



Shanghai Jiao Tong University

MA197 Algebra and Number Theory

Term:	December 16, 2019- January 7, 2020	Credits:	4 units
Classroom:	TBD	Teaching Assistant(s):	TBD
Class Hours:	Monday through Friday, 160 mins per teaching day		
Discussion Sessions:	2 hours each week, conducted by teaching assistant(s)		
Total Contact Hours:	64 contact hours (1 contact hour = 45 mins, 2880 mins in total)		
Required Texts (with ISBN):	Research and Online Learning A Book of Abstract Algebra, by Charles C Printer. ISBN-13: 978-0486474175 ISBN-10: 0486474178 Elements of Number Theory, by John Stillwell ISBN-13: 978-0387942902 ISBN-10: 0387942904		
Prerequisite:	N/A		



Course Overview

Groups in geometry, linear algebra, and number theory; cyclic and abelian groups; permutation groups; subgroups, cosets and normal subgroups; homomorphisms, isomorphisms and the first isomorphism theorem. The Euclidean algorithm, prime factorisation, congruences, the Euler totient function; the theorems of Fermat, Euler and Wilson, and the RSA public key cryptosystem; Chinese remainder theorem; quadratic reciprocity; factorisation and primality testing algorithms.

Learning Outcomes

On completion of this unit students will be able to:

1. Appreciate the beauty and the power of pure mathematics;
2. Recognise the fundamental concepts of algebra and number theory;
3. Explain the notion of proof in mathematics and be able to carry out basic proofs;
4. Illustrate how thousands of years of pure mathematical developments have enabled secure electronic communication;
5. Apply important number theoretic algorithms;
6. Describe the power of the generality of the concepts in group theory.

Grading Policy

Assessment Task	Weighting
Ten weekly Assignments	35%
Applied class participation	5%
Middle Exam	20%
Final Exam	40%



Grading Scale is as follows:

Number grade	Letter grade	GPA
90-100	A	4
85-89	A-	3.7
80-84	B+	3.3
75-79	B	3
70-74	B-	2.7
67-69	C+	2.3
65-66	C	2
62-64	C-	1.7
60-61	D	1
≤59	F (Failure)	0



Class Schedule

Date	Lecture	Readings
Day 1	Prime factorisation and Euclidean algorithm	A book of Abstract Algebra Online Learning and Course information and additional material will be uploaded
Day 2	Congruence and the Chinese Remainder Theorem	Online Learning
Day 3	Euler's phi function, Fermat's little theorem	Elements of Number Theory Online Learning
Day 4	Cryptographic applications of number theory	Elements of Number Theory Online Learning
Day 5	Factorisation algorithms , primality testing	Online Learning
Day 6	Quadratic reciprocity	A book of Abstract Algebra Online Learning
Day 7	Mid exam	Online Learning
Day 8	Symmetry and groups	Online Learning
Day 9	Introductory group theory	Online Learning
Day 10	Examples of groups	Online Learning
Day 11	Examples of groups	Online Learning
Day 12	Subgroups	Online Learning
Day 13	Lagrange's theorem	Elements of Number Theory Online Learning
Day 14	Quotient groups and beyond	Online Learning
Day 15	Examination	Online Learning