

MATH 416 Abstract Linear Algebra

Spring 2021

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About me

I am an Associate Professor in the Math Department. My research is in an area of mathematics called algebraic topology. I believe everyone should do a bit of abstract math because it's a great way to have fun.

There are more things I enjoy doing than I have time for. Some of them are knitting, hiking, and cycling.

Course Information

Course Overview

Rigorous proof-oriented course in linear algebra. Topics to be covered include vector spaces, linear transformations, determinants, eigenvalues and eigenvectors, diagonalizability, and inner product spaces. The course concludes with a brief introduction to the theory of canonical forms for matrices and linear transformations.

In this honors section, particular emphasis will be devoted on the “abstract” in the course name, and more theoretical concepts will be introduced instead of the traditional computational parts.

3 undergraduate hours. Credit is not given for both MATH 416 and either ASRM 406 or MATH 415. Prerequisite: MATH 241 or consent of instructor; MATH 347 is recommended.

Academic Calendar/Time Commitment

This semester-long course consists of 7 content modules roughly based on the main textbook chapters. You should dedicate approximately 6-8 hours per week in addition to virtual class time to working on the course itself, but actual time commitments will vary depending on your input, needs, and personal study habits. You are required to log on to the course moodle website and check your email a minimum of 4 days per week, but as discussions develop, you will probably need to do so more frequently (at least daily is recommended).

Required Texts

- Friedberg, S. H., Insel, A. J., & Spence, L.E. (2003). Linear Algebra (4th ed.). Prentice Hall. (ISBN-10: 0-13-008451-4)

The library has made this available for virtual reserve via HathiTrust. HathiTrust ETAS makes books available with a number of caveats: only one user can view the book at a time, and downloading and printing is not possible.

- Beezer, R. A. (2006). A First Course in Linear Algebra (version 3.50).

This is a free online text.

Course Components

This course will consist of the following components:

- **Module Overviews** Each module will begin with a module overview, which will explain what the module is about, what learning goals you are expected to achieve, how long the module will take, and in what activities you will participate. Each module is designed with the same structure and activities unless otherwise specified. Module instructional activities are explained in greater detail below. Due dates of specific assignments appear on each module's overview page.

- **Readings and Lessons**

Each module will contain a list of recorded lectures (paired with comprehension questionnaires) and assigned readings. In some cases, optional or supplemental readings may be listed for further study. Video lessons cover major topics from the readings but do not necessarily include all important information from the readings, thus the assigned readings are not to be skipped.

- **Live Sessions** Our class will meet **MWF 9:00AM - 9:50AM via Zoom**, a web-conferencing system built into our online course that allows us to meet online in real time. More information about Zoom is provided in the Orientation Module of the course.

Prior to each live session, students are expected to review pre-session requirements; e.g., students should have read the readings and worked through any pre-session instructional materials ahead of time in preparation for the session.

Each day of the week will have a different style live session, as follows.

- **Monday live sessions** Monday live sessions will be devoted to group work. Students will be split into groups of 2-3 and will collaborate on a worksheet.
- **Wednesday live sessions** Wednesday live sessions will be devoted to Q&A with the instructor. A selection of questions from the Campuswire forums may be discussed.
- **Friday live sessions** Friday live sessions will be devoted to a brief quiz (15-20 mins max). Three Fridays during the semester, we will have a double quiz (15 min + small break + 15 min).

- **Discussions** Discussions will provide an opportunity to engage with your classmates and instructors on one or more topics explored that given module. The discussion forums on Campuswire are a useful place to engage with one another and with the content covered in the module. See the Course Community tab for more details.

Assignments

Assignments will reinforce concepts presented in the lectures and readings and give you an opportunity to explore these concepts in greater depth.

Comprehension Questionnaires

These will accompany each video lesson, and you will answer questions about the material covered. Students can retake these questionnaires as many times as needed. These questionnaires will contribute to 10% of the grade.

Worksheets

There will be 12-13 collaborative worksheets, each started on Monday during the class live sessions. Each worksheet will be worth approximately 3% of the course grade, and the lowest two scores or absences will be dropped. All worksheets will contribute to 30% of the grade.

