PROGRAM SCHEME

SEMESTER - I

MODULE CODE	SUB- CATEGORY	MODULE	L	Т	Ρ	С	Internal Marks	External Marks	Total
CIVL5101	PC	STRUCTURAL DYNAMICS	4	0	0	4	50	100	150
CIVL5102	PC	THEORY OF PLATES AND SHELLS	4	0	0	4	50	100	150
CIVL5103	PC	ADVANCED CONCRETE STRUCTURES	4	0	0	4	50	100	150
CIVL5104	PC	MATERIAL TECHNOLOGY	3	0	0	3	25	75	100
CIVL5105	PC	MATERIAL TECHNOLOGY LAB	0	0	2	1	25	25	50
CIVL5106	SP	SPECIAL PROBLEM	0	0	2	1	25	25	50
	GE	ELECTIVE-A*	4	0	0	4	50	100	150
TOTAL CREDITS			19	0	4	21	275	525	800

L = Lecture

T = Tutorial

ELECTIVES

Ρ	= Pra	ctical	MODULE CODE	GENERIC ELECTIVE - A*
С	= Cre	dit	SAPA0320	SAP (ABAP)Ψ
	Poir	nt	SAPM0321	SAP (MM)Ψ
			SAPS0322	SAP (SD)Ψ
			SAPF0323	SAP (FI)Ψ
			SAPP0324	SAP (HR)Ψ
			CCNA0325	CCNA Ψ
			MATH0302	Numerical analysis and optimization

 ${}^{\psi}\!Additional$ fee, if any, shall be borne by the student.

SEMESTER - I

Structural Dynamics

L T P 4 0 0

MODULE CODE	CIVL5101
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice.

OBJECTIVES:

- 1. To impart the knowledge for analysis of structures subjected to dynamic loading.
- 2. To apply basic methods employed for analysis of civil engineering problems involving dynamics and earthquake.
- 3. To study the basic principles of free and forced vibration (both undamped and damped) of single degree of freedom and multiple degree of freedom systems as well as distributed parameter system

- **1.** Able to analyze the structures subjected to dynamic loads due to Earthquake and vibrations due to machines etc.
- 2. Able to perform the analysis of SDOF and MDOF.
- 3. Ability to perform dynamic analysis of various structures using Numerical Methods carry out dynamic analysis of base isolated buildings

MODULE CONTENT:

UNIT I : Single Degree of Freedom Systems:

Fundamental, Mass spring damper system, Analysis of free vibrations, Response to harmonic loading, periodic loading, Impulsive loading and general dynamic loading. Generalized SDOF, Vibration analysis by Rayleigh method.

UNIT II : Multi Degree of Freedom Systems

Two degree of freedom system – undamped free & forced. Multi degree of freedom systemundamped, Hozler's method, Stodola's method.

Unit III: Dynamic analysis and response

Orthogonality condition, Damped system. Dynamic analysis and Response- Modal Analysis, Response spectrum analysis, Rayleigh's-Ritz method.

Unit IV: Structures with Distributed Mass and Load

Axial, shear and transverse vibration due to bending of beams, Uniform shear beam, Beam in bending, Numerical techniques for shear beam, Bending of beams, Forced vibration, Plates or slabs subjected to normal loads.

Unit V:Earthquake Motion And Response

Introduction, Strong motion earthquake, Numerical method for spectra, Elastic spectra, Ground velocity and displacement, Inelastic spectra.

Unit VI: Machine Foundations

Design of machine foundations, industrial floors subjected to dynamic loading.

RECOMMENDED BOOKS:

TEXT BOOKS	 "Structural Dynamics - Theory and Computation" by Mario Paz, CBS publishers, 1999. Dynamics of structures by Anil K. Chopra. 1980
REFERENCE BOOKS	 Dynamics of Structures by John's Biggs. 1965 Elementary Earthquake Engineering by Jai Krishna and Chander shekhar, 2000. Earthquake Resistant Design by Dowrick-Wiley. 1978 Dynamic of Structures by Walter c. Hurty & Moshe F. Rubinsten,1984.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES Theory:

Assessments	1	2	3
Class Test	х	Х	Х
Quiz			Х
Assignment	X	Х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	1	2		3	2,3		1				
Outcomes											

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - I

Theory of plates and shells

L T P 4 0 0

MODULE CODE	CIVL5102
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice.

OBJECTIVES:

The aim of this subject is to develop understanding of the structural behaviour of shells and to analyze the various structures like rectangular plates, cylindrical shells, folded plates etc. using different methods of analysis:

- 1. To make students aware of the structural behavior of various structures like rectangular plates, cylindrical shells, folded plates etc.
- 2. To acquire knowledge on different methods of analysis of plates under lateral loads.
- 3. To get familiar with concepts of orthotropic plates and their applications.
- 4. To achieve an understanding on basic concepts and classification of shells.
- 5. To understand different methods of analysis of shells.
- 6. To enable learner to understand general theory for circular cylindrical shells.

- 1. Able to understand the concept of plates and types of loading on plates.
- 2. Exposure to various theories of analysis of plates and shells.
- 3. Enhance the knowledge regarding types of shells.
- 4. Able to understand the basic functionality circular cylindrical shells.
- 5. Ability to apply theory of plates and shells to problems involving various geometries and boundary conditions to diverse problems in civil.

MODULE CONTENT:

Unit I: Pure Bending of Plates

Slope and curvature, Relation between bending moments and curvature, Strain Energy.

Unit II: Symmetrical Bending Of Circular Plates

Differential equation in polar coordinates, Uniformly loaded circular plate with or without a hole at the centre and with various edge conditions.

Unit III: Rectangular Plates

Differential equation of the deflection surface (small deflection theory only). Fourier series expansion for various type of loads, Rectangular plate with various loadings and edge conditions, Navier's and Levy's methods.

Unit IV: Orthotropic Plates

Differential equation for orthotropic plates. Rigidities for various stiffening systems, Solution for open grids, Navier's solution for orthotropic plates, Working Design of a Coffer slab Construction.

Unit V: Shell Structures

Elements of Differential Geometry, Classifications of Shells, Shells of revolution loaded symmetrically with respect to their axis, Membrane theory, Edge disturbance, Application to conical shells, Spherical shells, Shells of revolution under unsymmetrical loading.

Unit VI: Cylindrical Shells

Membrane theory, General theory for circular cylindrical shell loaded symmetrically with respect to its axis, Circular cylindrical tank with various edge conditions.

TEXT BOOKS	 Timoshenko, S."Theory of Plates & Shells" – McGrawHill. Ramaswamy, "Concrete Shell roofs" Szilard,R. "Theory and analysis of plates".
REFERENCE BOOKS	 Reddy, J. N. "Theory and Analysis of Elastic Plates and Shells," CRC, 2nd edition, December 2006. 2. R. Szilard "Theory and Analysis of Plates," Prentice Hall, 1974. 3. P.L. Gould "Analysis of Shells and Plates," Prentice Hall, 1999.

