: p is method, Alg prical Methods rical Integratio sis tools and ithm/Programm outer Aided Str sis of Trusses sis of PF by St ch structural an outer Aided Str n of Steel Truss we way and Tw ural design type nercial Softwa cation in com S, Analysis of BINAIONS. Des	Module Module nent and Program hardware and os, d flowcharting, fu s & functions + ntroduction to prog d Programming product-inverse etc orithm /Programming on methods, Nume curve fitting, Nume curve fitting, Nume ing techniques of a ructural Analysis by Stiffness method. 3E alysis type. ructural Design members by IS-800 vo-way slabs by I - re Applications mercial software f 2D frame, Analysis	el structures. tures. Contents ming Languages WWW and Apps indamentals of se input-output + da gramming in MS 1 , Simultaneous 1 , Simultaneous 1 , Simultaneous 1 , Simultaneous 2 , Simultaneo	s, Algorithm essential equential programmin ata handling + vario EXCEL®, MATLAB linear equations, Eige bove methods. on methods, Regression in structural dynamic B by Stiffness metho Algorithm developme sections in RCC, Designed development for each	Analyzin CreatingHourss: g: p, sg: p, sfof D4

1	PratapRudra,"Getting started with MATLABTM", Oxford University press, 2010.
2	Jain M. K., Iyengar S. R. K. & Jain R. K. " Numerical Methods for Scientific and Engineering Computation ", 4th ed. 2004.
3	Pundit & Gupta "Structural Analysis", Tata MC Graw Hill Book company.
	References
1	Steve Otto and James P. Denier "An Introduction to Programming and Numerical Methods" in, Springer International books, 1st Edition, 2007
2	Cotes, R.C., Couties, M.G., and Kong, F.K., Structural Analysis, ELBS.
3	Chopra A. K., "Structural Dynamics for Earthquake Engineering", Pearson Publications.
	Useful Links
1	https://nptel.ac.in/courses/105/105/105105180/
2	http://www.nptelvideos.in/2012/11/numerical-methods-in-civil-engineering.html
3	https://in.mathworks.com/matlab/trial
4	http://www.gnumeric.org/freewarespreadsheetshttps://d.wps.com/?from=premiumpage#/

			СО-РО Марр	ing		
			<b>Programme O</b>	utcomes (PO)		
	1	2	3	4	5	6
CO1	2					
CO2		3			2	
CO3			3		1	
The strengt	th of mapping i	s to be written a	s 1: Low, 2: Med	ium, 3: High		·

Each CO of the course must map to at least one PO.

## Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

			Walc	hand College	of Engineering			
				1	2023-24			
				Course l	Information			
Progra	amm	ıe		M. Tech. Civil (S	tructural Engineeri	ng)		
Class,	Sem	nester		Second Year M.	Fech., Semester III			
Cours	e Co	ode		6ST612				
Cours	e Na	ıme		Elective 4: Advar	nces in Concrete Co	omposites		
Desire	d Re	equisit	es:	Concrete technolo	ogy			
,	Teac	ching S	Scheme		Examination S	cheme (Marks)		
Lectur			3 Hrs/week	MSE	ISE	ESE	Τα	otal
Tutori	ial		-	30	20	50	1	00
					Cred	its: 3		
				1				
	1				Objectives			
1				various concrete co	• •	ractice		
2				s in strength of cor	•			
3	То	provid				n modern construction	on indus	stry.
				Outcomes (CO) w		nomy Level		
			,	ents will be able to	,			
CO1	cen	nent.				ons of FRC and Fe	A	pplying
CO2		<b>fferent</b> air prop	~ ~	ns of silica fume co	oncrete and polyme	er concrete by know	ing A	nalyzing
CO3		opose nstructi	A	f light weight a	nd high strength	concrete in mod	ern C	Creating
Modu				Module	Contents			Hound
		HIDOR	D' C 10	4	Contents			Hours
Ι		Introd metho worka compr concre	ds, properties bility tests, mec ression, tension ete.	ies of constituent r of freshly mixe chanical properties, flexure, research fi	naterials, Mix prop d concrete (fiber behavior of fiber re	portion, mixing, cast reinforced concre sinforced concrete un ation of fiber reinfor	ting ete), ider	7
I		Introd metho worka compr concre <b>Ferro</b> Introd	uction, Propert ds, properties bility tests, mec ression, tension ete. <b>Cement concr</b> luction, materi	ies of constituent r of freshly mixe chanical properties, flexure, research fr rete	naterials, Mix prop d concrete (fiber behavior of fiber re indings, and applica ical properties, co	reinforced concrete inforced concrete un ation of fiber reinfor onstruction techniqu	ting ete), ader ced	
		Introd metho worka compr concre <b>Ferro</b> Introd design <b>Silica</b> Introd of sili	uction, Propert ds, properties bility tests, med ression, tension ete. <b>Cement concr</b> duction, materia in direct tension <b>Fume Concret</b> uction, physica ica fume, prop	ies of constituent r of freshly mixe chanical properties, flexure, research fi rete als used, mechan on, applications, an te l and chemical prop	naterials, Mix prop d concrete (fiber behavior of fiber re indings, and applica ical properties, co d merits as structur perties of silica Hur ume concrete in f	reinforced concrete inforced concrete un ation of fiber reinfor onstruction techniqu	ting ete), ader ced ues, ism	7
II		Introd metho worka compr concre Ferro Introd design Silica Introd of sili proper Polyn Introc impre	uction, Propert ds, properties bility tests, med ression, tension ete. <b>Cement concr</b> duction, materia in direct tension <b>Fume Concret</b> uction, physica ica fume, prop rties and durabi <b>her Concrete</b> duction, classi gnated concrete	ies of constituent r of freshly mixe chanical properties, flexure, research fi rete als used, mechan on, applications, an te l and chemical prop perties of silica fu lity of silica fume c fication, properti c, polymer concrete	naterials, Mix prop d concrete (fiber behavior of fiber re indings, and applica ical properties, co d merits as structur perties of silica Hur ime concrete in f concrete.	reinforced concrete inforced concrete ur ation of fiber reinfor onstruction technique ral materials me, reaction mechan	ting ete), ider ced ues, ism ical	7 7
II		Introd metho worka compr concre Ferro Introd design Silica Introd of sili proper Polym Introc impres Light	uction, Properties ds, properties bility tests, med ression, tension ete. <b>Cement concr</b> duction, materin in direct tension <b>Fume Concrete</b> uction, physica ica fume, prop rties and durabin ner Concrete duction, classi gnated concrete <b>Weight Concr</b> uction, classific	ies of constituent r of freshly mixe chanical properties, flexure, research fi rete als used, mechan on, applications, an te l and chemical prop perties of silica fu lity of silica fume c fication, properti e, polymer concrete ete	naterials, Mix prop d concrete (fiber behavior of fiber re indings, and applica ical properties, co d merits as structur perties of silica Hur ime concrete in f concrete. es of constituen , application.	reinforced concrete einforced concrete ur ation of fiber reinfor onstruction technique ral materials me, reaction mechan fresh state, mechan	ting te), ider ced ues, ism ical	7 7 7
