WebClass

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PaulEakin

Syllabus for MA 361 Fall 2008

Ma - 316 : First Semester Modern Algebra

This is a junior-level course in modern algebra which is also (correctly) described as "abstract" algebra.

The course begins with a study of the integers. Informed by lectures and class discussion, students will prepare precise mathematical arguments for a development, from a small set of axioms, of the theory of the integers through the fundamental theorem of arithmetic . Parts of this corpus will then be extended to produce "new" mathematics.

In the second part of the course, the integer foundation will be extended to other mathematical realms called (commutative) rings whose "arithmetic" is different but intimately related to that of the integers. The precise nature of these relationships is made precise through functional correspondences called "homomorphisms". The latter are first viewed as mechanisms for translating problems and solutions from one arithmetic to another and then as translators from one theory to another.

The third course component introduces this translation of theory through a general exploration of unique factorization via Euclidean rings. The objective is an appreciation of the application of mathematical abstraction to adapt established, productive theory to new problems.

Credit: This course carries three semester hours credit.

Prerequiisites:

This course is self-contained and does not rely *directly* on specific content from previous college-level courses. However the student should have at least three semesters of college-level mathematical experience. A previous introduction to abstract mathematics through linear algebra or number theory can be useful in becoming comfortable with the abstract nature of the material but is not required.

Text (none) :
This course has no required text and does not (to the instructor's knowledge) follow any specific book. The general philosphy was influenced by the second addition of **Topics in Algebra** by I.N. Herstein (Xerox College Publishing, 1975) however that would be more apparent to an expert than to the beginning student. For a general reference one can safely use almost any advanced undergraduate modern algebra text. However, reference material for the first part of the course (part A, below) would generally be found in a number theory text. None of these, however, is likely to be of direct use in the course and all needed information will be provided in class and instructor-prepared notes.

Instructor Information

MA 361 Fall 2008	Section 001
Instructor	Paul Eakin, Professor of Mathematics
Office	777 POT
Phone	257-6798
E-mail	paul@ms.uky.edu
Office Hours	2-3 MWF and by appointment
Mathskeller Hours	9-10, 12-1 MWF
Class Meetings	10 MWF in CB 341

Course Content:

Part A: A mathematically rigorous development of the integers and rational numbers from eleven axioms through the fundamental theorem of arithmetic. This involves approximately 50 definitions and theorems. Calculations based on the fundamental theorem.

Part B: Other arithmetics: the integers mod n, the Gaussian integers, boolan rings, polynomial rings, direct sums, matrices. Abstract rings, subrings, fields, characteristic subrings, homomorphism, isomorphism, ideals, units. The Frobenius isomorphism, Arhabhata algroithm, Chinese remainder theorem and related calculations.

Part C: Unique factorization, Euclidean rings, Gauss' Lemma. Unique factorization in the Gaussian integers and sums of squares. Unique factorization in polynomial rings.

Depending on time, part C will continue to explore how the same theory which extends the work of part A to produce the integers mod n can be applied with little additional work to produce analogous progeny of some of the examples from part C.

Exams:

There will be three exams, **each worth 100 points.** Each exam will have and in-class and "homework" component. The in-class component will be a 50 minute exam at the regular class time.
The percentage of the homework component is subject to change, depending on the progress of the course. Any changes will be announced no less than a week before the in-class exam.

Exam Sechedule (tentative)

The tentative dates for the class examinations are given below. The mid-term dates are subject to adjustment depending on course progress. Any changes will at most result in a test being given at a later date. Any adjustements will be announced at least a week in advance. ALL EXAMS ARE IN CB 341

Exam	Date
Exam 1	September 26 at 10:00 a.m.
Exam 2	October 24 at 10:00 a.m.
Final	December 16 (Tuesday) at 1:00 p.m.

Attendance and Participation
In addition to the exams there is an **attendance and participation grade of 50 points.** Attendance will be taken at each lecture. There are Each student is allowed two unexcused absences from lecture. Each unexcused absence beyond those two deducts **five** attendance points. Attendance is checked by the circulation of an attendance, sign-in sheet. It is considered cheating to sign the sheet for someone else.

Final Grade: There are 350 points possible in the course. The final grade is determined by the number earned, according to the following table.

Total Points	Final Grade
At least 315	A
At least 280	B
At least 245	C
At least 210	D
Less than 210	E

Point values of various course components:

Exam	Homework points	In-class Points	Total Points
Mid-term Exam 1	**50**	**50**	**100**
Mid-term Exam 2	**25**	**75**	**100**
Exam 3 (final exam)	**25**	**75**	**100**

Attendance		**50**	**50**

Homework: This course uses a web based homework system called WHS. Students use the system to obtain homework assignments as well submit them. There are no fees for using this system and accounts will be automatically created from registrar's information.

The homework problems may be computational or theoretical. The same problem can have a computational component which the computer will check immediately and a theoretical component which will be checked by the instructor.
Each student has a personal version of each assignment which must be completed before the assignment deadline. There will always be at least a week between when a homework set is assigned and when it expires. The system records the number of problems which are submitted with a correct answer. If you submit an incorrect answer, you are allowed to submit again (as many times as needed) until you have the correct answer. There is no penalty for submitting an incorrect answer.

Assistance on homework is permitted/encouraged in order for the student to acquire understanding. In-class examinations will substantially be checks of understanding of important details from the homework.
ASSISTANCE ON THEORETICAL COMPONENTS OF HOMEWORK MUST BE ACKNOWLEDGED IN THE SUBMISSION. THERE IS NO SUCH REQUIREMENT FOR MACHINE-CHECKED COMPONENTS.

Homework credit: Submissions of versions other than the student's personal version as well as submissions after the deadline (midnight of the due date) receive no credit.

Cheating:
Any form of representing the work of others as your own to gain academic credit or advantage is cheating. Helping someone else to cheat is cheating. For instance, signing the attendance sheet for someone else is cheating.
Individuals caught cheating receive failing grades in the course and be reported to the proper university administrators.
Collaboration on the online homework is not considered cheating.

modified: Wednesday, August 20, 2008

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Modified 1/18/2008 12:55