MATH 3121 Abstract Algebra

Course Outline - Fall 2023

1.Instructor

Professor Zhu, Yongchang
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Office hour: Friday 4:30-5:30pm

2.Teaching Assistant

GAO, Kailong
e-mail: kgaoab@connect.ust.hk

3.Meeting Time and Venue

Lectures
Date/Time: Tuesday and Thursday 16:30-17:50am,
Venue: 4619

Tutorials
Date/Time, Venue: T1a, Wed. 18:00-18:50; 1409
                                          T1b, Mon. 18-18:50; CYTG009A

4.Course Description

Duration: one semester. Credits: 4 units.
Pre-requisite: Math2121
Exclusion: Math2131

This course covers the following basic topics in algebra:
Sets and relations. Groups, group actions, symmetric groups, symmetry.   Rings and Fields, applications to number theory. Jordan canonical form of square matrices.   Students will investigate the fundamentals of these topics and become able to apply them to solve basic problems in science.

5. Intended Learning Outcomes

Upon successful completion of this course, students should be able to:

1. Recognize and use appropriately important concepts and definitions in algebra.
2. Know the applications of algebra such as symmetry.
3. Understand how the mathematical knowledge students learnt before can be better organized and generalized.
4. Know how to solve problems in algebra.
5. Know how to construct rigorous proofs.

6. Assessment Scheme

a. Examination duration: 2 hours

b. Percentage of course work, examination

Assessment: Assessing Course ILOs

Coursework: 25%   1, 2, 3, 4,
Examination: 75%   1, 3, 4

7. Student Learning Resources

Lecture Notes:
   Lecture Notes can be downloaded at the course home page in Canvas.

   Textbooks:

   J.B. Fraleigh, ``A First Course in Abstract Algebra'', 7th edition, Addison-Wesley.

8. Teaching and Learning Activities

Scheduled activities: 3 hrs (lecture)

9.Course Schedule

Week	Content	Remarks
1	Section 0. Basic set theory. Mappings. Section 1. Complex numbers and roots of unity.	
2	Section 2. Binary operations. Section 4. Groups.	
3	Section 5. Subgroups. Section 6. Cyclic groups.	
4	Section 7. Generating sets and Cayley digraphs. Section 8. Groups of permutations.	
5	Section 9. Orbits, cycles, and the alternating groups, orbits	
6	Section 10. Lagrange Theorem.	
7	Section 11. Direct products and finitely generated abelian groups	Midterm Review
8	Section 12. Symmetry. Section 13. Homomorphisms	.
9	Section 14. Factor groups Section 15. Group actions.	
10	Section 15. Group actions (continued) Section 18. Rings	
11	Section 19. Integral domains.	

12	Section 20. Fermat's and Euler's theorems.	
13	Section 21. The field of quotients of an integral domain. Section 26. Homomorphisms and factor rings	
14	Jordan canonical form of sqaure matrices (lecture notes). Review for Final.	