

Math 720: Algebra I

Course Information Sheet and Syllabus¹

Fall 2015

Instructor:

Dr. Susan Cooper

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Office Hours: Mondays & Wednesdays & Fridays 11:00 a.m. – 11:50 a.m.; or by appointment

Correspondence: The most reliable way to contact me is via email.

Class Times and Location: MWF 10:00 a.m. – 10:50 a.m., Elect. & Comp. Eng. – Room 243

Prerequisites: Math 621

Credit Hours: 3

Course Web-Page: We will use *Blackboard* which can be found at <https://bb.ndsu.nodak.edu/>.

Textbook: *Abstract Algebra* by David S. Dummit and Richard M. Foote (Third Edition). Errata for the textbook is provided at http://www.cems.uvm.edu/~foote/errata_3rd_edition.pdf.

Bulletin Description: Graduate level survey of algebra: groups, rings, fields, Galois theory, and selected advanced topics.

Course Introduction and Objectives: One of the great advantages of studying mathematics is that it helps one develop the ability to handle abstract ideas. Abstract algebra allows us to cultivate this ability with concrete examples, mathematical rigor, and beautiful applications. The study of algebra involves topics that are important branches of mathematics that are thriving and intriguing in their own right while hosting many applications to subjects such as number theory, geometry, and analysis. For example, central in ring theory is an ideal which was introduced by Kummer in his work on the famous Fermat's Last Theorem. A second example comes from 19th century work on solving polynomial equations – work that led to Galois theory.

Math 720 is a one-semester graduate course that provides an in-depth study of the theory of rings, modules, and linear algebra. For each topic we study sets that are endowed with algebraic structures. For rings, there are two operations (addition and multiplication) with an accompanying distributive law. The most familiar examples of rings include the integers and polynomial rings. Modules are Abelian groups which are acted upon by rings. In many ways, the structure of a ring is encoded in the properties of its modules. In linear algebra, we study vector spaces which are special examples of modules with the underlying ring being a field. A deep understanding of these three topics is fundamental to higher-level pure mathematics.

After successful completion of the course, students will be able to state, prove, apply fundamental theorems, and construct and work with a variety of concrete examples. In addition, students will be well-prepared for higher-level abstract algebra courses (such as Math 721 which focuses on groups, fields, and Galois theory).

Problem Sets: Mathematics is not a spectator sport. The best way to learn mathematics is by doing mathematics. Homework will be assigned on a weekly basis. For most Problem Sets, exercises will be assigned on Wednesdays and solutions will be due by 3:00 p.m. the following Wednesday. A subset of the solutions will be graded based on correctness, clarity, and style/creativity. The Problem Sets are intended to gauge your understanding of the material and all feedback is meant to improve your mathematical abilities and communication. Please see the handout “Guidelines for Problem Sets” for expectations.

¹The details stated in this course syllabus are subject to change at the discretion of the instructor. Announcements concerning all (if any) changes will be made in a timely fashion.

Exams: There will be one out-of-class two-hour midterm examination and one cumulative two-hour final examination.

Exam	Date	Time and Location
Midterm	Tuesday, October 13	4:00 p.m. – 6:00 p.m., Music Education 111
Final Exam	Wednesday, December 16	1:00 p.m. – 3:00 p.m., Elect. & Comp. Eng. – Room 243

A crucial step in being successful in mathematics is developing the ability to remember definitions and statements of key theorems. As such, books, notes, and calculators will not be allowed during the midterm or final examinations.

Attendance and Participation: This course covers a large amount of material and may seem very fast-paced. Your understanding of the course material will be greatly supported by regular attendance and engagement in class meetings. Indeed, some material covered may not be presented in the textbook and these lessons will not be repeated. You are expected to attend every class meeting, to fully participate in class discussions, and are responsible for any missed material when absent. In addition, attendance and participation is worth 10% of your grade. Officially excused absences will not be counted against you, but you must document such situations. Veterans and student service members with special circumstances or who are activated are encouraged to notify the instructor as soon as possible and are encouraged to provide Activation Orders.