Weekly Quizzes

This course includes about 12 single-length quizzes and 3 double-length quizzes. Each will be taken during the Friday class live session via Zoom. Two lowest scores or absences will be dropped. Each single-length quiz will be worth about 3.8% of the course grade, and all quizzes together will be worth 50% of the grade.

Final Exam

The final exam will have the format of three single-length quizzes, and will be worth 10% of the grade.

Campuswire participation and other extra credit work

I will be using the “class reputation” feature on Campuswire to award up to 3% extra credit to those who move up the reputation scale.

Summary grade composition

Comprehension Qs	10%
Worksheets	30%
Quizzes	50%
Final Exam	10%
Total	100%

Course Policies

Accessibility accommodations

To obtain disability-related academic adjustments and/or auxiliary aids, students should contact both the instructor and the Disability Resources and Educational Services (DRES) as soon as possible. You can contact DRES at 1207 S. Oak Street, Champaign, (217) 333-1970, or via email at disability@illinois.edu.

Participation

Active participation in the online learning environment is vital to your success in this course. In this course, you will be asked to engage in online discussions and other interactive learning environments that invite your active participation and involvement with other students and your instructor.

Student Commitment

By registering for this online course, you commit to self-motivated study, participation in online course activities, and timely submission of all assignments. Furthermore, you commit to accessing the course website and checking email at least four days per week, as well as to devoting at least 6-8 hrs./week to coursework and completing the required assignments and readings.

Last but not least, by registering for this online course, you commit to following the netiquette described under Student Behavior.

Deadlines

If you are unable to meet a particular deadline (i.e. show up for a scheduled graded activity), it is your responsibility to make prior arrangements with the instructor for that given week. Otherwise, work submitted later than 1 day will receive a letter grade deduction, and work submitted later than 3 days will not be considered for grading unless consent has been explicitly given by the instructor.

Academic Integrity

Academic integrity is taken very seriously in this course and more generally by the university. Students are responsible for becoming familiar with the University of Illinois Academic Integrity Policy. Academic dishonesty will not be tolerated. Examples of academic dishonesty include (but are not limited to) the following:

- Cheating
- Fabrication
- Facilitating infractions of academic integrity
- Plagiarism
- Bribes, favors, and threats
- Academic interference
- Examination by proxy

- Grade tampering
- Non-original works

Should an incident arise in which a student is thought to have violated academic integrity, the student will be processed under the disciplinary policy set forth in the Illinois Academic Integrity Policy. If you do not understand relevant definitions of academic infractions, contact your instructor for an explanation within the first week of class.

Copyright

Student Content

Participants in University of Illinois courses retain copyright of all assignments and posts they complete; however, all materials may be used for educational purposes within the given course. In group projects, only the portion of the work completed by a particular individual is copyrighted by that individual. The University of Illinois may request that students' materials be shared with future courses, but such sharing will only be done with the students' consent. The information that students submit during a course may, however, be used for the purposes of administrative data collection and research. No personal information is retained without the students' consent.

Non-student Content

Everything on this site and within University of Illinois courses is copyrighted. The copyrights of all non-student work are owned by the University of Illinois Board of Trustees, except in approved cases where the original creator retains copyright of the material. Copyrights to external links are owned by or are the responsibility of those external sites. Students are free to view and print material from this site so long as

- The material is used for informational purposes only.
- The material is used for noncommercial purposes only.
- Copies of any material include the respective copyright notice.

These materials may not be mirrored or reproduced on non-University of Illinois websites without the express written permission of the University of Illinois Board of Trustees. To request permission, please contact the academic unit for the program.

Student Behavior

Student Conduct

Students are expected to behave in accordance with the penal and civil statutes of all applicable local, state, and federal governments, with the rules and regulations of the Board of Regents, and with university regulations and administrative rules.

For more information about the student code and handbook, see the CITL course policies page.