II III IV		Introd metho worka compr concre Ferro Introd design Silica Introd of sili proper Polyn Introd impres Light Introd applic	uction, Propert ds, properties bility tests, med ression, tension ete. <b>Cement concr</b> duction, materia in direct tension <b>Fume Concret</b> uction, physica ica fume, prop rties and durabi <b>ner Concrete</b> duction, classific gnated concrete <b>Weight Concr</b> uction, classific ation. <b>Strength Conc</b>	ies of constituent r of freshly mixe chanical properties, flexure, research fi rete als used, mechan on, applications, an te l and chemical prop perties of silica fu lity of silica fume c fication, properti- e, polymer concrete ete cation, properties of	naterials, Mix prop d concrete (fiber behavior of fiber re indings, and applica ical properties, co d merits as structur perties of silica Hur ume concrete in f concrete. es of constituen , application.	reinforced concrete inforced concrete ur ation of fiber reinfor onstruction technique al materials me, reaction mechan fresh state, mechan t materials, polyn als, artificial aggrega	ting te), ider ced ues, ism ical	7 7 7 6
II III IV V		Introd metho worka compr concre Ferro Introd design Silica Introd of sili proper Polyn Introd impres Light Introd applic	uction, Propert ds, properties bility tests, med ression, tension ete. <b>Cement concr</b> duction, materia in direct tension <b>Fume Concret</b> uction, physica ica fume, prop rties and durabi <b>ner Concrete</b> duction, classific gnated concrete <b>Weight Concr</b> uction, classific ation. <b>Strength Conc</b>	ies of constituent r of freshly mixe chanical properties, flexure, research fi rete als used, mechan on, applications, an te l and chemical prop perties of silica fume c fication, properti- e, polymer concrete ete ete estion, properties of rete es of constituent m	naterials, Mix prop d concrete (fiber behavior of fiber re indings, and applica ical properties, co d merits as structur perties of silica Hur ume concrete in f concrete. es of constituen , application.	reinforced concrete inforced concrete ur ation of fiber reinfor onstruction technique al materials me, reaction mechan fresh state, mechan t materials, polyn als, artificial aggrega	ting te), ider ced ues, ism ical	7 7 7 6 6
II III IV V		Introd metho worka compr concre Ferro Introd design Silica Introd of sili proper Polyn Introd applic High Introd	uction, Propert ds, properties bility tests, med ression, tension ete. <b>Cement concr</b> duction, materia in direct tension <b>Fume Concret</b> uction, physica ica fume, prop rties and durabi <b>ner Concrete</b> duction, classific gnated concrete <b>Weight Concr</b> uction, classific ation. <b>Strength Conc</b>	ies of constituent r of freshly mixe chanical properties, flexure, research fi rete als used, mechan on, applications, an te l and chemical prop perties of silica fume c fication, properti c, polymer concrete rete cation, properties of rete es of constituent m <b>Tex</b>	naterials, Mix prop d concrete (fiber behavior of fiber re indings, and applica ical properties, co d merits as structur perties of silica Hur me concrete in f concrete. es of constituen , application. constituent materia haterials, Mix Desig	reinforced concrete inforced concrete ur ation of fiber reinfor onstruction technique al materials me, reaction mechan fresh state, mechan t materials, polyn als, artificial aggrega	ting te), ider ced ues, ism ical mer tes,	7 7 7 6 6 6
II III IV V VI		Introd worka compr concre Ferro Introd design Silica Introd of sili proper Polym Introd applic High Introd applic High Rafat	uction, Propert ds, properties bility tests, med ression, tension ete. <b>Cement concr</b> duction, materia in direct tension <b>Fume Concret</b> uction, physica ica fume, prop rties and durabi <b>ner Concrete</b> duction, classific gnated concrete <b>Weight Concr</b> uction, classific ation. <b>Strength Conc</b>	ies of constituent r of freshly mixe chanical properties, flexure, research fi rete als used, mechan on, applications, an te l and chemical prop perties of silica fume of lity of silica fume of fication, properti- ete ete etation, properties of rete es of constituent m <u>Tex</u> cial Structural Cono <b>Ref</b>	naterials, Mix prop d concrete (fiber behavior of fiber re indings, and applica ical properties, co d merits as structur perties of silica Hur me concrete in f concrete. es of constituen , application. Sconstituent materia aterials, Mix Desig tbooks cretes", Galgotia Pu erences	reinforced concrete inforced concrete ur ation of fiber reinfor onstruction technique al materials me, reaction mechan fresh state, mechan it materials, polymals, artificial aggrega gn, application.	ting ete), ader ced ues, ism ical mer tes, d.,2000	7 7 7 6 6 6

