# CS 698A: Selected Areas of Mechanism Design

1. **Objectives:** This course is based on selected topics in mechanism design and its relationship with areas like algorithms, optimization etc. These topics include cooperative games, stable matching, games on networks, potential games etc. This is a research-oriented course, hence students are expected to read and present cutting-edge research topics in this area, and also develop writing skills towards a formal technical report.

2. **Departments which may be interested:** CSE, MTH, EE, IME, ECO

3. **Pre-requisites:** Familiarity with formal mathematical reasoning, probability theory, calculus, basics of computational complexity, and familiarity with computer programming. The course expects familiarity with game theoretic ideas and results – hence a course like CS698W or CS656 will be required.

4. **Course Contents:**

   **Part 1:**

   1. Basics of mechanism design theory

   2. Cooperative games

   3. Stable matching theory

   4. Algorithmic aspects of mechanism design

   5. Network games

   6. Potential games

   **Part 2:** Selected papers from leading conferences and journals on the topic that deals with research in mechanism design in the paradigm of artificial intelligence and multi-agent systems.

   Part 1 is the lecture part by the instructor. Part 2 is for the students to survey, read, present papers (with help from the teaching staff) on the state-of-the-art of the topics that includes (but are not limited to) those discussed in Part 1. This part also requires every student to do a course project (aim: to extend the state-of-the-art, deliverables: writing a technical report comparable to a formal publication and an end semester presentation). It is encouraged that the students look out for papers of their interest from the theme of topics relevant for this course. The list of conferences and journals of interest is given in the references.

5. **Evaluation Components & Policies:** One midterm exam (weightage 40%) and one quiz (weightage 10%). The course project and presentation together amounts to 30%. Each student is supposed to scribe 2 lectures which weighs 20%.

6. **Lecture schedule & venue:** Tuesday, Friday 14.00-15.15 hrs, KD 102.

7. **Course webpage:** https://swaprava.wordpress.com/selected-areas-of-mechanism-design/

8. **Teacher**: Swaprava Nath. **Office hours:** via email: swaprava@cse.iitk.ac.in with subject including [CS698A]

9. **Teaching assistant:** Rahul Jain, jain@cse.iitk.ac.in, mail to have his office hours – better to post on Piazza (information available on course homepage).

10. **Course Policies:**

   Attendance for Part 1 of the course is mandatory. If any student has any medical/personal/professional reasons to miss the class, (s)he must be ready to produce documentary evidence for the same. The leave request for personal/professional reasons must be filed through the academic course management system (e.g., OARS or pingala), medical leave must have the health center certificate. In summary, if a student is in campus and in good health, (s)he must attend the classes. **Any leave without the reasons mentioned above may attract a penalty of 10% of the total course score**.

   Honesty practices according to the policy laid down by the CSE department will be followed. For details, see: https://www.cse.iitk.ac.in/pages/AntiCheatingPolicy.html

   **Drop policy:** free drop till 'add courses' deadline. Later on, since part 2 of the course requires student presentation of selected papers, drop is not encouraged when the papers to present are finalized. In any case, drop is not allowed after 1 month into the course.

11. **Books & References:**

   No specific textbook. The references and lecture notes of CS698W will be useful for the basics of game theory and mechanism design. Selected chapters from books and lecture notes that may be useful will be made available during the course. However the students may refer to the following books:

- Martin Osborne and Ariel Rubinstein: A course in game theory
- Y. Narahari: Game theory and mechanism design
- Roth and Sotomayor: Two sided matching – Econometric society monographs
- Vijay Krishna – Auction Theory.
- Debasis Mishra
  Game Theory course notes:http://www.isid.ac.in/~dmishra/gm1doc/notes_2016.pdf
  Mechanism Design course notes:http://www.isid.ac.in/~dmishra/gmdoc/mdnotes.pdf
- Papers from conferences, e.g., (but not limited to) EC, WINE, AAAI, IJCAI, AAMAS, and journals, e.g., Econometrica, Journal of Economic Theory, Games and Economic Behavior etc.