

**Commutative Algebra, Math 6350**  
**University of Utah, Fall 2023**

Anurag K. Singh

**Class** Monday, Wednesday, and Friday, 11:50 am – 12:40 pm, JWB 308

**Office hours** LCB 124, Monday 2:00 – 3:00 pm, Wednesday 1:00 – 2:00 pm, and by appointment.

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**Goals** We will start with basic topics in commutative algebra including Noetherian rings and modules, Nullstellensatz, dimension theory, and then move on to Cohen-Macaulay rings. A specific goal will be proving the theorem of Eagon and Hochster that determinantal rings are Cohen-Macaulay; we will discuss why this is of interest, and follow the original proof, using principal radical systems. In the process, we will develop a working knowledge of ingredients from algebraic geometry, local cohomology, etc.

**Prerequisites** The course should be accessible to anyone familiar with the first-year graduate algebra sequence, namely Math 6310 and 6320.

**Books/notes** The initial topics that we will cover can be found in any of:  
Atiyah-MacDonald, Introduction to commutative algebra,  
Eisenbud, Commutative algebra with a view toward algebraic geometry,  
Kunz, Introduction to commutative algebra and algebraic geometry,  
Matsumura, Commutative ring theory.

For principal radical systems and determinantal rings, we will follow Hochster's notes:  
[https://www.math.utah.edu/~singh/hochster\\_2005.pdf](https://www.math.utah.edu/~singh/hochster_2005.pdf)

## Information, policies, and resources

**The Americans with Disabilities Act:** The University of Utah seeks to provide equal access to its programs, services, and activities, for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability & Access, 162 Olpin Union Building, (801) 581-5020, <https://disability.utah.edu>. CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability & Access.

**Addressing Sexual Misconduct:** Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status, or genetic information. If you or someone you know has been harassed or assaulted on the basis of your sex, including sexual orientation or gender identity/expression, you are encouraged to report it to the University's Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, (801) 581-8365, <https://oeo.utah.edu/contact-us/index.php>, or to the Office of the Dean of Students (below). For support and confidential consultation, contact the Center for Student Wellness, 426 Student Services Building, (801) 581-7776. To report to police, contact the Department of Public Safety, (801) 585-2677 (COPS), <https://police.utah.edu>.

**Campus Safety:** The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at (801) 585-2677 (COPS). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit <https://safeu.utah.edu>.

**University Counseling Center:** The UCC staff is committed to supporting the mental health needs of our campus community: (801) 581-6826. For after-hours emergencies, contact the 24/7 Crisis Line: (801) 587-3000. More information is at <https://counselingcenter.utah.edu>.

**Office of the Dean of Students:** The Office of the Dean of Students is dedicated to being a resource to students through support, advocacy, involvement, and accountability. It serves as a support for students facing challenges to their success as students, and assists with the interpretation of University policy and regulations. Contact: (801) 581-7066, [deanofstudents@utah.edu](mailto:deanofstudents@utah.edu), <https://deanofstudents.utah.edu>.

**Student Names and Personal Pronouns:** Class rosters are provided to the instructor with the student's legal name as well as *preferred first name*, if previously entered by you in the Student Profile section of your CIS account; this can be managed online by you at any time. I will refer to you with the name and the pronoun that you prefer, in class or on assignments: please advise me of any changes or preferences. For assistance or support, please reach out to the LGBT Resource Center, <https://lgbt.utah.edu>.

**Diversity and Inclusivity:** It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally, or for others. In addition, if any of our class meetings conflict with your religious events, please let me know so that I can make alternative arrangements for you.

**Covid-19:** For information and guidelines, visit <https://coronavirus.utah.edu>.