MATH 724, Topics in Commutative Algebra: Monomial Ideals, 3 credits, Spring 2014
MWF 12:00-12:50 PM, South Engineering 118

INSTRUCTOR: Sean Sather-Wagstaff   OFFICE: Minard Hall 406H
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OFFICE HOURS: MTWRF 1:00-1:50 PM, or by appointment

PREREQUISITE: MATH 721, or permission of instructor.

USEFUL WEBPAGES:
Course webpage: `http://www.ndsu.edu/pubweb/~ssatherw/sp14/724/`
Course text: `http://www.ndsu.edu/pubweb/~ssatherw/DOCS/monhist.html`
Instructor webpage: `http://www.ndsu.edu/pubweb/~ssatherw/`
Anonymous evaluation form: `http://www.ndsu.edu/pubweb/~ssatherw/ssw-eval.html`
Math department webpage: `http://math.ndsu.nodak.edu/`
NDSU webpage: `http://www.ndsu.edu`
NDSU blackboard site: `https://bb.ndsu.nodak.edu/`
NDSU webpage on academic honesty: `http://www.ndsu.edu/academichonesty/`

TEXT: *Decompositions of Monomial Ideals* by Rogers and Sather-Wagstaff, available for download at the address above.

COURSE DESCRIPTION: Decomposition results are fundamental to many areas of mathematics. For example, we have the existence and uniqueness of prime factorizations of integers. This is essentially a statement about irreducible decompositions of ideals in $\mathbb{Z}$. This course will focus on similar results for monomial ideals. These are ideals in polynomial rings that come from combinatorics (contrasted with ideals of $\mathbb{Z}$ that come from arithmetic). We will characterize the monomial ideals that are m-irreducible, that is, irreducible with respect to intersections of monomial ideals. We will prove that every monomial ideal has a unique decomposition as a finite irredundant intersection of m-irreducible ideals. We will describe algorithms for computing such decompositions in general and for special classes of ideals.

COURSE GRADES:

Homework or lectures	90%	A	85–100%
Attendance and Participation	10%	B	75–84.9%
		C	60–74.9%
		D	50–59.9%
		F	0–49.9%

I will update your grades throughout the semester at the NDSU Blackboard site.

HOMEWORK: I will assign homework on a bi-weekly basis. Exercises will be assigned in class on Fridays and solutions will be due on the Friday two weeks later, preferably in class. Assignments will also be listed on the course webpage. Each section of homework will be worth the same amount. Late homework will be accepted, but only if you make alternative arrangements with me beforehand.

Students are encouraged to work on assignments in small groups, but each member of the class is required to turn in a neatly written, organized set of solutions. Students will receive no credit for solutions with no work or justification. I reserve the right to deduct points for messy papers. You may even consider using LaTeX to typeset your solutions.

PRESENTATIONS: Students who are not interested in submitting written homework assignments may instead give a series of classroom lectures on course material. Students pursuing this option must coordinate the lecture-dates and material with the instructor before-hand. Presentations will cover approximately one section of material from the text.

ATTENDANCE: While attendance is not explicitly required, it is worth 10% of your grade. I will take attendance each class period. Officially excused absences will not be counted against you, but you must document such situations with me personally.

TENTATIVE SCHEDULE:

Joint Mathematics Meetings (no class)	Wed 15 Jan, Fri 17 Jan
Martin Luther King Day holiday	Mon 20 Jan
SSW travel (no class)	Wed 29 Jan, Fri 31 Jan, Mon 03 Feb
President's Day holiday	Mon 17 Feb
Spring Break	Mon 17 Mar, Wed 19 Mar, Fri 21 Mar
NM AMS Meeting (no class)	Fri 04 Apr
TX AMS Meeting (no class)	Fri 11 Apr
Holiday/Recess	Fri 18 Apr, Mon 21 Apr
Classes end	Fri 09 May

ANNOUNCEMENTS: Periodically, I will send course announcements to your ndsu.edu email account. It is your responsibility to check this email account regularly.

INSTRUCTOR FEEDBACK: At the course webpage, there will be a link to an anonymous evaluation form where students can submit comments or suggestions for me at any time during the semester.

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 instructor know as soon as possible. For more information, please contact Student Disability Services at 231-7671 or go to `http://www.ndsu.edu/counseling/disability.shtml`.

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 `http://www.ndsu.edu/academichonesty`.

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

TENTATIVE LIST OF TOPICS (time permitting)

1. Foundational Concepts
2. Basic Properties of Monomial Ideals
3. Operations on Monomial Ideals
4. M-Irreducible Ideals and Decompositions
5. M-Irreducible Decompositions of Square-Free Monomial Ideals
6. Parametric Decompositions of Monomial Ideals
7. Computing M-Irreducible Decompositions