Syllabus

Instructor Name: Raghunath Tewari
Office: RM514
Phone: +91 (512) 259 7174
E-mail: rtewari@cse.iitk.ac.in

Class Logistics
Venue: KD101
Time: Mon and Tue 12 – 1:30pm
Website: [http://www.cse.iitk.ac.in/users/rtewari/cs640.html](http://www.cse.iitk.ac.in/users/rtewari/cs640.html)

Course Syllabus

- Space Complexity. NL completeness. Savitch’s Theorem. Immerman-Szelepsényi Theorem
- Polynomial Hierarchy. Alternating Turing Machines. Time-Space Tradeoff for SAT.
- Circuit Complexity. Polynomial sized circuits. Uniformity. Circuit classes NC and AC.
- Randomized Computations. RP, BPP, ZPP. Relationship between BPP and other classes. Randomized space complexity.
- Interactive Proofs. Various protocols. IP = PSPACE.
- Introduction to PCP and Hardness of Approximation. NP ⊆ PCP(poly(n), 1).
- Communication Complexity. Definition and lower bound techniques.
- Circuit Lower Bounds. Lower bounds on AC^0.
- Counting Complexity. The class #P. Toda’s Theorem.
- Tentative Topics (depending on availability of time). Hardness Amplification and Error Correcting Codes. Derandomization. Average case complexity, Quantum Complexity.

Testing and Grading

Your grades will be based on homework assignments, in-class quizzes, a mid semester exam and a final exam. The following table gives a guideline for evaluating your final grade.

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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Scribing Lecture Notes</td>
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<tr>
<td>Homework</td>
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<td>Quizzes</td>
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<td>Mid Semester Exam</td>
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<td>Project</td>
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<td>Final Exam</td>
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Useful Information

- There will be several homework assignments distributed over the semester. All solutions will not be graded. The instructor would randomly select a few questions per assignment and grade only those.

- You will be given two weeks to complete each assignment, which will be due at the beginning of class on the respective day. Late submissions are strongly discouraged and will be penalised.

- You may collaborate with your classmates on the problems but you MUST write your own solutions. Also, all collaborations that you had, must be clearly stated at the beginning of each question.

- All assignments must be typeset using a mathematical document preparation system such as \LaTeX. Handwritten solutions will not be accepted.

- There will be around 2 quizzes in this course.

- Plagiarism in any form such as cheating, copying, lending your work to others, etc., is very strongly discouraged and will be heavily penalised.

- For the quizzes and exams, you may consult your textbook and notes only. No electronic devices are permitted whatsoever. There will be NO makeup quizzes/exams unless under extreme circumstances, which is solely dependent upon the discretion of the instructor.

- It is strongly encouraged that you attend all lectures.

- Each student will be asked to scribe 1-2 lectures in this course.