

Branch Name:	Civil Engineering (Structural Engineering)
Semester/Year:	Semester II / First Year
Subject Title:	Structural Optimization
Subject Code:	2ET2060205T
Pre-requisite Subject:	--

Course Objective:

1. To introduce the concepts of design optimization and review major conventional and modern optimization methods used in structural optimization applications.
2. To understand the formulation of structural optimization problems.
3. To get familiarized with the application of linear and non-linear programming to structural optimization.
4. To get exposed to unconstrained and constrained optimization.
5. To understand direct and indirect methods, direct search and gradient methods.

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
5	3	2	-	5	24	60	16	40	-	-	-	-	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
01	Introduction to optimization, optimization techniques for unconstrained and constrained optimization problems	08	20
02	Classical Optimization, Lagrange Multiplier technique and Kuhn – Tucker conditions	08	20
03	Solution of NLP by direct methods and by series of unconstrained optimization problems, formulation of different types of structural optimization problems.	08	20
04	Computation of derivatives of response quantities with respect to design variables.	08	15
05	Minimum weight design of trusses, frame, etc.	08	20
06	Introduction Genetic Algorithm	02	5

List of References:

1. Optimization theory & application S. S. Rao
2. Structural optimization Majid
3. Advanced mathematics Kreysig
4. Numerical analysis Scarborough
5. Optimum Structural optimization Marris
6. Optimum Structural Design Spunt
7. Optimum Structural Design Uri Krisch

Course Learning Outcomes:

After learning the course, the students should be able to:

1. understand optimization techniques,

2. classify the optimization problems,
3. derive response quantities corresponding to design variable,
4. 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/>

Course Learning Outcomes (CLO):

After successful completion of the course the students shall be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	understand optimization techniques.	L-1, L-2
CLO2	classify the optimization problems.	L-1, L-2, L-5
CLO3	derive response quantities corresponding to design variable.	L-1, L-2, L-5
CLO4	apply optimization techniques to trusses, beams and frames.	L-1, L-2, L-3

L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

Mapping of CLOs with Pos & PSOs

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	M	M	M									M		M	
CLO2	M	M	M	M			M					M	M	M	M
CLO3	M	M	M	M	M	M						M	M	M	M
CLO4	M	M	M	M		M	M					M	M	M	M

H:High, M:Medium, L:Low