2	P.N. Balaguru, S.P. Shah, "Fiber Reinforced Cement Composites, McGraw Hill., illustrated, 1992.							
3	D. J. Hannant, "Fiber Cement and Fiber Concrete", John Wiley & Sons.illustrated,1978							
	Useful Links							
1	NPTEL :: Civil Engineering - Concrete Engineering and Technology							
2	NPTEL :: Civil Engineering - NOC: Advanced Concrete Technology							
3	NPTEL :: Metallurgy and Material Science - NOC: Theory and Practice of Non Destructive           Testing							
4	Module 12 (nptel.ac.in)							

Programme Outcomes (PO)									
6									

## Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

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ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

		Walc	hand College	of Engineering		
			1	2023-24		
			Course I	nformation		
Progra	amme		1	tructural Engineer	ing)	
	Semester			Fech., Semester III		
Cours	e Code		6ST613			
Cours	e Name		Design of Tall St	ructures		
Desire	ed Requisi	tes:	Mechanics of Str	uctures		
7	<b>Feaching</b>	Scheme		Examination S	cheme (Marks)	
Lectu		3 Hrs/week	MSE	ISE	ESE	Total
Tutor			30	20	50	100
				Crea	lits: 3	
		1	1			
				Objectives		
1	To impar	t the overall kno	owledge about the 1	naterial used in tal	l structural systems a	and its
1	compone	nts.				
2	To provi	de advanced kno	wledge for analyzi	ng different types	of Tall structures.	
3	To impar	t advanced know	wledge for design o	of different types of	f Tall structures usin	g
3	prevailin	g IS Codes.				
			Outcomes (CO) w		nomy Level	
	1		ents will be able to			
CO1			losophy & loading			Applying
CO2			or vertical and later	al loads.		Analyzing
CO3	Justify d	esign of tall stru	ictures.			Evaluating
Modu	ıle		Module (	Contents		Hours
mouu		duction: Desig			and disadvantages	
		U	1 2	, U	ater supply - drainage	
Ι			l - service system			
			t, growth and for			
	Load	s And Materia	ls: Gravity loading	g - Dead and Live	land coloulation	
	T	· load - calculation	-			
	Impa				dynamic approach	
П	Anal	et and construct tical and win	ion loads. Wind lo d tunnel experim	ading - static and ental method. Ea	dynamic approach - arthquake loading -	. 6
II	Analy Equiv	et and construct tical and win valent lateral for	ion loads. Wind lo d tunnel experim rce, Modal analysi	bading - static and ental method. Ea s - combination c	dynamic approach arthquake loading f loading in various	6
II	Analy Equiv	et and construct /tical and win /alent lateral fo n philosophies.	ion loads. Wind lo d tunnel experim rce, Modal analysi Materials for tall	ading - static and ental method. Ea s - combination c buildings - High	dynamic approach arthquake loading f loading in various strength concrete	6
II	Analy Equiv desig Light	et and construct (tical and win valent lateral fo n philosophies. weight concrete	ion loads. Wind lo d tunnel experim rce, Modal analysi Materials for tall - Fibre reinforced	ading - static and ental method. Ea s - combination c buildings - High concrete Composit	dynamic approach arthquake loading of loading in various strength concrete the Materials.	6
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II	Analy Equiv desig Light Strue load	et and construct vtical and win valent lateral fo n philosophies. weight concrete ctural Systems: distribution in s	ion loads. Wind lo d tunnel experim rce, Modal analysi Materials for tall - Fibre reinforced Behaviour of High teel and concrete	ading - static and ental method. Ea s - combination c buildings - High concrete Composit n Rise structures - Vertical and hor	dynamic approach arthquake loading of loading in various strength concrete the Materials. Different system for izontal load resistan	6
	Analy Equiv desig Light Strue load system	et and construct vical and win valent lateral fo n philosophies. weight concrete etural Systems: distribution in s ms - Rigid fram	ion loads. Wind lo d tunnel experim rce, Modal analysi Materials for tall - Fibre reinforced Behaviour of High teel and concrete es - braced frames	ading - static and ental method. Ea s - combination c buildings - High concrete Composit n Rise structures - Vertical and hor s - in filled frames	dynamic approach arthquake loading of loading in various strength concrete te Materials. Different system for izontal load resistan - shear walls - wal	6
	Anal Equiv desig Light Strue load syste frame	et and construct vical and win valent lateral fo n philosophies. weight concrete <b>etural Systems</b> : distribution in s ms - Rigid fram es - tubular system	ion loads. Wind lo d tunnel experim rce, Modal analysi Materials for tall - Fibre reinforced Behaviour of High teel and concrete es - braced frames ms - outrigger brac	ading - static and ental method. Ea s - combination c buildings - High concrete Composit n Rise structures - Vertical and hor - in filled frames red systems - Mega	dynamic approach arthquake loading of loading in various strength concrete te Materials. Different system for izontal load resistan - shear walls - wal a systems.	6 6
