

1.	Title of the course	Computational Methods in Optimization
2.	Course number	CS5107
3.	Status of the course	Core
4.	Structure of credits	3-0-0-3
5.	Offered to	PG
6.	New course/modification to	New course
7.	To be offered by	Department of Computer Science and Engineering
8.	To take effect from	July 2020
9.	Prerequisite	Nil
10.	Whether approved by the Department	Yes
11.	Course Objective(s): To develop an understanding of analytical and computational approach to different optimization techniques. To impart skills to model problems in the context of an optimization framework.	
12.	Course Content: Linear programming: introduction to linear optimization, geometry of linear programming, simplex method, duality theory, sensitivity analysis, integer programming formulations; Nonlinear programming: convex set, Lagrange multiplier, gradient methods, necessary and sufficient condition, Karush-Kuhn-Tucker (KKT) conditions; Stochastic optimization: stochastic gradient descent, dynamic programming, Markov Chain Monte Carlo (MCMC) based optimization; Introduction to heuristic search.	
13.	Textbook(s): 1. Nocedal J and Wright S, <i>Numerical Optimization</i> , 2nd Edition, Springer (2006). 2. Winston W L, <i>Operations Research: Applications and Algorithms</i> , 4th Edition, Thomson Learning (2004).	
14.	Reference(s): 1. Bertsekas D P, <i>Dynamic Programming and Optimal Control Volume I</i> , 4th Edition, Athena Scientific (2005). 2. Bertsekas D P, <i>Nonlinear Programming</i> , 2nd Edition, Athena Scientific (1999). 3. Bertsimas D and Tsitsiklis J N, <i>Introduction to Linear Optimization</i> , 1st Edition, Athena Scientific (1997). 4. Schrijver A, <i>Theory of Linear and Integer Programming</i> , 1st Edition, Wiley (1998).	