RECOMMENDED BOOKS:

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	Х		Х		Х
Quiz		Х			Х
Assignment	х	Х		Х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning	1	23	25	24	5			5			
Outcomes	1	2,5	2,5	2,1	5						

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - I

Advance Concrete Structure

L T P 4 0 0

MODULE CODE	CIVL5103
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice.

OBJECTIVES:

The aim of this subject is to impart knowledge to students in the latest technological aspects of concrete Structure and to provide them with opportunities in taking up advanced topics of the concrete structure.

- 1. To make students aware of the crack and deflection in concrete structure.
- 2. To acquire knowledge RCC frames and Beam-Column design.
- 3. To get familiar with design of deep beam and shear walls.
- 4. To achieve an understanding on basic concepts pre stressed concrete.
- 5. To understand the load balancing concept of pre stressed members.

- 1. Able to design and carry out the reinforcement detailing of building frames.
- 2. Able to design deep beam and shear walls.
- 3. Understand the terminology related to pre-stressing and pre-stressing systems ·
- 4. Analysis and Design of pre-tensioned as well as post-tensioned concrete beams and slabs using limit state methods ·
- 5. Analyse and design the anchorage systems for pre-stressing at the construction site

MODULE CONTENT:

Unit I: Introduction

Review of Basic Concepts, Behaviour and Design of Reinforced Concrete members considering flexure, Torsion, combined with flexure and flexural shear and axial compression. Estimation of crack width and deflection of reinforced concrete beams. Analysis and design of building frames subjected to wind load, Earthquake forces and structural response.

Unit II: Design and Detailing of Structures

Detailing for ductility, Strengthening of existing structures, Design and detailing of structures according to different codes. Ductile detailing of RCC frames.

Unit III: Design of special element

Design of beam-column joints, Design of deep beam, Design of shear walls.

Unit IV: Introduction of Pre stressed Concrete

Definition, comparison with reinforced concrete, advantages and disadvantages, basic principles, determination of concrete flexural stresses, basic concept method, c line method, load balancing method, classification of members, materials for pre stressed concrete, high strength concrete short-term & long-term properties.

Unit V: Losses in pre stress

Pre stressing steel, steel relaxation and other effects, auxiliary materials, pre stress losses, stresses in steel due to loads, cracking moment, deflection under service conditions of loading and pre stressing, determination of strength in bending, sheer and bond.

Unit VI: Design of pre stressed members

Design of PSC continuous beams, slab and domes, Analysis and design of PSC members for flexure, shear, bond, torsion and bearing.

	1. R. Park and T. Pauley, Reinforced concrete structures, John
TEXT BOOKS	Wiley and sons
	2. A. K. Jain, Reinforced Concrete: Limit State design, Nem
	Chand and Bros. 1999.
	3.Pre stressed Concrete by Krishna Raju.
	3. J. Krishna and OP Jain, Plain and Reinforced Concrete, Vol. I
	I, Roorkee, Nem Chand and Bros.
REFERENCE BOOKS	4. H. Nilson, D. Darwin and C. W. Dolar, Design of Concrete
	structures, Tata McGraw Hill
	5. Design of Pre stressed Concrete structures by T.Y. Lin 1981

RECOMMENDED BOOKS:

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х	Х	Х	х		
Quiz		Х	Х			
Assignment		Х		X		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	4		3	5		1				

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - I

Material Technology

L T P 3 0 0

MODULE CODE	CIVL5104
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to different material and properties useful in construction of structure and enhance skill mentioned below:

- 1. To make students aware of the chemical composition of Portland cement.
- 2 .To acquire knowledge and causes of fatigue of concrete
- 3. To get familiar with concepts factors affecting the strength of concrete
- 4. To achieve an understanding on basic concepts fiber reinforced concrete metal.
- 5. To understand the mechanical test of hardened concrete
- 6. To enable learner to know fact behind temperature and creep in concrete.

- 1. Able to understand the evolution of cement and basic terminology.
- 2. Able to understand various causes of fatigue in concrete.
- 3. Enhance the knowledge regarding various factor affecting the strength of concrete.
- 4. Able to understand the basic on basic concepts fiber reinforced concrete metal.
- 5. Ability to know various affect of temperature and creep on reinforced structure.

MODULE CONTENT:

Unit I: Cement and Concrete

Portland cement: chemical composition, hydration of cement, structure of hydrated cement, mechanical strength of cement gel, water held in hydrated cement paste and heat of hydration. Cements of different types. Elasticity, shrinkage and creep of concrete. Durability of concrete: Permeability of concrete. Chemical attack of concrete, air-entrained concrete and thermal properties of concrete.

Unit II: The mechanical test of hardened concrete

Light weight and high density concrete. Mix design. Statistical quality control; Biaxial strength of concrete, production placing compacting and curing of concrete

Unit III: Fibre reinforced concrete metals

Behaviour of common constructional metals in tension and compression. True stress-strain curve for mild steel in simple tension. Theories of failure and yield surfaces

Unit IV: Fatigue properties

Nature of fatigue failure, fatigue strength for completely reversed stresses, fatigue strength with super imposed static stress and factors influencing fatigue strength, investigation related to cracks and causes of occurrences of cracks.

Unit V: Temperature and Creep properties

Low temperature properties ,high temperature properties, creep-stress-time-temperature relations for simple tension, mechanics of creep in tension. Structure of materials and their imperfections. Deformation of crystals and theory of dislocations.

Unit VI: New concretes

Introduction polymer concrete, super plasticized concrete, fibre reinforced concrete, sulphur impregnated concrete, roller compacted concrete, ultra high strength concrete.

RECOMMENDED BOOKS:

	3. A.M. Neville, J.J. Brooks, Concrete Technology, Low Priced				
TEXT BOOKS	Edition, Pearson Education, 2004.				
	A J Martin, Mechanical behavior of engineering materials.				
	5. Building construction – sushil kumar.				
	4. S P Timoshenko, Strength of materials- Part II				
REFERENCE BOOKS	5. M. S. Shetty, Concrete technology- Theory & Practice,				
	S.Chand & Company New Delhi, 2005				

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100marks for theory and 50 marks for practical.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	5
2.	Sessional Test	2	15
3.	Group Discussion	4	5
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х		Х	
Quiz			Х		Х	х
Assignment	Х	Х		Х		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning	2	4		3	5		16				
Outcomes	-			5	5		1,0				

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - I

Material testing Lab

L T P 0 0 2

MODULE CODE	CIVL5105
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

- 1. To prepare the students to have hands on experiments and to have exposure to equipment and machines.
- 2. To make the student to study the property of cement and concrete.
- 3. To understand strength parameter of concrete.
- 4. To study the various role of admixture in concrete.
- 5. To prepare the students to effectively link theory with practice and application and to demonstrate background of the theoretical aspects.

- 1. Able to solve problems including design elements and related to their course work .
- 2. Able to generate and analyze data using experiments and to apply elements of data statistics.
- 3. Able to learn the various effect of admixture in concrete .
- 4. Able to study the variation in strength of cubical and cylindrical blocks.

