GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: Structural Mechanics-II
(Code: 3340601)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	FOURTH SEMESTER

1. RATIONALE

The Structural Mechanics –I in Third Semester was taught to study the analysis of determinate structures under action of various types of transverse &/or direct loading. Analysis of Industrial Trusses was also incorporated to give an idea of typical structure to the students. In this course, analysis of indeterminate structures under action of transverse loading, along with, analysis of members under direct loading is to be studied. Analysis of strained matter under the effect of principal stresses & strains i s also incorporated to give an idea of compound stresses to the students. The Structural Mechanics-II, will further aid the conceptuality of the student for design & analysis of Steel & Concrete Structures used in Civil Engineering construction.

2. COMPETENCY (Programme Outcomes (POs) According to NBA terminology)

The course content should be taught and implemented with the aim to develop with different types of skills so that students are able to acquire following competencies:

(i)   Analyze Statically Indeterminate structures like Fixed Beams
and Continuous Beams
(ii) Compute Slope and Deflection in statically Determinate Beams
(iii) Evaluate the Structure under Direct and Eccentric Axial
Loading

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
03	00	02	05	70	30	20	30	150

Legends: L - Lecture; **T -** Tutorial/Teacher Guided Student Activity; **P -** Practical;   **C -** Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I **Fixed Beam**	1. Draw Shear Force & Bending Moment Diagram for Fixed Beams	1.1 Different types of Determinate & Indeterminate Structures & Structural Components/Elements 1.2 Advantages of fixed beam over simply supported beam 1.3 Concept of analysis by Area Moment method 1.4 μ and μ' diagram 1.5 Numerical for SF & BM diagrams for fixed beam with central point load &/or UDL over Full Span
Unit – II **Slope & Deflection**	2. Compute deflection & slope induced in Statically Determinate Beams	2.1 Slope & Deflection 2.2 Formulae of Slope & Deflection for Cantilever Beam subjected to Point Load at free end , point load not at free end and with UDL along full Span 2.3 Formulae of Slope & Deflection for S.S Beam subjected to Central Point Load and with UDL along full Span 2.4 Numerical problems on Slope and Deflection for 2.2 & 2.3
Unit – III **Continuous Beam**	3.1 Draw Shear Force & Bending Moment Diagram for Continuous Beam using Theorem of Three Moment 3.2 Draw Shear Force & Bending Moment Diagram for Continuous Beam using Moment Distribution Method	3.1 Statically Indeterminate Beam Like Propped Cantilever , Continuous Beam with or without Over Hang Define Free Moment & Fixed End moment diagrams 3.2 Theorem of Three Moment (Clapeyron's Theorem) 3.3 Formulae to find B.M of a continuous beam using theorem of Three Moment Method 3.4 Point of Contra-flexure & its importance 3.5 Numerical to draw S.F & B.M Diagram for two or three span continuous beams having end supports as overhang , fixed and / or hinge and subjected to Central Point Load and/ or U.D.L over full span using Theorem of Three Moment 3.6 Stiffness, flexibility, carry over Factor & Distribution Factor 3.7 Moment Distribution Method 3.8 Numerical to draw S.F & B.M Diagram of two or three span continuous beams having end supports as overhang , fixed and / or hinge and subjected to Central Point Load and/ or U.D.L over full span using Moment Distribution Method

