ALGEBRA I - MATH 5590H AND 5111

Instructor. Sachin Gautam. Office MW 640. gautam.42@osu.edu

COURSE INFORMATION

Homepage. https://people.math.osu.edu/gautam.42/A18/algebra.html

Class time and place. MWF 11.30AM-12.25PM. Cockins 218.

Recitations. TR 11.30AM-12.25PM. Caldwell 177.

Textbook. D.S. Dummit and R.M. Foote, Abstract Algebra, 3rd edition.

Contents.

- *Group Theory.* Definitions, examples, basic properties. Subgroups, cosets, Lagrange's theorem. Group homomorphisms. Normal subgroups. Isomorphism theorems. (Semi)direct product of groups. Group actions, orbits and stabilizers, counting lemmas. The group of automorphisms. Sylow theorems. Finitely generated abelian groups. Compositions series. Nilpotent and solvable groups.
- *Ring Theory.* basic definitions of rings, ideals, homomorphisms, isomorphism theorems. Prime ideals and maximal ideals. Nilradical, primary ideals. Rings of fractions. Chinese remainder theorem. Prime and irreducible elements, PID, UFD, Euclidean domans. Quadratic integer rings.
- Polynomials. Polynomial rings. Irreducibility criteria, symmetric polynomials, discriminant.

Grading. Your overall grade will be determined by:

• *Homework* 15%. Homework will be assigned (almost) each week from the textbook. I will suggest a list of problems for practice and specify 4-6 problems from the list, whose solutions you will have to submit for grading.

Please see course schedule on page 3 for the dates of quizzes and exams.

- Quizzes 10%. There will be 6 short quizzes during the semester.
- Midterms 45%. We will have three in-class midterm exams, each worth 15% of your final grade.
- Final exam 30%.

Further readings. You are encouraged to read about (and present) some interesting topic/problem related to our course. There are a few slots in the course schedule, on page 3, left intentionally for such a discussion session. A list of suggested topics will be made available at:

https://people.math.osu.edu/gautam.42/A18/topics.html

Lecture notes. I will upload my notes, periodically, at the following link. So, in case you miss a class (**not recommended**) you can download the notes.

https://people.math.osu.edu/gautam.42/A18/notes.html

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A word about the class style. I will occasionally assign reading topics in the class, so that you can have sufficient time to think about it and have questions ready. Many of the lectures will be devoted to open discussions and problem sessions, which will be more beneficial if you have already done the reading assignment.

A word about the calendar on page 3. The schedule sketched here is flexible. I have left enough room for discussions, further topics and student presentations. Of course, such things depend very sensitively on how the class is progressing. I will try to keep it up to date, and make the most recent version availablet at:

https://people.math.osu.edu/gautam.42/A18/syllabus.pdf

GENERAL POLICIES

Academic Misconduct. It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp).

Disability Services. Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; http://www.ods.ohio-state.edu/

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Course Schedule

The following schedule is tentative only. You will be notified of any changes by email, or in class. The most recent version of this syllabus will remain available at https://people.math.osu.edu/gautam.42/A18/syllabus.pdf

1 8/21-24Definitions and examples. Subgroups, order, generators. Presentation of a group. Cyclic groups. Pree groups.1.1-1.5, 6.3 2.1-2.4HW 1 due on 8/31 2.1-2.42 8/27-31Cosets, index, normal subgroups, quotient groups. September 3 - Labor day, no class1.6, 3.1-3.3HW2 due on 9/7 Q1 on 8/27 M3 9/4-7Group actions. Counting lemmas. Group acting on itself. 9/4-71.7, 4.1-4.3HW3 due on 9/14 Q2 on 9/7 F4 9/4-7Sylow theorems - applications. Simple groups. 9/10-143.5, 4.4, 4.5No homework No quiz9/10-14Symmetric and alternating group. automorphism. Semidirect products. 63.5, 4.4, 4.5HW 4 due on 9/28 S.1-5.56 0 9/17-21Review. Finitely generated abelian groups. Group of automorphism. Semidirect products. 63.4, 6.1HW5 due on 10/57 7 10/1-14Commutators. Nilpotent groups. Central series 10/1-56.1Q3 on 10/1 M9/24-28 10/8-10Mid term 2 on Wednesday 10/10 Autumn break - Oct. 11,12, no class.7.1-7.4HW6 due on 10/269 10/15-10Isomorphism theorems. Integral domains. Characteristic.7.1-7.4HW6 due on 11/210/12-22 10/29-11/2Hiber Basis theorem. Primary decomposition.7.1-7.4HW6 due on 11/210/22-26 10/29-11/2Lice/alization15.1, 15.2Q5 on 11/2 F10 10/29-11/2Hibert Basis theorem. Primary decomposition.8.1-8.3 9.2, 9.3HW8 due on 11/1610 10/29-11/2Hibert Basis theorem. Primary decomposition.8.1-8.3 9.2, 9.3HW8 due on 11/2612 <b< th=""><th>Week</th><th>Topics</th><th>Sections</th><th>HW/Quiz</th></b<>	Week	Topics	Sections	HW/Quiz	
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 12/3-5
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 Final exam: Thursday 12/13. 10-11.45AM. Location TBD.