



## Math 320: Linear Algebra and Differential Equations (006) SP24

### General Course Information

#### Generic Math 320 Course Description

Introduction to linear algebra, including matrices, linear transformations, eigenvalues, and eigenvectors. Linear systems of differential equations. Numerical aspects of linear problems.

**Prerequisites:** MATH 222, 276 or graduate/professional standing

**Course website:** <https://canvas.wisc.edu/courses/386475>

#### Course Designations and Attributes

Breadth – Natural Science

Level – Advanced

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Honors – Honors level (!) course

#### Credit Hours

This 3-credit class meets for two 75-minute class periods and one 50-minute discussion class each week over the spring semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc.) for at least 2 hours out of the classroom for every class period. This syllabus includes additional information about meeting times and expectations for student work.

#### Class Instructional Mode, Time, and Location

Class	Date & Time	Location
320-006	TR 9:30 am – 10:45 am	Van Vleck B239

There will be a total of 28 classes with no classes during spring recess (03/23 – 03/31).

#### Discussion Sessions

Section	Date & Time	Location
DIS-402	M 1:20 pm – 2:10 pm	Van Vleck B203
DIS-403	W 1:20 pm – 2:10 pm	Van Vleck B129

There will be a total of 13 discussion sessions per section.

## Instructor

Dr Thomas Chandler (he/him), [tgchandler@wisc.edu](mailto:tgchandler@wisc.edu), <https://people.math.wisc.edu/~tgchandler/>

**Availability:** The instructor will be available at the following times/places:

- Office Hours: T 3:00pm – 4:00pm, F 10:30am – 11:30am (Table 3, Math Learning Center, Van Vleck B224).
- Extra (in-person or virtual) instructor office hours can be arranged. Please contact the instructor via email to arrange.
- Contributing to Q&A on Piazza, predominantly on Tuesday and Thursday evenings.

## Teaching Assistant

Yiyu Wang, [yiyu.wang@wisc.edu](mailto:yiyu.wang@wisc.edu)

**Availability:** The TA will be available at the following times/places:

- Office Hours: M 2:30pm – 3:30pm, W 2:30pm – 3:30pm (Van Vleck 418).
- Extra (in-person or virtual) TA office hours can be arranged. Please contact the TA via canvas or email to arrange.
- Contributing to Q&A on Piazza, predominantly on Monday and Wednesdays.

## Other Course Information

### Required Textbook, Software, & Other Course Materials

**Required Textbook:** This course will follow *Differential Equations and Linear Algebra* by Gilbert Strang. Book website: <http://math.mit.edu/~gs/dela/>, which includes [video lectures by Gil Strang](#).

**Software:** MATLAB (MATrix LABoratory) will be used by the instructor for several demonstrations. UW students have institutional access to MATLAB, see <https://software.wisc.edu/cgi-bin/ssl/csl.cgi> (UW login required). Learning and using MATLAB is highly recommended, but is not required for this course; however, assessed homework may require reading, understanding, and writing algorithms in MATLAB-like syntax. Alternatives to MATLAB (e.g. Python and Mathematica) may also be useful to students.

**Other:** Handwritten class notes, as well as homework and midterm solutions, will be posted on Canvas.

### Course Website, Learning Management System & Digital Instructional Tools

- All course material, homework, announcements, and grades will be uploaded onto Canvas (<https://canvas.wisc.edu/courses/386475>)
- All virtual contact (e.g. virtual office hours) shall be on Zoom. A link can be found on the Canvas website (<https://canvas.wisc.edu/courses/386475>)
- Questions of general interest related to the course should be posted and discussed on the course Piazza site (<https://piazza.com/wisc/spring2024/sp24math320006>) or brought to office hours. The course instructor and teaching assistant will be regularly contributing to posts on Piazza.
- All other questions should be sent to the instructor directly via email.

## Grading

This course will be assessed via weekly problem sheets (cumulative, with the two lowest scores being dropped), two midterm exams, and a final exam. The scales given below may be decreased (but never increased) to allow for grade curving.

**Weighting:** 35% Assessed Homework, 15% Midterm 1, 15% Midterm 2, 35% Final.

**Tentative Grading Scales:** 0-59 F, 60-69 D, 70-78 C, 79-81 BC, 82-88 B, 89-91 AB, 92-100 A

## Examination

There will be three (in-person) exams for this course: two midterms and a final exam. These exams shall be closed book and no communication with anyone (in or out of the class) is allowed during the exams. All the exams are cumulative with no make-up exams. Further information about each exam will be given closer to the time.