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – IV **Combined Direct & Bending Stresses**	4 .1 Calculate Direct & Bending Stresses of various structural components 4.2 Check stability of Retaining wall & Dam	4.1 Eccentricity 4.2 Formula for combined Direct & Bending Stresses 4.3 Limit of Eccentricity 4.4 Core of section for Rectangular & Circular (Hollow & Solid) 4.5 Formulae for combined stresses on sections subjected to eccentric loads considering Uniaxial & Biaxial eccentricity 4.6 Stress distribution diagrams 4.7 Application of concept of combined stresses to find pressure at base & stability check of Retaining Wall & Rectangular & Trapezoidal Dam 4.8 Numerical for 4.6 & 4.7
Unit – V **Principle Stresses & Principle Planes**	5. Calculate Principal Stresses & Principal Plane on a plane in a Strained structural Material	5.1 Formulae for Normal , Tangential & Resultant Stresses due to Direct Orthogonal Stresses & Shear Stress 5.2 Numerical based on 5.1 5.3 Formulae for Principal Stresses and for Location of Principal Planes 5.4 Numerical based on 5.3 5.5 Mohr's Circle and its application for 5.1 & 5.3 5.6 Numerical based on 5.1 , 5.3 Graphically

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	**Fixed Beam**	06	01	02	04	07
II	**Slope & Deflection**	04	01	02	04	07
III	**Continuous Beam**	12	04	03	14	21
IV	**Combined Direct & Bending Stresses**	08	03	04	07	14
V	**Principle Stresses & Principle Planes**	12	02	05	14	21
	Total	**42**	**11**	**16**	**43**	**70**

Legends: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised taxonomy)
Note: This specification table shall be treated as only general guideline for students and teachers. The actual Distribution of marks in the question paper may vary slightly from above table

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**Course outcomes in psychomotor and effective domain**) so that students are able to acquire the competency. Following is the list of experiments for guidance.

S. No.	Unit No.	Practical/Exercise	Apprx. Hrs. Required
1	I	Solve at least ten problems pertaining to Unit – I	02
2	II	Perform Deflection test on a Simply Supported beam with different sectional properties (material, c/s dimensions etc)	02
3	II	Perform Deflection test on a cantilever beam with different sectional properties (material, c/s dimensions etc)	02
4	II	Perform Deflection test on a fixed beam with different sectional properties (material, c/s dimensions etc)	02
5	II	Solve at least six problems pertaining to Unit – II	02
6	III	Solve at least Six problems pertaining to Unit – III	06
7	IV	Solve at Least Four numerical Problems of Unit- IV	04
8	V	Solve at least Eight problems pertaining to Unit – V	08
		TOTAL	**28**

7. SUGGESTED LIST OF STUDENT ACTIVITIES

1. Conduct a mini project in which a group of students will practically verify the effect of cross section , end conditions on the deflection of beams .
2. Site Visit to understand Retaining Wall structure ,Dam and indeterminate structures

8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

1. Demonstration of Models & Charts of Indeterminate Structures , Dams & retaining wall & field Visits

9. SUGGESTED LEARNING

RESOURCES (A) List of Books:

S. No.	Title of Books	Author	Publication
1.	Strength of Material & Mechanics of Structures	Dr. B C Punamia	Standard Publication
2.	Strength of Material	S RAMAMURTHAN	Dhanpat Rai Publication
3.	Strength of Material	Timo Shanko	Tata Mcgraw Hill
4.	Theory of Structures	R S KHURMI	S Chand
5.	Theory of Structures – vol I & II	S B Junarkar H J Shah	Charotar Publication

B. List of Major Equipment/Materials

1. Cantilever Beam, Fixed & Simply Supported Beam model to measure defelection

C. List of Software/Learning Websites

1. www.csiberkeley.com
2. www.gtstrudl.gate
3. www.ramint.com

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

1. PROF. B G RAJGOR, H.O.D, APP. MECH. , BBIT , V V NAGAR
2. Prof. K.VENKATESHWARLU , H.O.D , T F G , Adipur
3. PROF. B.G.Bhankhar, H.O.D, APP. MECH. G.P.Ahmedabad
4. PROF. J H GABRA , I/C H.O.D , APP. MECH. , G.P , GODHRA
5. Prof. C.H.BHATT , DR. S.&S.S. GHANDHY COLLEGE, SURAT
6. Prof. K K PATEL , H.O.D , G . P RAJKOT

Coordinator and Faculty Members from NITTTR Bhopal