LIST OF EXPERIMENTS

1.	To determine the tensile strength of cement
2.	To estimate deleterious materials and organic impurities
3.	To determine Soundness by autoclave.
4.	To determine flexural strength of concrete
5.	To determine fineness by specific surface by Blaine air permeability method
6.	To determine compressive strength of cylindrical mould
7.	To study the effects of Admixture Accelerator, Retarder, Super Plasticizer.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	С	d	e	f	g	h	i	j	k
Course Learning Outcomes	1			2	4		3				

EVALUATION

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - I

Special Problem	L T P 0 0 2
MODULE CODE	CIVL5106
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

A special problem is an individual study in a specialized area under the direction of a faculty of the Department. Student will select a problem after discussing with guide and completes it under his/her supervision. Each special problem must culminate in a written final report, which is to be submitted to the committee appointed by the Head of the Department who will evaluate the performance and award the marks.

Note: The award will be scaled to 25 marks.

SEMESTER

– II

MODULE CODE	SUB-CATEGORY	MODULE	L	т	Р	С	Internal Marks	External Marks	Total
CIVL5107	PC	ADVANCED STEEL STRUCTURES	4	0	0	4	50	100	150
CIVL5108	PC	MATRIX STRUCTURAL ANALYSIS		0	0	4	50	100	150
CIVL5109	SP	SEMINAR	0	0	2	1	25	25	50
MECH5107	PC	FINITE ELEMENT METHODS	4	0	0	4	50	100	150
RESM0101	PC	RESEARCH METHODOLOGY	4	0	0	4	50	100	150
	PE	ELECTIVE - I	4	0	0	4	50	100	150
TOTAL CREDITS			20	0	2	21	275	525	800

L = Lecture	ELECTIVES						
T = Tutorial	MODULE CODE	PROGRAM ELECTIVE I					
		DESIGN OF HIGH RISE					
P = Practical	CIVL5210	BUILDING					
C = Credit							
Point	CIVL5211	WIND ENGINEERING					

SEMESTER - II

Advanced Steel Structures	
MODULE CODE	CIVL5107
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice.

OBJECTIVES:

The aim of this subject is to develop understanding of the structural behavior of steel structures and to analyze various structures using different methods of analysis.

- 1. To learn the concepts of plastic analysis
- 2. To have an experience in the complete design of towers.
- 3. To learn the concept of design of steel bridges.
- 4. To learn the analysis and design of beams in multi storey buildings.
- 5. To learn about light gauge steel structure.

- 1. Ability to analyze and design of tension members.
- 2. Ability to analyze and design of frames.
- 3. Ability to analyze and design of steel bridges.
- 4. Ability to analyze and design of towers.
- 5. Ability to design light gauge steel structures

MODULE CONTENT:

Unit I: Plastic Analysis of Frames

Theory of plastic bending, Plastic hinge concept - Mechanism method, Application to continuous portal frames, Plastic moment distribution, Analysis of Gable frames - instantaneous centre of rotation Connections.

Unit II: Connections

Bearing type joints - unstiffened and stiffened seat connections, resisting connection of brackets, bolted and welded-semi-rigid connections.

Unit III: Design of Beams

Beams subjected to biaxial bending, Built-up Purlins - Various types and design, Design of Wind girders-Beam-columns with various support conditions, Design of foundations with lateral forces

Unit IV: Design of Steel Bridges

Design of bridges, trusses, lateral bracings, sway brackets and stress reversals.

Unit V:Towers

Basic structural configurations - free standing and guyed towers towers, wind loads, design criteria for different configurations and transmission line tower.

Unit VI: Light Gauge Steel Structures

Introduction to Light Gauge Steel Structures and its advantages, Interaction buckling behaviour of cold formed steel members, behaviour and design of compression and tension members.

RECOMMENDED BOOKS:

	1.Design of Steel Structures- S K Duggal, McGraw Hill New	
	Delhi, 2010.	
	2. Design of Steel Structures by Arya and Ajmani.	
TEXT BOOKS	3. The steel skeleton Volume I and II by J.F. Baker Publication	
	English Language Book Society.	
	4. Steel Structure- Design and Behaviour Salmon and Johnson	
	Publication Harper And Row.	
	1. Structural Steel Designer's Hand Book by Merritt.	
REFERENCEBOOKS	2. Plastic Design of Steel Frames by LYNN.S.Beedle.	
	3. Handbook for Structural Engineers, SP: 6(6)-1972.	
	4. Design of Steel Structures- Ramchandra, Vol I & II Standard	
	Book House, Delhi, 1975 8.	

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3
Class Test	Х	Х	Х
Quiz			Х
Assignment	Х	Х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	C	d	e	f	g	h	i	j	K
Course Learning			1,2,	3	23						
Outcomes			3,4	5	2,5						

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analyzed actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER II

Matrix structural analysis

L	Т	P
4	0	0

MODULE CODE	CIVL5108
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice.

OBJECTIVES:

To introduce matrix force and displacement methods for two and three dimensional structures including programming aspects.

- 1. To introduce fundamental characteristics of elements and system by evaluation of its flexibility and stiffness matrices
- 2. To impart knowledge about analysis of system through direct and element approach of flexibility method
- 3. Analysis of structures by direct and element approach of stiffness method is to be included
- 4. Programming techniques for simple problems and use of standard programmes to be practiced
- 5. Awareness to the use of advanced techniques of matrix methods are to be created.

- 1. Analyse framed structures using flexibility and stiffness method.
- 2. Develop computer programs for analysis of framed structure.
- 3. Use effectively commercial software for analysis and design of structures.
- **4.** Analyse structure having member discontinuities, curved members, non-prismatic members, elastic supports, semi-rigid connections etc.

MODULE CONTENT:

UNIT I: Fundamental concepts

Force and displacement measurement, Generalised or independent measurements, constrained or dependent measurements, Concept of flexibility and stiffness using systems of springs, Reciprocal relationships between stiffness and flexibility, Stiffness and flexibility in constrained measurements, Coordinate system: structure idealization stiffness and flexibility matrices.

UNIT II: Flexibility method

Direct method applied to beams and frames, Relationship between element and system, Strain Energy in terms of flexibility coefficients, Elements flexibility equation.

Unit III: Stiffness method

Direct stiffness method to beams, frames and simple trusses, Strain energy in terms of stiffness coefficients, Relationship between element and systems, Static condensation techniques, Problems in beams, frames including secondary effects, Suitability element stiffness equation.

Unit IV: Programming

Programming of solution techniques for simultaneous equation solution, Matrix operation and Simple program development for element stiffness matrix, assemblage and Complete structure of a stiffness analysis program with subroutines, Use of GTSTRUDL / STAAD / SAP to solve problems in trusses, Beams and frames.

Unit V: Advanced topics

Sub structuring techniques, Force and displacements, Band width, Reduction, Tridiagnolisation technique, Band solvers, Frontal, Solvers, Re analysis technique, Transfer matrix method, Use of symmetry and anti-symmetry.

Unit VI: Analysis of 3D structures

Concept of 3D modelling, Matrix displacement analysis of 3D structures, Grid and pin jointed trusses.

