CS202M First Information Sheet

Course-Objectives: To provide students first introduction to mathematical logic with its past and present context and some (meta-)mathematical results. The emphasis will be on propositional languages. The course also aims to give some appreciation of a broad range of logics devised to reason in mathematics and outside it.

Instructor: Dr. Anil Seth. Office address: KD 204, CSE Department.

Syllabus: Syllabus with approximate weekly plan is given on the next page.

Course-Duration: The course will run for the first half (Jan-Feb) of 2023-24-II semester.

Instruction: The course is classroom based with lectures scheduled 8-9 AM on Mon, Wed and Friday every week. Venue of the lectures is room RM101 in CSE department. The students are strongly encouraged to attend lectures for understanding the course. However, there are no marks for attendance.

Meeting-Instructor *(outside class hours):* 3-5 pm on Mondays or by fixing a mutually convenient time over email/discussion forums in course website.

Problem-Solving: There will be 2-3 problem sheets given out at regular intervals during the course. These will be for your practice only, no submission for these is required. The instructor will provide solutions to these problems some days after their being released.

Evaluation: Following is the tentative plan.

1. There will be an exam of 60-90 minutes duration after half-way in the course (say, in the last week of January 2024). This exam has 35% weightage.
2. End of the course exam has 65% weightage.

Course-Website: On IIT K hello portal.

References:

There is no single book which covers even 50% of the course topics. Lectures and class notes may be your most efficient resources for the course material. The lectures will mainly source material from the following.

1. M. Huth and M. Ryan, *Logic in Computer Science: Modelling and Reasoning about Systems*, Cambridge University Press; 2nd edition, August 2004

2. A. S. Troelstra and H. Schwichtenberg, *Basic Proof Theory.* Cambridge Tracts in Theoretical Computer Science 43, Cambridge University Press; 2nd edition, July 2000.

3. G. Priest, *An Introduction to Non-Classical Logic.* Cambridge University Press; 2nd edition, 2008.

Syllabus and Weekly Lectures Plan

Week	Topics
1	**Natural Deduction (ND) rules and examples for Propositional Logic (PL). Minimal, intuitionistic and classical systems.**
2	**Quantifiers, ND rules for quantifiers, Example deductions.**
3	**Lattices, Boolean Algebra (BA), Semantics of classical PL. Soundness and completeness.**
4	**Completeness of two element BA. Some representation results for BA. Normal forms: NNF, CNF DNF and prenex NF.**
5.	**Heyting Algebra, Definition and examples, Kripke structures.**
6.	**Non-classical logics**