



OPTIMIZATION METHODS FOR CIVIL ENGINEERING

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INTENDED AUDIENCE : PG Students, Research Scholar and B. Tech(Final Year)

COURSE OUTLINE :

The primary objectives of the course are to introducing the students to the fundamentals of classical optimization techniques and also exposing them to the theory of different non-classical optimization methods and algorithms developed for solving various types of civil engineering optimization problems. The course will also enable the students to apply the various classical and non-classical optimization techniques in solving real-world optimization problems by using Matlab and MS Excel. At the end of this course, students will be able to understand the importance of optimization, apply basic concepts of mathematics to formulate an optimization problem, analyze and appreciate a variety of performance measures for various optimization problems. This will encourage the students to use optimization techniques in solving real-world civil engineering design and planning problems and will promote research interest in optimization techniques.

ABOUT INSTRUCTOR :

Prof. Rajib Kumar Bhattacharjya is a Professor in the Department of Civil Engineering, Indian Institute of Technology Guwahati, India. Before joining the Indian Institute of Technology Guwahati, he worked in the Department of Civil Engineering, National Institute of Technology Silchar (July 1997-May 2008), and also at Jorhat Engineering College, Jorhat Assam (May 1995- July 1997). He received his Bachelor and Master's Degree in Civil Engineering from Gauhati University, India in the year 1993 and 1995 respectively, and Ph.D. in Civil Engineering from Indian Institute of Technology Kanpur, India, in the year 2004. His current research interests include Water resources management, Climate change, groundwater management and pollution control, management of saltwater intrusion in coastal aquifers, classical and non-classical optimization methods, and artificial neural networks. He has more than 20 years of teaching and research experience and has authored more than 90 peer-reviewed scientific publications in various reputed international journals and conference proceedings. He has jointly edited several books, including Urban Hydrology, Watershed Management and Socio-Economic Aspects (Springer 2016), Urban Ecology, Water Quality and Climate Change (Springer 2018), Nature-Inspired Methods for Metaheuristic Optimization: Algorithms and Applications in Science and Engineering (Springer 2020), etc. He has implemented several research projects related to water resources management as PI and Co-PI. He has also been a visiting professor at other institutes, including the Dalhousie University, Halifax, Canada, Ecole Centrale Nantes, France, and the National Institute of Technology Meghalaya. He also received training at IHE, Delft on Integrated River Basin Management.

COURSE PLAN :

- Week 1:** Introduction to optimization
- Week 2:** Linear Programming Problem
- Week 3:** Classical Optimization methods
- Week 4:** Classical Optimization methods (continued)
- Week 5:** Classical Optimization methods (continued)
- Week 6:** Classical Optimization methods (continued)
- Week 7:** Metaheuristic optimization algorithms
- Week 8:** Metaheuristic optimization algorithms (continued)
- Week 9:** Metaheuristic optimization algorithms (continued)
- Week 10:** Engineering application using Matlab and Excel solver
- Week 11:** Engineering application using Matlab and Excel solver (continued)
- Week 12:** Civil Engineering Applications