

**MA212: Algebra I**  
(2019 Autumn Semester)

**Place & Time:** Math. Building, Lecture Hall LH-3, Tue Thu 11:30 am – 1 pm (Credits 3:0)

**Instructor:** Apoorva Khare

**Office:** Mathematics, X26

**Email:** khare@iisc.ac.in

**Office Hours:** Wed afternoons, by appointment

**Phone:** 2293-2514

**Teaching Assistants, rooms, office hours**

Sneh Bala Sinha	snehasinha@iisc.ac.in	Math Dept, Room R29	Mon	5–6 PM
Surjadipta De Sarkar	poornenduk@iisc.ac.in	Math Dept, Room N11	Fri	5–6 PM

**Course website:** <http://www.math.iisc.ac.in/~khare/teaching.html#2019-212>

**Pre-requisites for Undergraduates:** UM203

**Syllabus:**

*Part A:*

- Groups: definitions & basic examples;
- Normal subgroups, quotients;
- Three isomorphism theorems;
- Centralizer and normalizer of a subset, centre of a group;
- Permutations, symmetric groups and Cayley's theorem;
- Group actions and their applications, Sylow's theorems.

*Part B:*

- Rings and ideals: basic definitions, quotient rings;
- The Chinese Remainder Theorem;
- Maximal and prime ideals;
- Unique factorization, unique factorization domains, principal ideal domains, Euclidean domains, polynomial rings;
- Modules: basic definitions and examples, Hom and tensor products, the Structure Theorem for finitely generated modules over PIDs;
- Fields: basic definitions and examples, algebraic & transcendental numbers;
- Finite fields, characteristic, the order of a finite field.

**Suggested books and references:**

- (1) Artin, M. *Algebra*, Prentice-Hall of India, 1994.
- (2) Dummit, D.S. and Foote, R.M., *Abstract Algebra*, McGraw-Hill, 1986.
- (3) Herstein, I.N., *Topics in Algebra*, John Wiley & Sons, 1995.
- (4) Lang, S., *Algebra* (3rd Ed.), Springer, 2002.

**Grading & Exam Schedule** (Credits 3:0)

Homework	25%	due on Fridays in TA office hours, or earlier in class
Mid-sem	25%	Monday, September 23, 9:30–11 am (Venue TBA)
Final	50%	Thursday December 5, 9:30 am (Venue TBA)

**Homework:**

Homework will be assigned weekly – posted on the course webpage – and is due by Friday of the following week in the TA office hours – or earlier in the week in class. Each student should hand in their independently written solutions, written in their own words.

**Miscellaneous**

- (1) **Exams:** There will be no backup exams, so please be on campus and available for the mid-sem and the final.
- (2) **Emails:** Please write MA212 in the subject heading of all email correspondence with the instructor/TAs. This is in general effective in filtering / weeding out spam email.
- (3) **Homework:** The TAs are responsible for the homework component of the class. We are unable to accept late homework. Homework extensions only delay the grading of solutions.

Please submit HW on time, in the TA office hours on Friday or in class. Do not place your homework under the office doors of the TA/instructor. In the past, homework placed under office doors has sometimes been lost or misplaced.

- (4) **Office Hours:** Please note that it is difficult to discuss mathematics questions by email due to the lack of an appropriate interface. You are encouraged to ask your technical questions during office hours. As the TAs have responsibilities other than this course, please go to them only during office hours (unless prior arrangements have been made).
- (5) **Ethics:** Read the information on the IISc student ethics page.
- (6) In the past poor time management and planning have led to homework being handed in late etc... To be fair to the TAs and your fellow students, please do not unnecessarily burden the teaching team with unreasonable requests. Please be responsible and plan ahead if you have to be away from campus during the semester.