COMPUTATIONAL COMPLEXITY THEORY

RAGHUNATH TEWARI
Department of Computer Science and Engineering
IIT Kanpur

TYPE OF COURSE : New | Elective | UG/PG
COURSE DURATION : 12 Weeks (18 Jan' 21 - 09 Apr' 21)
EXAM DATE : 25 Apr 2021

PRE-REQUISITES : Design and Analysis of Algorithms, Theory of Computation

INTENDED AUDIENCE : Advanced undergraduate and postgraduate students

COURSE OUTLINE :
In this course we study mathematical techniques that enable us to show the power and limitations of various computational models. We consider these models by putting restrictions on the resources that the model can use and study the class of problems that are solvable by these models. We also compare the various classes that are thus obtained and try to give relations between them.

ABOUT INSTRUCTOR :
Raghunath Tewari is an Associate Professor in the department of Computer Science and Engineering at IIT Kanpur. His research interests lie in the areas of computational complexity theory, algorithms and graph theory.

COURSE PLAN :

Week 1**:** NP Completeness

Week 2**:** Hierarchy Theorems, Space Complexity

Week 3**:** Space Complexity (Cont'd)

Week 4**:** Polynomial Hierarchy

Week 5**:** Circuit Complexity

Week 6**:** Randomized Complexity

Week 7**:** Valiant Vazirani Theorem

Week 8**:** Toda’s Theorem, Complexity of Permanent function

Week 9**:** Interactive Proofs

Week 10**:** Interactive Proofs (contd)

Week 11**:** Circuit Lower Bounds

Week 12**:** Communication Complexity, PCP Theorem