RECOMMENDED BOOKS:

TEXT BOOKS	 Jack. C, McCormac, Structural Analysis: Using Classical and Matrix Methods, John Wiley, Fourth Edition, 2007. Rajasekaran.S, Sankarasubramanian., Computational Structural Mechanics, Prentice Hall of India Pvt Ltd, New Delhi - 110 001, First Edition, 2001.
REFERENCE BOOKS	 Beaufit F.W et al. Computer Methods of Structural Analysis, Prentice Hall, 1970. John L.Meek, Matrix Structural Analysis, Mc Graw Hill Book Company, 1971.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х		Х	
Quiz			Х		Х	х
Assignment	Х	Х		х		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	А	b	С	d	e	f	g	h	i	j	k
Course Learning		1		1.2				2			
Outcomes		4		1,2				5			

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - II

Seminar	L T P 0 0 2
MODULE CODE	CIVL5109
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

Every student will be required to submit a report and present a seminar talk on a topic guided by a faculty. The Head of the Department will constitute a committee to evaluate the presentation and award marks.

Note: The award will be scaled to 25 marks.

SEMESTER II

FINIT	E ELEMENT METHOD	L	Т	Р
		4	0	0
	MODULE CODE	MECH5	107	
	CREDIT POINTS	4		
	FORMATIVE ASSESMENT MARKS	50		
	SUMMATIVE ASSESMENT MARKS	100		
	END SEMESTER EXAM DURATION	3 hrs.		
	LAST REVISION DATE			

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice.

OBJECTIVES:

- 1. To get familiar with the Finite Element Analysis fundamentals.
- 2. To generate element stiffness matrices for fem problems.
- 3. To formulate the design problems into FEA.
- 4. To perform engineering simulations using Finite Element analysis software (ANSYS & LS- DYNA).

- 1. Have an understanding of the principles and concepts related to finite element methods.
- 2. Able to implement finite element methods for simple 1-D problems such as truss analysis and 1-D heat conduction either by hand calculation or by programming.
- 3. Able to numerically solve for stresses, strains and deformation of a structural component due to axial load, torsion, and bending, acting individually or in combination.
- 4. Able to numerically solve for stresses, strains and deformation of a structure under either plane-stress or plane-strain conditions.
- 5. Have a basic knowledge about finite element methods for solving time-dependent and/or non-linear problems.

MODULE CONTENT:

Unit-I: Introduction

Fundamentals; Description of method; Matrix techniques; Large system of algebraic equations; Basics of solid mechanics; Stress and strain relationships in elastic behavior - linear and non linear.

Unit-II: Variational methods

Variational methods in solid mechanics; Minimum potential energy and minimum complementary energy; Application to FE methods.

Unit-III: Theory of finite element method

Element shapes – one, two, three dimensional and axisymmetric elements; Displacement models in generalized coordinates; Convergence; Nodal degrees of freedom; Interpolation displacement models.

Unit-IV: Elements of fem

Element stresses and strains; Element stiffness and loads; Lumped loads; Variational formulation of element stiffness and lumped load; Numerical integration; Condensation of internal degrees of freedom.

Unit-V: Solution of fem problem

Assemblage of Elements; Discretization of a body or structure; Effect of element aspect ratio; Infinite bodies; Higher order elements and refinement of mesh; Nodal compatibility and interface displacement compatibility; Assembly stiffness matrix; Boundary conditions; Solution for element stress or strain.

Unit-VI: Application of finite element method

Application of FEM to problems in mechanics; Fluid flow and structural element; Making Computer Codes for FEM solutions.

RECOMMENDED BOOKS:

	1. Introduction to the Finite Element Method: CS Desai and							
TEXT BOOKS	JF Abel Van Nostrand Reinhold Co., New York.							
	2.	Finite	Element:	OC	Zienkiewicz	Butterworth-		
		Heinem	ann, Londor	l.				
	1.	Finite I	Element Pro	cedure:	Klaus-Jurgen	Bathe Prentice		
		Hall, N	ew York.					
REFERENCE BOOKS	2.	Concep	t and Applic	ations	of Finite Eleme	ent Analysis: R		
		Cook, l	D Malkus,	M Ples	ha and R V	Witt M. Wiley,		
		New Yo	ork.					

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	Х		Х		
Quiz		Х	Х		Х
Assignment	х			Х	Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	C	d	e	f	g	h	i	j	k
Course Learning Outcomes	2,4		5	2	4,5	3		3	4	2	

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - II

Research Methodology

L T C 4 0 4

MODULE CODE	RESM0101
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice.

OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to research methodology so that learner will be able to understand the research design and represent the research work. Some of the objectives of the course are:

- 7. To acquire basic knowledge research.
- 8. To get familiar with different types of research design.
- 9. To understand the basic of data collection.
- 10. To get familiar with the different techniques of data analysis.
- 11. To acquire basic knowledge of technical writing.
- 12. To get the knowledge of using tools and techniques in research.

- 6. Able to understand importance of research and its type.
- 7. Able to understand research papers and type of research design.
- 8. Able to formulate the research problem.
- 9. Able to choose the appropriate data analysis tool.
- 10. Able to justify with the type of research by publishing it at appropriate platform.
- 11. Able to use different types of softwares and techniques in research writing.

MODULE CONTENTS:

Unit I: Introduction to Research and Problem Definition

Meaning, Objective and importance of research, Types of research, steps involved in research, defining research problem.

Unit II: Research Design

Research Design: Concept and Importance in Research, Features of a good research design, Exploratory Research Design: concept, types and uses, Descriptive Research Designs: concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Literature Survey.

Unit III: Data collection

Classification of Data, Methods of Data Collection, Sampling, Sampling techniques procedure and methods, Ethical considerations in research

Problem Identification & Formulation: Hypothesis, Qualities of a good Hypothesis, Null Hypothesis & Alternative.

Unit IV: Data analysis

Statistical techniques and choosing an appropriate statistical technique, Data processing softwares (e.g. SPSS etc.), Interpretation of results

Data Preparation: Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis (Cross tabulations and Chi-square test)

Unit V: Technical Writing and reporting of research

Types of research report: Dissertation and Thesis, research paper, review article, short

communication, conference presentation etc., Referencing and referencing styles.

Research Journals, Indexing and citation of Journals, Impact factor of Journals, Ethical issues related to publishing, Intellectual property Plagiarism and Self-Plagiarism.

Unit VI: Use of Tools and Techniques for Research

Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases. methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism.

RECOMMENDED BOOKS:

TEXT BOOKS	 C. R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques, New Age International publishers, Third Edition. Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, 2nd Edition, SAGE, 2005 Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
REFERENCE BOOKS	 Creswell, John W. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications, 2013. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press. Select references from the Internet

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х	Х	Х			
Quiz	Х	Х				х
Assignment		Х	Х	Х	Х	х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	В	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	3,4	5	3,5						4		

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER – II (Elective-I)

Design of High Rise Building	$\begin{array}{ccc} \mathbf{L} & \mathbf{T} & \mathbf{P} \\ 4 & 0 & 0 \end{array}$
MODULE CODE	CIVL5210
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice.

OBJECTIVES:

The aim of this subject is to impart knowledge to *familiarize* the students with the methods of analysis of tall steel and concrete buildings under various loading conditions.