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III	Analy Equiv desig Light Strue load system frame Analy trans	et and construct vical and win valent lateral for n philosophies. weight concrete etural Systems: distribution in s ms - Rigid fram es - tubular system ysis And Design fer systems - ap	ion loads. Wind lo d tunnel experim rce, Modal analysi Materials for tall - Fibre reinforced Behaviour of High teel and concrete es - braced frames ms - outrigger brac a: Analysis and Des proximate methods	ading - static and ental method. Ea s - combination c buildings - High concrete Composit n Rise structures - Vertical and hor - in filled frames ed systems - Mega ign principles of va - Modeling for ac	dynamic approach arthquake loading of loading in various strength concrete te Materials. Different system for izontal load resistan - shear walls - wal a systems. arious horizontal load ccurate analysis - 3E	6
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III	Analy Equiv desig Light Struc load system frame Anal transmanaly effect	et and construct vical and win valent lateral fo n philosophies. weight concrete etural Systems: distribution in s ms - Rigid fram es - tubular syste ysis And Design fer systems - ap sis - Member as - Creep, shrint lity Analysis	ion loads. Wind lo d tunnel experim rce, Modal analysi Materials for tall - Fibre reinforced Behaviour of High teel and concrete es - braced frames ms - outrigger brack at Analysis and Des proximate methods forces - displacem kage and temperatu	ading - static and ental method. Ea s - combination c buildings - High concrete Composit n Rise structures - Vertical and hor - in filled frames ed systems - Mega ign principles of va - Modeling for ac nents. Analysis fo re.	dynamic approach arthquake loading of loading in various strength concrete te Materials. Different system for izontal load resistan - shear walls - wal a systems. arious horizontal load ccurate analysis - 3E r various secondary ames, wall frames	6 6 7 8 7 6
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III	Analy Equiv desig Light Strue load syste frame Anal transt analy effect Stabi approvario	et and construct vical and win valent lateral fo n philosophies. weight concrete etural Systems: distribution in s ms - Rigid fram es - tubular syste ysis And Design fer systems - ap sis - Member es - Creep, shrint lity Analysis eximate methods us methods of a	ion loads. Wind lo d tunnel experim rce, Modal analysi Materials for tall - Fibre reinforced Behaviour of Higl teel and concrete es - braced frames ms - outrigger brac t: Analysis and Des proximate methods forces - displacem cage and temperatu	ading - static and ental method. Ea s - combination of buildings - High concrete Composite n Rise structures - Vertical and hor - in filled frames eed systems - Mega ign principles of va - Modeling for ad ents. Analysis for re.	dynamic approach arthquake loading of loading in various strength concrete te Materials. Different system for izontal load resistan - shear walls - wal a systems. arious horizontal load courate analysis - 3E r various secondary ames, wall frames ading, P - effect and ability, out of plumb	6 6 7 6 7 6 7
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III IV	Analy Equiv desig Light Strue load system frame Anal transmanaly effect Stabin approvario effect brace	et and construct vical and win valent lateral for n philosophies. weight concrete etural Systems: distribution in s ms - Rigid fram es - tubular syste ysis And Design fer systems - ap sis - Member is - Creep, shrint lity Analysis eximate methods us methods of a sis - Elastic Defo d frames for ear	ion loads. Wind lo d tunnel experim rce, Modal analysi Materials for tall - Fibre reinforced Behaviour of High teel and concrete es - braced frames ms - outrigger brac at Analysis and Des proximate methods forces - displacem kage and temperatu	ading - static and ental method. Ea s - combination of buildings - High concrete Composit n Rise structures - Vertical and hor - in filled frames ed systems - Mega ign principles of va - Modeling for ac nents. Analysis for re. g analysis of fr tects of gravity loa of foundation inst e Analysis - Princi esistant design.	dynamic approach arthquake loading of loading in various strength concrete te Materials. Different system for izontal load resistan - shear walls - wal a systems. arious horizontal load ccurate analysis - 3E r various secondary ames, wall frames ading, P - effect and ability, out of plumb ples of design of tal	6 7 8 7 6 7 7
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	Textbooks
1	Schuller.W.G., "High Rise Building Structures", John Wiley & sons, 1977
2	Lynn.S. Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors, New Delhi, 1986.
	References
1	Lin T.Y and StotesBurry.D, "Structural Concepts and Systems for Architects and Engineers", John Wiley and Sons, 1988
2	Dr.Gupta.Y.P, Editor, "Proceedings of National Seminar on High Rise Structures - Design and construction practices for Middle Level Cities", Nov - 14 - 16, 1955. New Age International Publishers Ltd., Chennai
3	Lecture Notes on "Tall Buildings" - Short Term Course organized by Civil Engineering Department, SRM Engg college, Kattankulathur. June 2002
	Useful Links
1	
2	
3	
4	

