

# INDIAN INSTITUTE OF TECHNOLOGY INDORE

Department of Mathematics

Organizes

SHORT TERM COURSE

on

MATHEMATICAL OPTIMIZATION & APPLICATIONS

March 22-27, 2021



Supported by AICTE/MHRD



## OVERVIEW OF THE COURSE:

Mathematical optimization is known to be a connecting link between various disciplines of science and engineering, where optimization is studied in different setting. This short-term course introduces fundamental ideas of mathematical optimization, building upon on solution strategies, along with the discussions on the practical aspects of optimization in a broad spectrum of areas. One half of the course is focused on a thorough review of linear and non-linear optimization while the other half is focused on introducing various research areas of theoretical as well as applications of optimization.

## HOW DOES IT BENEFIT FACULTY:

The contents of the course are developed keeping in view the interest of faculty participants from various backgrounds. This course gives a deeper understanding of the basic concepts of optimization that helps participants to develop a more matured view of mathematical aspects of optimization. Further, this course exposes them to various developments both in the theory and applications of optimization where the use of optimization principles are employed.

## COURSE FACULTY

- Dr. Joydeep Dutta, IIT Kanpur
- Dr. Aparna Mehra, IIT Delhi
- Dr. Sk Safique Ahmad, IIT Indore
- Dr. Ashisha Kumar, IIT Indore.
- Dr. Sinnu Susan Thomas, IITM-Kerala
- Dr. Srilatha Chebrolu, NIT Andhra Pradesh
- Dr. Suvendu Ranjan Pattanaik, NIT Rourkela
- Dr. A. Chandrashekar, Central University of Tamil Nadu.
- Dr. Sushama C M, NIT Calicut
- Dr. Puneet Sharma, IIT Jodhpur
- Dr. Balendu Bhooshan Upadhyay, IIT Patna
- Dr. Sriram Sankaranarayanan, IIM Ahmedabad
- Dr. Charitha Cherugondi, IIT Indore (Coordinator)

## COURSE SYLLABUS:

- Introduction to Linear Programming, Simplex Method, Big M method/Two Phase method, Duality and Dual Simplex method.
- Integer Programming, Branch and Bound methods, Cutting plane algorithms, Transportation models, Assignment problems.
- Introduction to Linear Complementarity problems, Variational inequalities: equivalent optimization reformulations through gap functions.
- Characterizations of convex functions, First and Second order necessary and sufficient optimality conditions for constrained optimization. Constrained optimization with equality constraints, Lagrange multipliers, projected gradient methods with equality constraints.
- Gradient and sub-gradient descent methods, complexity of the algorithms in convex optimization. Fitzpatrick functions, the sum problem of maximal monotone operators, resolvents and reflectors, the Douglas-Rachford splitting operator.
- Gaussian Processes in Machine Learning and Bayesian Optimization. Data envelopment analysis in connection with multi objective optimization.
- Least-squares Problem for Matrices: QR Factorization and Singular Value Decomposition, Portfolio optimization, Decision making in competitive markets, Computation of Nash equilibria, Traffic equilibrium.

**MODE OF CONDUCT OF COURSE:** ONLINE (google meet link will be provided for the registered participants)

**REGISTRATION PROCESS:** ONLINE only (link given at the bottom)

**REGISTRATION DEADLINE:** 20-03-2021

## REGISTRATION FEES:

- **NO FEE** for **faculty participants** from Colleges/Institutes and Universities **approved by AICTE**
- **Rs. 2000/-** per faculty/researcher for those from **Non-AICTE** institutions/universities/colleges.
- **Rs. 5000/-** per participant for those from industry.

**CERTIFICATE:** Participants who successfully complete the course will be awarded with an e-certificate.

**FOR ANY QUERIES:** write to [mathopt21@gmail.com](mailto:mathopt21@gmail.com)

## MODE OF PAYMENT (Non-AICTE colleges/industry)

**Online payment:** [https://paytm.com/education/Madhya\\_Pradesh/Indore/Indian\\_Institute\\_of\\_Technology\\_Indore\\_\(IITI\)/Registration\\_Fee\\_For\\_New\\_Students/New\\_Registration?utm\\_source=web&utm\\_medium=smarturl&utm\\_campaign=feeweb&utm\\_term=fees](https://paytm.com/education/Madhya_Pradesh/Indore/Indian_Institute_of_Technology_Indore_(IITI)/Registration_Fee_For_New_Students/New_Registration?utm_source=web&utm_medium=smarturl&utm_campaign=feeweb&utm_term=fees)

## Bank Transfer: (Through NEFT/IMPS to the below A/c)

Name of the Beneficiary: Registrar, IIT Indore  
Bank name & Branch : Canara bank, Simrol IIT, Indore  
Account No: 1476101027440  
IFSC Code: CNRB0006223

**\*\*Faculty participants from AICTE colleges do not need to pay**

**REGISTRATION LINK:** <https://forms.gle/WbA86r5CGUnoxaAf7>

**REGISTRATION DEADLINE:** 20-03-2021

## COURSE COORDINATOR:

**Dr. Charitha Cherugondi**

Department of Mathematics

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