- 1. To learn principles of stability of high rise buildings.
- 2. To design the high rise buildings for earthquake and wind resistance.
- 3. To evaluate the performance of high rise structures for strength and stability.

- 1. Achieve Knowledge of design and development of problem solving skills.
- 2. Understand the principles of strength and stability
- 3. Design and develop analytical skills.
- 4. Summarize the behavior of various structural systems.
- 5. Understand the concepts of P-Delta analysis.

MODULE CONTENT:

UNIT-I:Design Criteria

Design philosophy, loading, sequential loading, and materials – high performance concrete, fiber reinforced concrete, lightweight concrete, design mixes. Loading and Movement: Gravity loading: Dead and live load, methods of live load reduction, Impact, Gravity loading, Construction loads.

UNIT-II: Wind and Earthquake loading

Static and dynamic approach, Analytical and wind tunnel experimentation method. Equivalent lateral force, modal analysis, combinations of loading, working stress design, Limit state design, Plastic design.

UNIT-III: Behavior of Various Structural Systems

Factors affecting growth, Height and structural form; High rise behavior, Rigid frames, braced frames, in-filled frames, shear walls, coupled shear walls, wall-frames, tubular, cores, Futigger – braced and hybrid mega system.

UNIT-IV: Analysis and Design

Modeling for approximate analysis, accurate analysis and reduction techniques, analysis of building as total structural system considering overall integrity and major subsystem interaction, analysis for member forces; drift and twist, computerized general three dimensional analyses.

UNIT-V:Stability of Tall Buildings

Overall buckling analysis of frames, wall frames, approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first order and P-Delta analysis,

Transnational, Torsional instability, out of plum effects, stiffness of member in stability, effect of foundation rotation.

UNIT-VI: Structural elements

Sectional shapes, properties and resisting capacities, design, deflection, cracking, prestressing, shear flow. Design for differential movement, creep and shrinkage effects,temperature effects and fire.

RECOMMENDED BOOKS:

	1. Taranath Bungale, "Structural Analysis and Design of Tall
TEXT BOOKS	Buildings" McGraw Hall
	2. Beedle L.S. "Advances in Tall Buildings" VMR.
	3. Wilf gang Schuller, "High rise building structures"- John
	Wiley
	1. Lynn S.Beedle, "Advances in Tall Buildings"- CBS Publishers
	and Distributors.
REFERENCE BOOKS	2. Dr. Y.P. Gupta - Editor, "Proceedings National Seminar on
	High Rise Structures- Design and Construction practices for
	middle level cities"- New Age International Limited.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х	Х	Х	Х		
Quiz		Х	Х			
Assignment		х		Х		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	С	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	4		3	5		1				

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER – II(Elective – I)

Wind	Engin	eering
		8

$\begin{array}{ccc} \mathbf{L} & \mathbf{T} & \mathbf{P} \\ 4 & 0 & 0 \end{array}$

MODULE CODE	CIVL5211
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice.

OBJECTIVES:

- 1. To introduce concept of wind flow
- 2. To give knowledge on static and dynamic wind load analysis
- 3. To give exposure to Indian Standard code for wind
- 4. To enable students to do static wind load based design
- 5. To introduce students to wind tunnels
- 6. To perform experiments on wind effects on structures.
- 7. To familiarize the students regarding wind loading and the effects of wind on behaviour of buildings and other structures.

- 1. In depth knowledge of IS 875(Part 3),
- 2. Indian Standard Code for wind load on structures
- 3. Knowledge about wind tunnels and various aspects of wind flow.
- 4. Ability to do static and dynamic analysis for wind loading
- 5. Ability to design a structure for different types of wind induced loadings.

MODULE CONTENT:

Unit I: Introduction

Historical background to wind loading, Causes and types of wind, Factors affecting wind loading.

Unit II: Wind Characteristics

Variation of wind velocity, atmospheric circulations – pressure gradient force, coriolis force, frictionless wind balance, geotropic flow, boundary layer.

Extra ordinary winds – Fen Cohen, Bora, Cyclones, Tornadoes etc., Static wind effects and building codes with particular reference to IS 875 (Part-III), wind speed map of India, introduction to the proposed revisions of IS 875 (Part III).

Unit III: Wind Characteristics

Turbulence characteristics, Bluff body aerodynamics, Wind pressure and forces on buildings and structures.

Unit IV: Introduction to random vibrations

Along wind and across wind response of tall buildings. Wind tunnel testing: Open circuit and closed circuit wind tunnels, rigid and aero elastic models, wind tunnel measurements and instruments along with site visit.

Unit V:Towers and slender structures

Cladding systems and Mechanical damping system, wind tunnel testing and simulation techniques.

Unit V:Case studies

low rise buildings, parking sheds, workshop building, multi-storey building, water tanks, towers, chimneys, bridges

RECOMMENDED BOOKS:

	 An Introduction to Wind Engineering John Wiley & Sons, E. Simiu & R.H Scalan.
TEXT BOOKS	 Structural Analysis and Design of Tall Buildings- B.S Taranath.
	3. Relevent IS Codes.
	1. EmilSimiu and R. H. Scanlan, "Wind Effects on Structures –
	An Introduction to Wind Engineering", John Wiley and Sons,
REFERENCE BOOKS	New York, 986.
	2. C. Scruton, "An Introduction to Wind Effects on Structures",
	Oxford University Press, Oxford, UK, 198

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	х		Х		Х
Quiz		Х			Х
Assignment	Х	Х		Х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	С	d	e	f	g	h	i	j	k
Course Learning	1	23	25	2.4	5			5			
Outcomes	1	2,5	2,5	2,4	5			5			

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER -III

MODULE CODE	CATEGORY	MODULE	L	Т	Ρ	С	INTERNAL MARKS	EXTERNAL MARKS	TOTAL
CIVL6101	PC	DESIGN OF HYDRAULIC AND LIQUID RETAINING STRUCTURES	3	1	0	3.5	50	100	150
CIVL6102	PC	EARTHQUAKE RESISTANT STRUCTURES	3	1	0	3.5	50	100	150
CIVL6103	PC	DESIGN OF BRIDGES	4	0	0	4	50	100	150
CIVL6104	PC	COMPUTATIONAL LABORATORY	0	0	2	1	25	25	50
CIVL6105	DI	LITERATURE SURVEY (DISSERTATION STAGE 1)*	0	0	0	2	50	50	100
	PE	ELECTIVE-II*	4	0	0	4	50	100	150
	GE	ELECTIVE- B**	4	0	0	4	50	100	150
TOTAL CREDITS			18	2	2	22	325	575	900

- L = Lecture
- T = Tutorial

ELECTIVES

	AI	
P = Practio	cal MODULE CODE	GENERIC ELECTIVE - B**
C = Credit Point	SAPA0320	SAP (ABAP)Ψ
	SAPM0321	SAP (MM)Ψ
	SAPS0322	SAP (SD) ^ψ
	SAPF0323	SAP (FI)ψ
	SAPH0324	SAP (HR)ψ
	CCNA0325	CCNA ^ψ
	MECH6302	THEORY OF ELASTICITY
	MGMT0306	ORGANISATIONAL BEHAVIOUR
	MODULE CODE	PROGRAM ELECTIVE II*
	CIVL6205	SOIL - STRUCTURE INTERACTION
	CIVL6206	REMOTE SENSING AND GIS IN ENGINEERING

♥Additional fee, if any, shall be borne by the student.

