# OPTIMIZATION FROM FUNDAMENTALS

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**INTENDED AUDIENCE :** Mathematics, any engineering and science discipline

**COURSE OUTLINE :**
This course will cover the topic of Optimization from its fundamentals. It will start with an overview of real analysis and convexity. With this base it will cover linear programming, convex optimization and nonlinear programming, complementarity problems and algorithms for the same. We will end with dynamic optimization.

**ABOUT INSTRUCTOR :**
Prof. Ankur is an Associate Professor with the Systems and Control Engineering group at Indian Institute of Technology Bombay (IITB). He received his B.Tech. from IITB in 2006, M.S. in 2008 and Ph.D. in 2010, both from the University of Illinois at Urbana-Champaign (UIUC). From 2010-2012 he was a post-doctoral researcher at the Coordinated Science Laboratory at UIUC. His research interests include information theory, the role of information in stochastic control, game theory, combinatorial coding theory problems, optimization and variational inequalities, and operations research. He is an Associate (from 20152018) of the Indian Academy of Sciences, Bangalore, a recipient of the INSPIRE Faculty Award of the Department of Science and Technology, Government of India, 2013, Best paper awards at the National Conference on Communications, 2017, Indian Control Conference, 2018, International Conference on Signal Processing and Communications (SPCOM) 2018, Excellence in Teaching Award 2018 at IITB and the William A. Chittenden Award, 2008 at UIUC. He was a consultant to the Securities and Exchange Board of India on regulation of high frequency trading. He has been a visiting faculty at MIT, USA, University of Cambridge, UK, NUS, Singapore and IISc Bangalore.

**COURSE PLAN :**

**Week 1:** Introduction to optimization and overview of real analysis
**Week 2:** Optimization over open sets
**Week 3:** Optimization over surface
**Week 4:** Transformation of optimization problems and convex analysis
**Week 5:** Introduction to linear programming
**Week 6:** Linear programming and duality
**Week 7:** Linear programming and duality
**Week 8:** Nonlinear and convex optimization
**Week 9:** Nonlinear and convex optimization
**Week 10:** Algorithms
**Week 11:** Algorithms
**Week 12:** Dynamic optimization