

Foundations of Optimization - Video course

COURSE OUTLINE

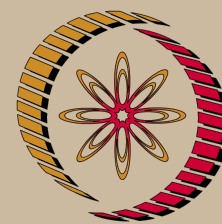
This course will deal with the fundamentals of optimization theory and algorithms. This course will be delivered for a wide audience consisting of science and engineering students. Mathematically oriented business students will profit from it.

This course will stress on the basic theory of optimization of differentiable functions and also discuss in detail the important numerical algorithms to solve such problems.

Motivating examples will be provided throughout the course

COURSE DETAIL

S. No.	Lectures/ Topics
1	Basic facts about maxima and minima
2	Examples and modeling
3	Mathematical Prerequisites
4	Optimality conditions for Unconstrained Optimization
5	The Steepest Descent Method
6	Convergence analysis of Steepest Descent Method
7	Newtons Method and Convergence Analysis
8	Quasi Newton Methods-1
9	Quasi Newton Methods -2
10	Conjugate Gradient Method-1
11	Conjugate Gradient Method-2
12	Fundamentals of Constrained Optimization



NP-TEL

NPTEL

<http://nptel.ac.in>

Mathematics

Pre-requisites:

Calculus of several variables and linear algebra

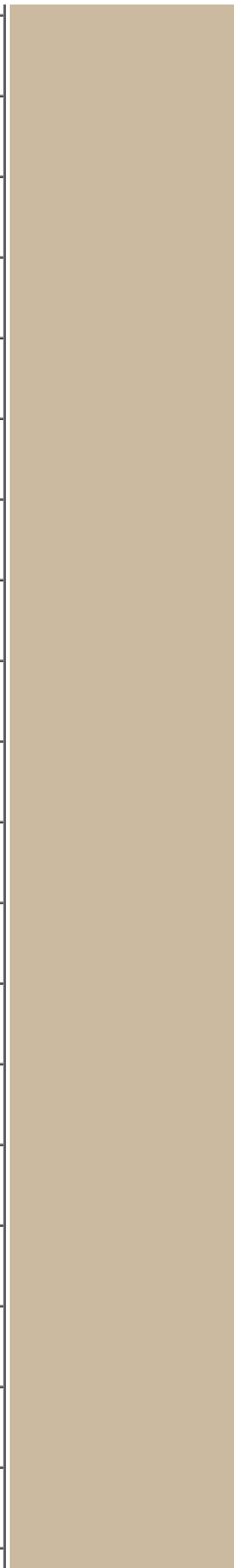
Hyperlinks:

Will be told during the lectures.

Coordinators:

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13	Minimizing a differentiable function over a convex set
14	Karush-Kuhn-Tucker Conditions-1
15	Karush-Kuhn-Tucker Conditions-2
16	Active-Set Method
17	Quadratic Optimization-1
18	Quadratic Optimization-2
19	Quadratic Optimization-3
20	Penalty Function Method
21	Penalty Functions and Karush-Kuhn-Tucker Conditions
22	Sequential Quadratic Programming-1
23	Sequential Quadratic Programming-2
24	Conic Optimization
25	Semi-definite Programming-1
26	Semi-definite Programming-2
27	Lagrangian Relaxations for Integer Programming
28	SDP relaxations for quadratic integer programming
29	The S-Lemma and Quadratic Programming Duality-1
30	The S-Lemma and Quadratic Programming Duality-2
31	Duality in optimization



32	Duality in conic and semidefinite programming
33	Trust Region Methods-1
34	Trust Region Methods-2
35	Derivative Free Optimization-1
36	Derivative Free Optimization-2
37	Derivative Free Optimization-3
38	Derivative Free Optimization-4
39	Derivative Free Optimization-5
40	Introduction to Calculus of Variations.

'DESIGN PARADIGM: SOURCE OF INNOVATION & INVENTION'

Amit Ray

LECTURES & COURSE MODULE

Module No.	Title	Issues	No. of lectures
01.	Introduction to Design Paradigm	What is Design Paradigm? ; Recognizing Paradigm; Paradigm & Metaphors; Paradigm & Design Relationship	03
02.	Design & Natural Phenomenon	Paradigm in Nature; About Biomimicry	02=05
03.	Human Body	Paradigm in Human Body	01=06
04.	Where Does Form Come From?	'Form Follows Function'	01=07
05.	Design, Paradigm & Science of Design	A comparison between the modern design and a brief historical look at the traditional; not wholly conscious ways of designing and developing artifacts	02=09

06.	Natural Development in Traditional Design	Man's adoption of changing environment, rigidity in traditional design	02=11
07.	Design-Nature Relationship	Wealth of nature's design; modular design	02=13
08.	Simple Shape Paradigm	Basic Geometrics; Platonic Solids (Five Simple Solids); Simple applications in Packaging Design	03=16
09.	Paradigm in Nature	Simple Paradigms- Ball, Disc, Tube, Coil, Helicoids, Spiral, Spoon, Cup, Jar, Bottle, Bubble, Blister, Skin, etc. Möbius Strip, Wrap, Pipe, Bag,	04=20
10.	Bending & Flexing	Sapling, Hinges, Elbow, Ball & Socket, Gooseneck, Nitinol	03=23
11.	Bigger & Smaller	Growth, Expansion & Contraction, Swelling & Squashing, Spring, Arms & Legs, Wing, Scissors, Screw, Flower, etc.	04=27
12.	Joining	Zipper, Sewing, Welding, Ball & Socket, Universal Joints, Knots, Bridge, etc.	03=30
13.	Attaching	Glue, Adhesive Tape, Clips & Clamps, Magnet	02=32
14.	Passages	Pipe, Bottleneck, Wire, Filter, Strainer, Canal, etc.	02=34
15.	Complex Paradigms	Combination of multiple simple paradigm forming complex paradigms- Nested Spoon, etc.	02=36
16.	Objects within Objects	Peas, Egg, Coconut, Pregnant Woman, Oyster, etc.	02=38
17.	Application of Paradigm	Using Paradigm for Product Design	02=40
Total			40

References:

Will be mentioned during the lectures.