Classroom Atmosphere and Courtesy: A part of learning is making mistakes. We want to establish a classroom atmosphere where the inevitable false starts and mistakes become an opportunity to improve – not an opportunity for embarrassment. Please be constructive and polite in questioning your colleagues in class.

In addition, cellular telephones, pagers, and other similar devices are not to be used and are to be turned off or set to vibrate-mode during class-time. Students violating this policy will receive one warning per semester. After the warning, violations will result in the loss of attendance/participation credit for the day.

Missed/Late Work Policies: Late submissions of Problem Sets and make-up exams will only be granted for unavoidable, documented circumstances as described below:

Circumstance	Required Documentation
illness or other medical situation	official note from clinic, hospital, doctor, nurse, or other health care provider
military service	official military activation orders
funeral or other family emergency	official documentation from newspaper, funeral, or medical official
sports or other official NDSU activity	official documentation from NDSU athletics or activity's faculty adviser

Please note that recreational activities do not qualify for make-ups or late submissions. If you have a pre-existing conflict with an exam, homework deadline or class meeting, you are expected to make alternative arrangements *beforehand*. You are also permitted to submit an assignment before its given deadline.

Course Grades: Final course grades will be determined as follows:

Task	Percentage of Grade
Problem Sets	50%
Midterm Examination	20%
Final Examination	20%
Attendance & Participation	10%

Percentage Grade	Grade Earned
85% – 100%	A
75% – 84.9%	B
60% – 74.9%	C
50% – 59.9%	D
0% – 49.9%	F

Tentative Course Schedule and Calendar of Events:

Dates(s)	Topic/Event
August 26–September 4	Rings
September 7	Labor Day (no class)
September 9–September 16	Rings Continued
September 18–25	Euclidean, Principal Ideal and Unique Factorization Domains
September 28–October 5	Polynomial Rings
October 7–October 12	Introduction to Module Theory
October 13, 4:00–6:00 p.m.	Midterm Examination
October 14–November 2	Module Theory Continued
November 4–November 9	Vector Spaces
November 11	Veteran’s Day (no class)
November 13–November 18	Vector Spaces Continued
November 20–November 25	Modules over Principal Ideal Domains
November 26–November 27	Thanksgiving (no classes)
November 30–December 11	Modules over Principal Ideal Domains Continued
December 11	Last Day of Classes
December 16, 1:00–3:00 p.m.	Final Examination

Other Resources: Please note the following:

- *Notes:* We may at times cover material not presented in the textbook. It is your responsibility to prepare clear and thorough notes – these will provide you with clarifying examples and reasoning behind the theory seen in class. Notes for such material will not be provided but you may find other standard algebra textbooks (such as “Algebra” by Hungerford) useful.
- *Email Announcements:* Periodically, course announcements will be sent to you via Blackboard. It is your responsibility to check this email account regularly.

ADA Statement: The Americans with Disabilities Act requires that reasonable accommodations be provided for students with physical or cognitive disabilities in order to ensure their equal access to course content. If you have a documented disability and require accommodations, please let your instructors know as soon as possible. For more information, please contact Student Disability Services at 231-7671 or go to <http://www.ndsu.edu/disabilityservices/>.

Academic Honesty: The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.

Any student found guilty of academic dishonesty will receive a grade of 0 for the task in question. In addition, every such student will be reported to the Chair of Mathematics, the Dean of their major college, the Dean of the College of Science and Mathematics, the Provost, and the Registrar. The Registrar will add any such student to NDSU’s Student Academic Misconduct Database. (Multiple entries in this database may result in additional sanctions from NDSU.) Students found guilty of a second offense of academic dishonesty in this class will receive a course grade of F, and will not be allowed to drop or withdraw from the course.

Veterans: Veterans and student soldiers with special circumstances or who are activated are encouraged to notify the instructor in advance.