GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL (STRUCTURAL ENGINEERING) (20)

STRUCTURAL OPTIMIZATION

SUBJECT CODE: 2722012

SEMESTER: II

Type of course: Elective

Prerequisite:

Rationale: The basic requirement of an efficient structural design is that the response of the structure should be acceptable as per various specifications, i.e., it should at least be a feasible design. There can be large number of feasible designs, but it is desirable to choose the best from these several designs. The best design, optimal design, could be in terms of minimum cost, minimum weight or maximum performance or a combination of these. Thus, optimization techniques play an important role in structural design. The purpose of optimization is to find the best solutions from which a designer can derive a maximum benefit from the available resources.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks		Practical Marks				
L	T	P	C	ESE (E)	PA (M)	ESE (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2#	0	4	70	30	30	0	10	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction to optimization, optimization techniques for unconstrained and constrained optimization problems	08	20
2	Classical Optimization, Lagrange Multiplier technique and Kuhn – Tucker conditions	08	20
3	Solution of NLP by direct methods and by series of unconstrained optimization problems, formulation of different types of structural optimization problems.	08	20
4	Computation of derivatives of response quantities with respect to design variables.	08	15
5	Minimum weight design of trusses, frame, etc.	08	20
6	Introduction Genetic Algorithm	02	5

Reference Books:

1. Optimization theory & application S. S. Rao
2. Structural optimization Majid

3. Advanced mathematics Kresysig
4. Numerical analysis Scarborough
5. Foundation of structural optimization Marris
6. Optimum Structural Design Spunt
7. Optimum Structural Design Uri Krisch

Course Outcome:

After learning the course the students should be able to:

(a) understand optimization techniques,
(b) classify the optimization problems,
(c) derive response quantities corresponding to design variable,
(d) apply optimization techniques to trusses, beams and frames.

List of Open Source Software/learning website:

http://nptel.ac.in/
http://ocw.mit.edu/courses/civil-and-environmental-engineering/

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website