*Students are to earn 2 credits on review of litrature in 3rd semester out of 12 credits in total assigned to dissertation, to be completed in 4th semester.

SEMESTER – III

Design of Hydraulic and Liquid Retaining Structure	L	Т	Р
	3	1	0

MODULE CODE	CIVL6101
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice

OBJECTIVES:

To educate the students in detailed concepts related to water transmission mains, water distribution system, sewer networks and storm water drain, with emphasis on computer application

- 1. To understand about the methods of analysis and design of water tanks and the types of cement roofing system To get familiar with concepts Design of tanks
- 2. To understand in detail about the design of various embankment used in dam and water proofing .
- 3. To understand the designing of steel water tanks.
- 4. To enable learner to understand canal regulation structure.

- 1. To make them understand the fundamentals of Structural design of Concrete, Prestressed Concrete, Steel and Cast iron etc
- 2. To understand in detail about the design of special purpose structures like underground reservoirs and swimming pools
- 3. To improve the knowledge on the repair and rehabilitation of structures and also diagonising and identification of the cause and damage in various liquid retaining structure
- **4.** To know about the exposure on steel, lattice structures used to know about the exposure on steel, lattice structures used in water and sewerage

MODULE CONTENT:

Unit I:Introduction of Containers

Types of Tanks, Materials, Types of joints, their spacing anddesign, Design considerations, Cover requirement, tanks resting on ground, Circular andrectangular tanks.

Unit II: Under Grounds and Elevated Tanks

Circular and rectangular tanks, Problem of high ground watertable, Tanks containing liquids at high temperature. Elevated tanks of different shapes with staging arrangement of columns / cylindrical shaft, Design of tank foundations.

Unit III: Elevated Steel Tanks

Circular tanks with conical bottom, Circular tank with segmental bottom, Design considerations, Staging, Pressed steel plate tanks.

Unit IV: Gravity Dams

Planning and investigations of reservoir and dam sites, Choice of dams, preparationandprotection of foundation and abutments.Forces acting on solid gravity dam, modes of failures, stability analysis, elementary and practical profile of gravity dam, internal stresses and stress concentrations in gravity damjoints, seals, keys in gravity dams, dam safety and hazard mitigation.

Unit V: Homogeneous and zoned embankment dams

Homogeneous and zoned embankment dams ,factors influencing design of embankmentdams, criteria for safe design of embankment dam, steps in design of embankment dam,seepage analysis and its control through body and dam foundation, classification of rock filldams and their design considerations.

Unit VI:Canal regulation structures

Canal regulation structures and design of cross drainage works, canal drops, operation andmaintenance of canals.

RECOMMENDED BOOKS:

	1. Concrete Structures by Vazirani&Ratwani.				
TEXT BOOKS	2. Reinforced Concrete Structures by I.C.Syal&A.K.Goel.				
	3. USBR, "Design of gravity dams", A Water Resources				
	Technical Publication, Denver, Colorado				
	1. Design of Steel Structures by Arya and Ajmani.				
REFERENCE BOOKS	2. Engineering for dams Creager W P, Justin J D and Hinds J.,				
	Nemchand and Brothers				

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	х		Х		х
Quiz		Х			Х
Assignment	Х	Х		х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	С	d	Е	f	g	h	i	j	k
Course Learning		1		3	2			4			
Outcomes											

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - III

Earthquake Resistant Structures	L T P 3 1 0
MODULE CODE	CIVL6102
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to earthquake resistant structures and different system to enhance skills in earthquake engineering as mentioned below:

- 1. To understand the principles of vibration with regard to single degree of freedom system.
- 2. To carry our dynamic analysis of moment resistant frames.
- 3. To determine the design lateral forces by means of codal provisions.
- 4. To introduce the concept of ductility and corresponding detailing.
- 5. To expose the students to base isolation techniques earthquake induced damages.

- 1. Able to evaluate seismic forces for various structures as per relevant Indian standard.
- 2. Able to design and ductile detailing of structures for resistance as per Indian standards.
- 3. Able to apply concepts of repair and rehabilitation of earthquake affected structures.
- 4. Able to apply concepts of detailing for ductility of earthquake affected structures.
- 5. Able to understand behavior of RC structure.

MODULE CONTENT:

UNIT I: Introduction

Introduction to engineering seismology, origin and propagation of seismic waves, characteristics of earthquake and its quantification – Magnitude and Intensity scales, seismic instruments. Earthquake Risk Evaluation and Mitigation. Structural behavior under gravity and seismic loads, Lateral load resisting structural systems, Requirements of efficient earthquake resistant structural system, damping devises, base isolation systems.

UNIT-II: Structureal Configuration

Structural Configuration for earthquake resistant design, Aspects in planning and layout - regular and irregular buildings- calculation of centre of mass and centre of rigidity for simple layouts- eccentricity and torsion.Design provisions for these in IS-1893. Effect of infill masonry walls on frames, modeling concepts of infill masonry walls.

UNIT-III: Design seismic forces

Codal provision for design - IS 1893-2002 – Response spectrum – determination of lateral forces – base shear – by response spectrum method for 2 storey moment resistant frame-calculation of drift

UNIT-IV: Detailing for ductility

Ductility-codal provision for detailing for earthquake resistance- IS 13920-1993 and IS1893:2002 Shear wall design and detailing.

UNIT-V:Special Topics

Repair and Rehabilitation techniques - seismic damage ratings - Passive and Active control of vibration - New and favorable materials - case studies in repair and rehabilitation.

UNIT VI Behaviour of RC Structures:

Load Transfer Path, Strength Hierarchy, Reversal of Stresses, Importance of Beam Column Joints, Importance of Stiffness and Ductility (Capacity Design Concept) in Structures, Effect of Short Column, Effect of Soft Storey, Improper Detailing.

RECOMMENDED BOOKS:

	1. Earthquake Resistant Design of Structures, Pankaj							
	Agrawal, Manish Shrikhande, PHI Learning.							
	2. IS 1893-2002 Indian Standard Criteria for Earthquake							
TEXT BOOKS	Resistant Design of Structures.							
ILAI DOORS	3. IS 4326-1993 2002 Indian Standard for Earthquake							
	Resistant Design and Construction of Buildings.							
	4. IS 13920-1993 2002 Ductile detailing of Reinforced							
	Concrete Structures subjected to Seismic Forces.							

