

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**CIVIL ENGINEERING**  
**B. E. SEMESTER: VII**

Subject Name: **Advanced Structural Analysis (Department Elective - I)**  
 Subject Code: **170605**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
4	2	0	6	70	30	30	20

Sr. No	Course Content
1.	<p><b>Stiffness Method (Member Approach) :</b></p> <p>Overview of different stiffness &amp; rotation-transformation matrices, analysis of beam, truss, plane frame with external load and secondary effects, Analysis of Grid &amp; Space structures under loading &amp; various secondary effects like deformation of support, prestrain &amp; temperature, Analysis of Composite structures having combination of different types members.</p>
2.	<p><b>Stiffness Method (Special topics )</b></p> <p>Symmetry/Anti-symmetry, Oblique, supports Elastic supports, Axial-flexural interaction.</p> <p><b>Nonlinear Analysis :</b></p> <p>Concepts of nonlinearity like Material nonlinearity, Geometry nonlinearity &amp; Nonlinear analysis.</p>
3.	<p><b>Finite Element Method:</b></p> <p>Introduction to FEM, Types of problems, Stresses &amp; Equilibrium, Strain-displacement relations, Stress-strain relations. Application of FEM to One dimensional (bar &amp; beam) problems &amp; two dimensional problems using Constant strain triangles. Two dimensional iso-parametric elements – Four noded quadrilateral elements, numerical integration, higher order elements.</p>
4.	<p><b>Computer Applications:</b></p> <p>Algorithm of Stiffness method Member Approach/Finite Element method. Different techniques for solution of equations using matrices, banded matrix, storage techniques for large size problem. Development of computer programs for analysis of skeletal structures using C/ C++. Application of professional software for structural analysis and design of real life structures.</p>

## **All Topics Carries equal weightage.**

### **TERM WORK:**

Term work shall consists of

- (a) Minimum 5 problems from each topics no.1, 2 & 3 & cross checking with any professional software and/or user made program.
- (b) C/C++ Programs with inputs/outputs for one skeletal structure.
- (c) Analysis of at least one real-life structure using Professional software.

### **USEFUL SOFTWARE:**

STAAD-Pro/STRUDS/SAP-2000/STRAP/ETABS/ANSYS/VC++

### **Text Books:**

1. Gere & Weaver ; Matrix Analysis of Framed Structures, CBS Publication
2. Bhavikatti; Finite Element Analysis, New Age International Publishers

### **Reference Books:**

1. Meghre & Deshmukh ; Matrix Analysis of Structures, Charotar Publication
2. Desai & Abel; Finite Element Method, Tata Mcgrawhill
3. S S Khandare; CAD Application
4. Shesa Prakash & suresh, Computer Aided Design Lab, Laxmi Publication.