Inclusivity Statement

The effectiveness of this course is dependent upon the creation of an encouraging and safe classroom environment. Exclusionary, offensive or harmful speech (such as racism, sexism, homophobia, transphobia, etc.) will not be tolerated and in some cases may be subject to University harassment procedures. We are all responsible for creating a positive and safe environment that allows all students equal respect and comfort. At minimum, I expect each of you to help establish and maintain an environment where you and your peers can contribute without fear of ridicule or intolerant or offensive language.

Netiquette

In any social interaction, certain rules of etiquette are expected and contribute to more enjoyable and productive communication. The following are tips for interacting online via email or discussion board messages:

- Remember that the person receiving your message is someone like you, deserving and appreciating courtesy and respect.
- Brief and thoughtful messages have the greatest effect.
- Your messages reflect on you personally; take time to make sure that you are proud of their form and content.
- Use descriptive subject headings in your emails.
- Think about your audience and the relevance of your messages.
- Be careful when you use humor and sarcasm; absent the voice inflections and body language that aid face-to-face communication, internet messages are easy to misinterpret.
- When making follow-up comments, summarize the parts of the message to which you are responding.
- Avoid repeating what has already been said; needless repetition is ineffective communication.
- Cite appropriate references whenever using someone else's ideas, thoughts, or words.

Communications

Instructor Feedback Turnaround Time

Questions posted to the Campuswire forums generally will be answered within one business day. Students are encouraged to answer questions posted by others.

Email will be answered within one business day, likely within few hours if received during regular business hours. When sending email, include a subject line that identifies the course number and nature of your question. If you leave a voicemail message with the instructor, please check your email for a response.

Assignments submitted online will be reviewed and graded within a week.

If your instructor is unable to meet this timeline, students will be notified.

Responding to the Discussion Forums

The role of the instructor within the discussion forums is to help facilitate discussion by providing probing questions, asking for clarification, and helping solve conflicts as necessary. The instructor may not respond to every post. You are encouraged to share your thoughts, experiences, and ideas with each other as well.

Daily Contact

In addition to the scheduled virtual class meeting times, each day students should check the course moodle pages for updates and announcements, the discussion forums on Campuswire, as well as read (and respond if asked) to any course-related email.

Course Questions

Questions pertaining to the course material or structure should be posted in our Campuswire class feed or chatrooms. You can get to those forums from the Course Community tab on the main page. Posting questions there allows everyone to benefit from the answers. If you have a question, someone else is probably wondering the same thing. Anyone submitting a question via email will be directed to resubmit the question to a Campuswire class feed or chatroom. Also, participants are very much encouraged to answer questions posed by peers if they know the answers and the instructor has not yet responded. This not only expedites the process but also encourages peer interaction and support.

Personal and Grade-Related Questions

Questions of a personal nature should first be sent to the instructor's email address (listed on the Instructor Information page). When sending email, include a subject that identifies the course number and nature of your question.

Emergencies

If you have an emergency that will keep you from participating in the course, please notify your instructor by using the instructor's email address (listed on the Instructor Information page). Provide callback information in your email if necessary. You should also notify your program director of any emergencies.

Announcements

The Announcements forum serves as a way for your instructor and University of Illinois administrators to make announcements within our online learning environment. Announcements posted here will also be sent to your Illinois email address, so be sure to check your email or the Announcements forum at least once a day to see whether any new announcements have been made.

Telephone

The telephone is still sometimes the most effective mode for troubleshooting problems related to the course. The instructor's phone number and other contact information can be found on the Instructor Information page.

Sexual Misconduct Policy and Reporting

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the university's Title IX and Disability Office. In turn, an individual with the Title IX and Disability Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated university employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found in the Confidential Resources section. Other information about resources and reporting is available at wecare.illinois.edu.

Student Wellness Resources

The University of Illinois strives to promote student success through the support of student psychological and emotional well-being. Please take advantage of the resources listed on the Student Affairs website.

Emergency Dean

“Help is only a phone call away.” A university-wide Emergency Dean is always available to provide you with personal assistance in times of emergency, such as serious illnesses, hospitalizations, accidents, deaths or other major crises. Emergency Dean Service: 217-333-0050.