REFERENCE BOOKS	 Dynamics of Structures: Theory and Applications to Earthquake Engineering, AK Chopra, Prentice Hall Dynamics of Structures, R.W. Clough and Joseph Penzien McGraw-Hill Education. Structural Dynamics by Mario & Paz, Springer. Earthquake Resistant Design by David J. Dowrick, Wile A. E. D. 144
	Wiley India Pvt Ltd

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed.Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х		Х	
Quiz		Х			Х	Х
Assignment	х			Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	C	d	e	f	g	h	i	j	k
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Course Learning	1.2	23	235	23	5	15			
Outcomes	1,2	2,3	2,3,3	2,5	5	4,5			

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - III

Design of Bridges

L	Т	Р
4	0	0

MODULE CODE	CIVL6103
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to bridges and design of bridges of different types to enhance skills in civil engineering as mentioned below:

- 1. To develop an understanding of basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
- 2. To help the student develop an intuitive feeling about the sizing of bridge elements, i.e. develop a clear understanding of conceptual design.
- 3. To understand the load flow mechanism and identify loads on bridges.
- 4. To carry out a design of bridge starting from conceptual design,
- 5. To select suitable bridge, geometry to sizing of its elements.

LEARNING OUTCOMES:

1. Able to know about basics of bridge engineering.

- 2.Able to understand the load-carrying capacity of various types of bridges, upon learning the structural responses to different kinds of loads.
- 3. Able to design short and medium span bridges, with confidence using existing codes of practice, taking into account of the structural strength, service life and durability.
- 4. Able know the limitations of the design methods used.

MODULE CONTENT:

<u>UNIT-I: General Bridge systems</u> Considerations in alignment, Planning, Economic considerations, Aesthetics and selection of type of bridge, Bridge Hydrology, Scour Depth, Depth of foundation, Estimation of Design Discharge <u>UNIT-II: Loading Standards</u>

Specifications for loading, geometrical proportioning etc. Road, Rail-cum-Road bridges, Indian Road Congress and Indian Railway loading standards and their comparison with loading standards followed in U.K., U.S.A. and Europe.

UNIT-III: Design of Bridges

Reinforced Concrete Bridges, Slab culverts, T-Beam Bridges, Box Girder Bridges.

UNIT-IV: Design of sub structure

Pier and abutments caps, Design of pier, Abutments – Type of foundations.

UNIT V Dynamic Response of Bridges

Design considerations for pre-stressed bridges, trussed steel, Cable stayed and suspension bridges.

UNIT-VI Bearings for Bridges Importance of Bearings

Bearings for slab bridges, Bearings for girder bridges, Electrometric bearing – Joints – Expansion joints.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Bridge engineering by S.Ponnuswamy, TataMcGraw-Hill	
	2. Bridge superstructure by N.Rajagopalan, Narosa Publishing	
	1. Design of Bridges, N. Krishna Raju, Oxford and IBH	
REFERENCE BOOKS	2. Victor D.J, Essential of Bridge Engineering Oxford &	
	3. N. Rajagopalan, Bridge Superstructure, Narosa	

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed.Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test		Х	Х	х		
Quiz	Х		Х			х
Assignment		х		Х	Х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	C	d	e	f	g	h	i	j	k
Course Learning	1,2	2,3	2,3	2,3	5	4,					
Outcomes	,	,	,	,		,					

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - III

Computational Laboratory

L	Т	P
0	0	2

MODULE CODE	CIVL6104
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to civil engineering material and to enhance skills as mentioned below:

- 1. To prepare the students to have hands on experiments and to have exposure to Computer programming in C++ related to to solve problems related to civil engineering.
- 2. To make the student to study the property of analysis of structures through programming.
- 3. To prepare the students to effectively link theory with practice and application and to demonstrate background of the theoretical aspects.

LEARNING OUTCOMES:

- 1. Able to solve problems including design elements and related to their course work.
- 2. Able to generate and analyze data using experiments and to apply elements of data statistics.
- 3. The purpose behind this course is to make the students familiar with the software available in structural engineering.

LIST OF EXPERIMENTS

1.	Computer programming in C++.
2.	Development of computer programs to solve problems related to civil engineering using matrix method.
3.	Development of Finite Element Programming for analysis of beams.
4.	Development of Finite Element Programming for analysis of truss.
5.	Development of Finite Element Programming for analysis of frames.
6.	Analysis of plates and shells using commercial softwares.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning	1			2	4		3				
Outcomes							_				

EVALUATION

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,

- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER – III

SOIL STRUCTURE INTERACTION (ELECTIVE-II*) L T P 4 0 0

MODULE CODE	CIVL 6205
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice

OBJECTIVES:

The aim of the course is to provide the participants an understanding of effectively simulating the soil-structure interaction problems using computer applications and realistic material models. At the end of the course, the participants are expected to have fair understanding of:

- 1. Basics of Finite Difference and Finite Element Analysis.
- 2. Realistic material models for structural materials, soils and interfaces/joints.
- 3. Modeling of engineering systems and Soil-Structure Interaction (SSI) using computer methods for a number of practical problems in geotechnical engineering.

- 1. Understand the basic elements of SSI such as inertial and kinematic effects.
- 2. Learn how to evaluate kinematic interaction parameters for shallow foundations.
- 3. Able to understand methods of analysis of structures with SSI effects

MODULE CONTENT:

UNIT-I :SOIL-FOUNDATION INTERACTION

Introduction to soil - Foundation interaction problems, Soil behaviour, Foundation behaviour, Interface, behaviour, Scope of soil-foundation interaction analysis

Unit II:MODEL ANALYSIS

Soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic plastic behaviour, Time dependent behaviour.

Unit III: BEAM ON ELASTIC FOUNDATION

SOIL MODELS Infinite beam, Two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness.

Unit IV:PLATE ON ELASTIC MEDIUM

Infinite plate, Winkler, Two parameters, Isotropic elastic medium, Thin and thick plates, Analysis of finite plates, rectangular and circular plates, Numerical analysis of finite plates, simple solutions.

Unit V:ELASTIC ANALYSIS OF PILE

Elastic analysis of single pile, Theoretical solutions for settlement and load distribution, Analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap.

Unit VI:LATERALLY LOADED PILE

Load deflection prediction for laterally loaded piles, subgrade reaction and elastic analysis, Interaction analysis, and pile raft system, solutions through influence charts.

RECOMMENDED BOOKS:

	6. McCarthy, D.F. Essentials of Soil Mechanics and
	Foundations, basic geotechnics (6th Edition), Prentice
TEXT BOOKS	Hall, 2002.
	7. Selvadurai, A.P.S., Elastic Analysis of Soil Foundation
	Interaction, Elsevier, 1979.

REFERENCEBOOKS	 Hemsley, J.A, Elastic Analysis of Raft Foundations, Thomas Telford, 1998. Poulos, H.G., and Davis, E.H., Pile Foundation Analysis and Design, John Wiley, 1980. Scott, R.F. Foundation Analysis, Prentice Hall, 1981. Structure Soil Interaction - State of Art Report, Institution of structural Engineers 1978 ACL 336 Suggested
	 Structure Soil Interaction - State of Art Report, Institution of structural Engineers, 1978. ACI 336, Suggested
	Analysis and Design Procedures for Combined Footings and Mats, American Concrete Institute, Dehit, 1988.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed.Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3
Class Test	Х	Х	Х
Quiz			Х

	Assignment	Х	х	
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MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	J	k
Course Learning Outcomes	1	2		3	2,3		1				

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - III

Remote Sensing and GIS in Engineering (Elective-II*)L T P 4 0 0

MODULE CODE	CIVL6206
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice

OBJECTIVES:

- 1. To introduce the students to the basic concepts and principles of various components of remote sensing.
- 2. To provide an exposure to GIS and its practical applications in civil engineering.
- 3. To provide exposure to students in gaining knowledge on concepts and applications leading to modeling of earth resources management using Remote Sensing 2. To acquire skills in storing, managing digital data for planning and development.