CO-PO Mapping										
	Programme Outcomes (PO)									
	1	2	3	4	5	6				
CO1	2		2							
CO2		3			2	2				
CO3			3		2	2				
The streng	th of manning	g is to be writt	en as 1. Low 2.	Medium 3. H	ligh					

## Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

				ege of Enginee Aided Autonomous I		, -			
			1	AY 2023-24					
				irse Information					
Progr	amme			ural Engineering)					
0	Semest	ter		Tech., Semester IV	7				
	se Code		6ST691	,					
Cours	se Name	è	Dissertation Pha	ase IV					
Desire	ed Requ	isites:	Dissertation Pha	ase III					
		~ .	1		~				
		Scheme	<b>T</b> 4 4		Scheme (Ma	irks)			
Practi		10 Hrs/week	LA1	LA2	ESE		Total		
			100				100		
				Cr	edits: 5				
			Co	ourse Objectives					
1	To an	alvze/experim		arch topic further.					
		· ·		<u> </u>	ults based or	n the det	ailed analytica		
2		review, classify and consolidate observations/results based on the detailed analytical/ erimental work.							
3			he research work in the prescribed format and present it effectively.						
				1	1		J		
		Cou	rse Outcomes (C	O) with Bloom's T	<b>Faxonomy Le</b>	vel			
At the	end of	the course, the	e students will be	able to,					
CO1		•	/experimental we	ork in detail for	the selected a	research	Applying		
	proble								
<u>CO2</u>			research outcom				Analysing		
CO3	Comp	oose and conc	lude the results for	or presentation.			Evaluating		
				Contents					
Discor	tation I	Phase 1 will	have a presentat	tion based on the	progress of	work aft	ar Phase 3 Th		
				of one more object					
				e latest research ma					
incoraci			unitie to study the						
				References					
1	Na	tional and Int	ernational journal	s, Conference Proc	eedings in Str	uctural E	ngineering.		
2	Tee	chnical Repor	ts of Professional	societies.	_				
3	Int	ernational and	l national codes o	f Practices and Har	ndbooks.				
	Pu	blished Ph.D.	and M. Tech The	esis of Reputed Inst	itutes.				
4			C	<b>D-PO Mapping</b>					
4				Programme Out	comes (PO)				
4		1	2	3	4	5	6		
					•		2		
(	C <b>O1</b>			2	2		3		
	CO1 CO2 CO3			2 2 2	2 2		3 3 2		

Each CO of the course must map to at least one PO.

		•••		e <b>ge of Enginee</b> Aided Autonomous I		511				
			1	AY 2023-24						
				Irse Information						
Progr	amme			ural Engineering)						
Class,										
Cours	e Code		6ST692	Tech., Semester IV						
Cours	e Name		Dissertation Pha	ise V						
Desire	ed Requisit	es:	Dissertation Pha	ise IV						
Т	eaching Sch	ama		Examination	Sahama (Ma	ardze)				
Practi		Irs/week	LA1	LA2	ESE	ai KSj	Total			
I I acti				100	ESE		100			
					edits: 5		100			
			I							
	1			urse Objectives						
1	-		ent selected resea	<u> </u>						
2	To review experiment		y and consolidat	e observations/res	ults based or	n the de	tailed analytica			
3	To docum	nent the 1	research work in	the prescribed for	ormat and pre	esent it e	ffectively.			
	1			O) with Bloom's T	Taxonomy Le	evel				
	end of the o	course, the	e students will be							
CO				ome Statement/s						
CO1	Apprise problem.	analytical	/experimental wo	ork in detail for	the selected	research	Applying			
CO2	· · · · ·		research outcome				Analysing			
CO3	Compose	and conc	lude the results for	r presentation.			Evaluating			
				Contents						
Disser	tation shoul	ld be done ased on th	after completion ne completed wo	ion based on the of one more object rk through 5 phas journal or conferen	ve in continuation of the second s	ation with	the Phase 4. Th			
researc				DC						
esearc			National and International journals, Conference Proceedings in Structural Engineering.							
researc					eedings in Str	ructural E	ngineering.			
researce respec	Techni	cal Repor	ts of Professional	s, Conference Proc societies.		ructural E	ngineering.			
researce respec	Techni Interna	cal Repor	ts of Professional l national codes o	s, Conference Proc societies. f Practices and Har		ructural E	ngineering.			
researce respec	Techni Interna Interne	cal Repor tional and t sources	ts of Professional l national codes o and Distance Lea	s, Conference Proc societies. f Practices and Har rning.	idbooks.	ructural E	ngineering.			
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researce respec	Techni Interna Interne	cal Repor tional and t sources ned Ph.D.	ts of Professional I national codes o and Distance Lea and M. Tech The CC	s, Conference Proc societies. f Practices and Har rning. sis of Reputed Inst D-PO Mapping Programme Outo	idbooks. itutes. comes (PO)					
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1 2 3 4 5	Techni Interna Interne	cal Repor tional and t sources ned Ph.D.	ts of Professional I national codes o and Distance Lea and M. Tech The CC	s, Conference Proc societies. f Practices and Har rning. sis of Reputed Inst D-PO Mapping Programme Outo	idbooks. itutes. comes (PO)					

