GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: STRUCTURE
(Code: 3345006)

Diploma Programme in which this course is offered	Semester in which offered
Architectural Assistantship	4th Semester

1. Rationale:

Knowledge and understanding of various types of civil engineering structures is very important for architects in order to draw details of various civil engineering projects. It is essential to draw details before execution of any projects. This course imparts basic concepts of mechanics along with its classification as well as concepts, principles, applications and practice covering coplanar concurrent force system, coplanar non-concurrent force system, centre of gravity, bending moment and shear force. This knowledge is required to understand basics of civil engineering structures. The course is designed in such a manner so that the students get knowledge and understanding of various types of civil engineering structures. At diploma level students are expected to develop their understanding about these aspects of various civil engineering works in order to apply their knowledge and skills in preparing architectural drawings of various structures.

2. Competency

The course content should be taught and curriculum should be implemented with the aim to develop required skills so that students are able to acquire following competency

- **Design simple civil structures**

3. COURSE OUTCOMES (COs)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Explain concept of force and different force system
ii. Calculate forces in different types of structures under various types of loads
iii. List basic structural elements and systems
iv. Enlist various factors affecting structural changes that occur in different members of a structure due to various loads acting on them
v. Apply various laws of mechanics in various civil engineering structures
vi. Draw shear force and bending moment diagrams for different types of beams under different load conditions.

4. Teaching and Examination Scheme

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	S/T	P	C	ESE	PA	ESE	PA	
3	0	0	3	70	30	0	0	100

Legends: L-Lecture; **S/T**- Tutorial/Teacher guided theory Practice – Studio; **P** - Practical; **C** – Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5. Detailed Course Content:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Introduction	1a. Explain the concept of mechanics 1b. Classify scalar and vector quantities 1c. Differentiate the systems of units	1.1.1 Classification of mechanics 1.1.2 Scalar and vector quantities 1.1.3 Fundamental units and derived units 1.1.4 International systems of units 1.1.5 S.I. Units of different quantities
Unit – II Coplanar concurrent force system	2a. Explain the concept of force and various force system 2b. Compute resultant of forces 2c. Apply condition of Equilibrium and its conditions 2d. Apply Lami's theorem 2e. Understand concept of free body diagram	2.1.1 Concept of force 2.1.2 Classification of forces 2.2.1 Resultant of force 2.2.2 Law of superposition 2.2.3 Law of transmissibility 2.2.4 Law of parallelogram of forces 2.2.5 Law of triangle of forces 2.2.6 Law of polygon of forces 2.2.7 Resolution of forces (analytically) 2.3.1 Equilibrium 2.3.2 Conditions of equilibrium 2.4.1 Lami's theorem 2.5.1 Free body diagram
Unit – III Coplanar non-concurrent force system	3a. Describe the concept of moment 3b. Describe the concept of couple and differentiate between moment and couple 3c. Calculate support reactions in various determinate structures	3.1.1 Principle of moment 3.1.2 Definition of moment of a force 3.1.3 Magnitude of moment 3.2.1 Couple and its properties 3.2.2 Difference between moment of a force and couple 3.2.3 Conditions of equilibrium 3.3.1 Different types of statically determinate beams 3.3.2 Types of loads 3.3.3 Types of supports 3.3.4 Reactions of beam supports
Unit – IV Centre of gravity	4a. Differentiate between centroid and centre of gravity 4b. Compute centroid of line and area 4c. Compute centre of gravity of solids	4.1.1 Centroid 4.1.2 Centroid of simple geometric areas 4.1.3 Centroid of composite areas 4.1.4 Methods to find a centroid 4.1.5 Centre of gravity of solids

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – V Shear force and bending moment	5a. Explain the concept of shear force and bending moment 5b. Draw shear force and bending moment diagram for statically determinate beams	5.1.1 Definition of shear force and bending moment 5.1.2 Shear force and bending moment diagram for simply supported beam 5.1.3 Shear force and bending moment diagram for cantilever beam 5.1.4 Shear force and bending moment diagram for overhang beam 5.2.1 Point of contraflexure and its importance 5.2.2 Inter relation between shear force and bending moment diagram

6. SUGGESTED SPECIFICATION TABLE WITH HOURS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction	04	04	02	00	06
II	Coplanar concurrent force system	08	02	02	10	14
III	Coplanar non-concurrent force system	12	04	04	12	20
IV	Centre of gravity	06	02	02	06	10
V	Shear force and bending moment	12	04	00	16	20
	Total Hrs	**42**	**16**	**10**	**44**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (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 from above table.

7. SUGGESTED LIST OF EXERCISES/PRACTICALS

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8. SUGGESTED LIST OF STUDENT ACTIVITIES

Do as many numerical problems and design as many simple structures as possible. In case of any difficulty, discuss with your peers, senior students or teachers.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If any)

i. Arrange visit to engineering mechanics laboratory and demonstrate practical exercise to get more familiar with fundamentals of applied mechanics.

ii. Ask students to design simple structures in class and solve their problems if any then and there.

10. SUGGESTED LEARNING RESOURCES:

A. List of Books

Sr. No.	Title of Book/Journals	Author	Publication
1.	Engineering Mechanics	R.S. Khurmi	S. Chand, New Delhi
2.	Applied Mechanics	H J Shah and Junarkar	Charotar Publication
3.	Strength of Materials	S. Ramamurtham, R. Narayan	Dhanpat Rai Publishing company (P) Limited
4.	Strength of Materials	Dr. B.C. Punmia	Laxmi Publications

B. List of Major Equipment/ Instrument

-NIL-

C. List of Software/Learning Websites

All relevant websites related to structural design

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. P.R. Marfatia,** Lecturer in Civil, Govt. Polytechnic for girls, Surat
- **Prof. A.R. Rathod,** Lecturer in Architecture, Govt. Polytechnic for girls, Ahmedabad
- **Prof. R.T. Dabhi,** Lecturer in Architecture, Govt. Polytechnic, Vadnagar

Co-ordinator and Faculty Members from NITTTR Bhopal

- **Prof. M. C. Paliwal**, Dept of Civil & Environment Engineering
- **Dr J.P.Tegar,** Dept of Civil & Environment Engineering