- 4. To provide exposure to data models and data structures in GIS and to introduce various Raster and Vector Analysis capabilities.
- 5. To expose the concept of quality and design of cartographic outputs in open GIS environment.

LEARNING OUTCOMES:

- 1. Fully equipped with concepts, methodologies and applications of Remote Sensing Technology.
- 2. Prepare the candidates for National and Global Employability
- 3. Acquire skills in handling instruments, tools, techniques and modeling while using Remote Sensing Technology
- 4. It empowers the candidate with confidence and leadership qualities.

MODULE CONTENT:

UNIT I - Introduction And Concepts

Introduction of Remote Sensing – Energy sources and Radiation principles, Energy equation, EMR and Spectrum, EMR interaction with Atmosphere- scattering, Absorption, EMR interaction with earth surface features- reflection, absorption, emission and transmission, Spectral response pattern, vegetation, soil, water bodies Spectral reflectance.

UNIT II-Sensors Characteristics

Platforms: airborne and space borne; Satellite orbits: geostationary and near polar; Image data characteristics: spatial, spectral, radiometric and temporal; Satellite missions of ISRO and LANDSAT programme with their image characteristics; History, development and set up of Remote Sensing Programme of India, USA, Russia, China and ESA.

UNIT III-Remote Sensing Satellites

Land observation satellites, characters and applications, IRS series, LANDSAT series, SPOT series, High resolution satellites, character and applications, CARTOSAT series, IKONOS Series, QUICKBIRD series, Weather/Meteorological satellites, INSAT series, NOAA, GOES, NIMBUS Applications, Marine observation satellites OCEANSAT

UNIT IV-Basics Of Gis

Introduction, concepts, Information system, components of GIS, History, Geospatial data architecture, Operations, Geographic co ordinate systems, Map projections, concepts, Input data for GIS, display ,types of output products. GIS categories, Level and scale of Measurement, importance of data quality

UNIT V- Introduction To Gis Softwares

Defining GIS -introduction to Spatial Data File Formats - Basics of ArcCatalog and Arc Map, Tabular Data Design, Functions, pitfall and Reprocessing, Tables, Queries, and Basic Geoprocessing Tools, Data sources and data collection data files in ArcMap and ArcPad, The Raster Data File Format-, Overview of MAP INFO, QGIS, ERDAS IMAGINE

UNIT VI-Vector Data & Processing

GIS data types, data Representation, Data sources, typical GIS data sets, Data Acquisition, vector data model, topology, topology rules, Non topological vector data, object based vector data model, relationship between classes, data structure, data verification and editing spatial data models and errors – GIS database, attribute data input and management

RECOMMENDED BOOKS:

	1. Kang tsung Chang ., Introduction to Geographical
	Information System, Tata McGraw Hill, 7th edition, 2010
TEXT BOOKS	2. A.M. Chandra and S.K. Ghosh. Remote Sensing and
	Geographical Information system. Narosa Publishing
	House, New Delhi. 2006
	1. Menno-Jan Kraak, Ferjan Ormeling, Cartography:
	Visualization of Spatial Data, 2009, 3rd Edition, Pearson
REFERENCE BOOKS	Publishers.
	2. Kang-tsung Chang , Introduction to Geographical
	Information System, , Fourth Edition, Tata McGraw
	Hill,2008

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

|--|

Class Test	Х	Х	Х	х	
Quiz		Х	Х		
Assignment		Х		х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	С	D	e	f	g	h	i	j	k
Course Learning Outcomes	2	4		3	5		1				

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - III

ELECTIVE-B*

THEORY OF ELASTICITY

L	Т	P
4	0	0

MODULE CODE	MECH6102
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice

OBJECTIVES:

- 1. Define the stress, strains and their relation in detail.
- 2. To apply different compatible equations to solve cantilever and simply supported beam problems.
- 3. To understand the two dimensional elasticity problems.
- 4. To understand the torsion in straight bars.

LEARNING OUTCOMES:

- 1. Ability to understand the basic concepts in continuum mechanics of solids, including of strain, internal force, stress and equilibrium in solids.
- 2. Ability to use analytical techniques to predict deformation, internal force and failure of simple solids and structural components.
- 3. Ability to apply principles of continuum mechanics to design a structure or component to achieve desired performance under realistic constraints.

MODULE CONTENT:

Unit-I: Concept of stress

State of stress at a point; Stress notations; State of strain at a point and notations; States of plane stress and plane strain; Hooke's law and generalized statement of Hooke's law; Stress-strain relationships; Concept of principal stress and strain; Mohr's circle.

Unit-II: Cantilevers and beams

Compatibility equations; Stress function; Use of stress function in solution of two dimensional problems in Cartesian coordinates; Boundary conditions; Problems of cantilever; Supported beam under distributed load of uniform and uniformly variable intensity; Use of Fourier series.

Unit-III: Two dimensional problems

Two dimensional elasticity problems in polar coordinates; Equation of equilibrium; Axisymmetric problems; Thick cylinder; Curved bars; Hole in a plate problem; Idea of an edge dislocation.

Unit-IV: Torsion

Torsion of straight bars; Elliptic and circular section; Membrane analogy; Torsion of thin rectangular section; Application of energy method to torsion problem; Torsion of thin tubes.

<u>Unit-V: Complex analysis</u>

Complex variables for curvilinear coordinates; Laplace's equation; Complex stress function and corresponding displacements; Curvilinear coordinates and stress components; Elliptic hole in a uniformly stressed plate.

Unit-VI: Waves and vibrations

Propagation of waves in elastic solid media; Use of elastic waves; Wave equation; Time harmonic solution,; Boundary conditions; Reflection and rarefaction; Rayleigh waves; Vibration of rods and plates.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Theory of Elasticity: S P Timoshenko McGraw-Hill International, New York
REFERENCE BOOKS	 Applied Elasticity: Zhilun Xu Wiley Eastern Ltd, New Delhi Applied Elasticity: Chi-Teh Wan McGraw-Hill, New York

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3
Class Test	х	Х	
Quiz		Х	Х
Assignment	х		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	D	e	f	g	h	i	j	k
Course Learning Outcomes	3		2,3		1	3		3		2	

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - IV

MODULE CODE	CATEGORY	MODULE	L	Т	Р	С	Internal	External	Total Marks
CIVL6107	DI	DISSERTATION and VIVA (DISSERTATION STAGE 2)	-	-	-	10	250	250	500
TOTAL CREDITS			0	0	0	10	250	250	500

- L = Lecture
- T = Tutorial
- P = Practical
- C = Credit Point

*Students have to publish a research paper in a journal / conference of the research work done in the semester.