		Wa		ege of Engin		angli			
			(Government	t Aided Autonomou	s Institute)				
			~	AY 2023-24					
D				urse Informatio					
Programme         M.Tech. (Structural Engineering)									
Class, Semester Second year M. Tech., Semester IV									
Course Code 6ST693									
Course NameDissertation Phase VIDesired Requisites:Dissertation Phase V									
Desire	d Requ	isites:	Dissertation Ph	ase V					
Те	aching	Scheme		Examinati	on Scheme	(Marks)			
Practi		2 Hrs/week	LA1	LA1		ESE	Total		
						100	100		
					Credits: 6	100	100		
			C	ourse Objectives					
1	To ana	lyze/experim		arch topic further					
		• •		te observations/1		d on the de	tailed analytical		
2		mental work.	, <del></del>						
3			esearch work in	n the prescribed	format and	l present it e	ffectively.		
				F		· · · · · · · · · · · · · · · · · · ·			
		Cour	rse Outcomes (C	CO) with Bloom'	s Taxonom	v Level			
At the	end of t		e students will be			., 20, 01			
CO		,		come Statement/	's				
CO1	Appri proble		/experimental w	ork in detail fo	r the selec	ted research	Applying		
CO2	<u> </u>		research outcom	es critically.			Analysing		
CO3	<b>Comp</b> writing		clude the results	for presentation	and disser	tation report	Evaluating		
		-							
				Contents					
				er presentation. E					
				work. The exter					
			work, findings o	of the study, repor	rt submissio	n, contributio	ons to the body o		
knowle	edge etc	•							
				References					
1	Net	ional and Int	rnational journa	ls, Conference Pr	oceedings :	n Structural T	ngineering		
2			ts of Professiona		occounties I		mgmeeting.		
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4			and Distance Lea		ianuoouks.				
5				esis of Reputed In	netitutes				
5	Iut			O-PO Mapping	151111105.				
			U	Programme O	utcomes (P	0)			
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Class, S Course Course Desired Tea	Semeste Code Name	r	M.Tech. Civil	ourse Informatio	n					
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Course Course Desired Tea	Code Name	1	become year iv		conng)					
Course Desired Tea	Name		6ST671							
Desired Tea			Internship							
Tea	Requis	sites	<b>i</b>	mester I and II of	F V M Te	ch (Civil-Stri	ictures)			
		51(05.	Courses of Ser				ietures)			
	ching S	cheme		Examinat	ion Scheme	(Marks)				
		l Hr/week	ISE	MSE		ESE	Total			
			100				100			
			100		Credits: 1					
			(	Course Objectives	5					
1	To pro	vide acquai		life structural en		problems in	industry/societ			
	-	-		rk in collaborati						
	10 pio	vide all opp	ortunity to wo		ve and prof					
		Com	rea Autoomae (	CO) with Plaam	a Tayonam					
At the e	nd of th			CO) with Bloom <sup>3</sup>	s raxonom	ly Level				
			e students will b		and annly it	for officiant				
			U U	edge to solve societal problems and apply it for efficient Applying Applying						
				vities effectively v	with industry	v/society and				
	-		rite effective rep	•	vitii industi.	y society and	Analysing			
				fessional code of o	conduct and	contribute to				
I			development.				Analysing			
			<b>i</b>							
				Contents						
The obj	ective o	f internship	is to expose the	students to indust	y environm	ent and pract	ices. Students wi			
				organizations or re						
				for a minimum pe						
vacatior	n. The e	valuation sl	nould be carried	l out through a pr	esentation a	and a detailed	l report about th			
internsh	ip.									
				References						
1										
2										
			(	CO-PO Mapping		$\mathbf{O}$				
		1	<b></b>	Programme O						
	21	1	2	3	4	5	6			
<u> </u>			2		2					
<u> </u>			<u>Z</u>			2				
		<u> </u>		1: Low, 2: Mediu		2				