CS 4030 Computational Complexity
Slot F Lecture Hall: ELHC 403

Course Contents:

Time and Space complexity classes – inclusions - Hierarchy theorems, Savitch Theorem, Immemerman Szcelepscenyi theorem.

Basic time and space complexity classes – L, NL, POLYL, P, NP, PSPACE, EXP, NEXP Reductions and completeness. Turing reductions, Baker Gill solovey Theorem, Ladner's theorem.

Circuit complexity, P/POLY, parallel complexity NC, P completeness. relationship between cirucit size/depth with deterministic time/space.

Polynomial hierarchy, Lipton Karp Theorem, #P, Valient's theorem (no proof) Toda's theorem (no proof)

Randomized complexity classes – RP, coRP, BPP and PP. Adleman's theorem, Siper Gacs Theorem.

Interactive Protocols – AM protocol for graph non-isomorphism, evidence of non-NP completeness of graph isomorphism problem – Hash functions – Complexity class IP – Shamir's theorem.

Probababilisitic Proof systems – PCP theorem (no proof), Hardness of approximation results.

References:

1. S. Arora and B. Barak, Computational Complexity – a modern approach, Cambridge University Press, 2009.
2. C. H. Papadimitriou, Computational Complexity, Addison Wesley, 1994.

Evaluation Policy:

Mid semester exam 1: 30%
Mid Semester exam 2: 30%
Final Examination : 40%

20% of the questions (distributed over all the examinations) will cover topics presented through student seminars.