MATH-UA.0348-001 Honors Algebra I, Fall 2020

Instructor Fengbo Hang, WWH 630, 212-998-3221, email: fengbo@cims.nyu.edu

Time and location 11am-12:15pm, Tuesdays and Thursdays, WWH 102

Office hours Wednesdays, 10am-12noon, by zoom.

Recitation section Jumageldi Charyyev, MATH-UA.0348-002, 2:00pm-3:15pm, Fridays, WWH 102

Textbook We will mainly follow
   Topics in algebra (2nd edition) by I. N. Herstein. ISBN-13: 978-0471010906; but discuss examples in
   Algebra by M. Artin. ISBN-13: 978-0134689609;
   from time to time. We will also use
   Algebra by T. W. Hungerford. ISBN-13: 978-0387905181. Available at https://link.springer.com/;
   Chapter II section 4 for group action on a set.

Other references

- Abstract Algebra: Theory and Applications by Judson. Available at http://abstract.ups.edu/

- Abstract Algebra by Dummit and Foote. ISBN-13: 978-0471433347

- http://aimath.org/textbooks/approved-textbooks/

Course description Basic theory of groups, rings and fields.

Course requirements The course meets for lecture twice a week for 75 minutes each class period and you have one recitation of 75 minutes a week. You are also expected to study outside of class, up to four hours for each hour of class. Studying can be reading the book, reviewing notes, practicing problems, or doing homework.

Calculator policy At NYU, undergraduate mathematics is largely conceptual rather than computational. Calculators may be used on homework but do not suffice on problems for which explanation is required. Calculators may not be used on exams.

Course prerequisites MATH-UA 123 Calculus III or MATH-UA 213 Math for Economics III (for Economics majors) and MATH-UA 140 Linear Algebra with a grade of A- or better or the equivalent. Recommended: MATH-UA 129 Honors Calculus III and MATH-UA 148 Honors Linear Algebra with a grade of B+ or better or the equivalent. Honors Algebra I is a conceptually challenging course. Students are assumed to be able to write up good proofs.

Evaluation plan Homeworks will be assigned on every Thursday and due the next Friday after the recitation class. Only pdf file of solutions submitted through NYU Classes are accepted. There will also be a midterm exam and a final exam. These elements will be combined into a course average using the following weights:

Homework	30%
Midterm	30%
Final	40%
Total	100%

Policy on missed and out-of-sequence assessments

In general, out of fairness to the rest of the students in the class, late homework assignments and makeup exams are not possible. We will drop the lowest homeworks to give you "free pass" for any reason.

We may approve a rescheduled or makeup exam in the following cases:

- A documented medical excuse.

- A University-sponsored event such as an athletic tournament, a play, or a musical performance. Athletic practices and rehearsals do not fall into this category. Please present documentation from your coach, conductor, or other faculty advisor describing your absence.

- A religious holiday.

- Extreme hardship such as a family emergency, again with documentation.

Weddings and other special family events do not qualify as any of the above; the free pass is appropriate here. Nor can we reschedule for purposes of more convenient travel, *even if tickets have already been purchased.*

Rescheduled exams (those not arising from emergencies) must be taken prior to your absence. Otherwise, please contact us before you return to class.

If you require additional accommodations as determined by the Moses Center for Student Disabilities, please let us know as soon as possible.

Grading   The weighted average above will be converted to a letter grade beginning with the following scale:

Cutoff	Grade
93%	A
90	A-
87	B+
83	B
80	B-
75	C+
65	C
50	D

As for a "curve", we may lower these cutoffs to create higher letter grades.

Policy on academic integrity   New York University takes plagiarism and cheating very seriously and regards them as a form of fraud. Students are expected to conduct themselves according to the highest ethical standards. These offenses are all considered violations of academic integrity:

- Use of unauthorized resources for completion of assignments (e.g., a solution manual illegally purchased or downloaded or an internet community that provides answers);

- Nondisclosure of collaboration on homework or copying another student's written solution;

- Discussion of a quiz or exam between someone who has taken it and someone who has not;

- Copying another student's quiz or exam;

- Forging documentation to justify a makeup quiz or exam or late assignment.

There are of course other possibilities. We expect you to be familiar with your school's student handbook and its statement of academic integrity. Penalties range from a score of zero on a problem, assignment, quiz, or exam, to a failing grade in the course and notification of the student's dean. Multiple violations can result in dismissal from the university.

Rough schedule of classes   Below is only a rough schedule. Actual pace and contents may be different.

   Students in sec 001-A should do everything remotely. Students in sec 001-B can attend in-person lectures (including recitation section) only during odd number weeks. Students in sec 001-C can attend in-person lectures (including recitation section) only during even number weeks. A student can choose remote learning anytime.

1. 09/03: equivalence relations and partitions, greatest common divisor, prime numbers, unique factorization theorem.

2. 09/08, 09/10: congruence modulo a given number, definition of groups and some examples, basics of groups.

3. 09/15, 09/17: subgroups, cosets, Lagrange theorem, counting for product of subgroups.

4. 09/22, 09/24: homomorphisms, normal subgroup, quotient groups, automorphisms

5. 09/29, 10/01: group action on sets, symmetry (Artin Chapter 5)

6. 10/06, 10/08: symmetry, Cayley's theorem, permutation groups

7. 10/13, 10/15: conjugacy action, Cauchy theorem, Sylow theorems.

8. 10/20, 10/22: **midterm exam on 10/20**. Sylow theorems and applications.

9. 10/27, 10/29: direct product and structure of finite abelian groups

10. 11/03, 11/05: bilinear forms (Artin Chapter 7)

11. 11/10, 11/12: linear groups (Artin Chapter 8)

12. 11/17, 11/19: basics of rings, homomorphisms, ideals and quotient rings.

13. 11/24: integral domain and field, Euclidean rings

14. 12/01, 12/03: examples of Euclidean rings, polynomial rings

15. 12/08, 12/10: unique factorization domains.

16. Final exam: TBA, see Albert.