*By signing up to this course, you are agreeing to take the exams at the following (Madison, WI) times:*

Exam	Date & Time	Location
Midterm 1	28 <sup>th</sup> February 5:45 pm – 7:15 pm	To be announced
Midterm 2	10 <sup>th</sup> April 5:45 pm – 7:15 pm	To be announced
Final Exam	5 <sup>th</sup> May 7:45 am – 9:45 am	To be announced

*Please note that the two midterms are evening exams. Please inform the instructor of any problems sitting these exams as soon as possible.*

**Exam Proctoring:** Exam proctoring will be required for this course. Failure to use the proctoring service assigned will result in a zero on the exam. Further details will be given before each exam.

## Assessed Homework: Problem Sheets

A weekly problem sheet will be posted on Canvas focused on the content presented in the corresponding week's classes. Each sheet will require students to read pages out of the textbook and answer relevant mathematical questions. Students are encouraged to discuss the problems with classmates; however, the final write-up should be individual. Both mathematical accuracy and clarity of argument will be assessed and count towards the final grade (see grading above).

The problem sheet grades are cumulative, but the two lowest scores will be dropped. Solutions to the problem sheets should be neatly written-up, or typed-up using *e.g.* LaTeX, and submitted on Canvas as a pdf before the posted deadline. Tentatively, the problem sheets shall be due Friday by 11:59pm. *A grace period of 6 hours shall be given for submission, however any submissions during this period (without prior permission) will be docked 10%.* Submissions after the grace period will not be accepted. The instructor should be informed of any problems with completing the assessed homework.

## Non-Assessed Homework: Further Work and Practice Exam Questions

On top of the assessed homework, further work may be posted on Canvas and handed out in class but will not be collected or graded; this will include practice exam questions. This work is intended to help consolidate your knowledge and prepare for the exams. Solutions to all the book's problems are found at <http://math.mit.edu/~gs/dela/>, but reading someone else's solutions is much easier than solving the problem yourself. It is highly recommended that you carefully study the assigned sections of the book: the techniques taught in Math 320(!) are most easily learnt through practice. Feel free to post any questions about the non-assessed portion of the course on Piazza or bring them to the office hours.

## Generic Course Learning Outcomes

By the end of the course, students should be able to:

- Recall and state the formal definitions, properties, and theorems associated to elementary linear algebra and ordinary differential equations (*e.g.* existence and uniqueness theorems for first-order ODEs, eigenvalues, and eigenvectors).
- Verify if a mathematical object has a given property used in elementary linear algebra and differential equations (*e.g.* that a matrix is invertible, that a set is a vector subspace, that a vector is an eigenvector).
- Check the premises of theorems used in elementary linear algebra in order to apply their conclusions (*e.g.* that a given matrix has zero determinant and therefore cannot be inverted).
- Resolve algebraic statements related to elementary linear algebra through appropriate computations and compute solutions to elementary systems of ordinary differential equations.
- Express informal mathematical arguments in English using appropriate mathematical terminology and notation.

## Course Outline

**Tentative Semester Schedule:** This course will cover Chapters 1, 2, 4–6 of the textbook by Gilbert Strang. The material will not be understood upon a first read but should be studied in multiple iterations. Sections 1.1 – 1.2 consists of review material, however aspects of these sections might be more detailed than what the student is used to, thus they should be studied before the first class. The rest of the course will follow the tentative schedule:

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<b>Week</b>	<b>Textbook Sections</b>
Week 1	Course Introduction; Sections 1.1 – 1.3
Week 2	Sections 1.4 – 1.6
Week 3	Sections 1.7 – 2.1
Week 4	Sections 2.2 – 2.4
Week 5	Sections 2.5 – 2.7
Week 6	Midterm 1
Week 7	Sections 4.1 – 4.2
Week 8	Sections 4.3 – 4.5
Week 9	Sections 5.1 – 5.4
<i>Spring Recess</i>	
Week 10	Sections 5.5 – 5.6
Week 11	Midterm 2
Week 12	Sections 6.1 – 6.3
Week 13	Sections 6.3 – 6.4
Week 14	Sections 6.4 – 6.5

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**Typical Week Schedule:** A typical week will follow the following timetable:

Monday	Tuesday	Wednesday	Thursday	Friday
Discussion 402 TA Office Hours	Class Inst. Office Hours	Discussion 403 TA Office Hours	Class	Homework Inst. Office Hours

## How to Succeed in this Course

Students should attend all classes, whilst contribution to the office hours and piazza are also highly recommended. The classes are informal instructional lectures ran by the instructor, any interruption for questions or observations are welcomed and highly recommended — there are no ‘silly’ questions in this course! During the discussion classes ran by the TA, you will work together on activities to help develop your understanding of the course content; participation in discussions is expected. The office hours are an opportunity to ask any questions (either about the course or the bigger picture) but are also a chance to just come say ‘hi’ and chat with fellow mathematicians. You do not have to have a specific question to come to the office hours but can instead just come to listen or work. Throughout the semester, the instructor will be providing useful tips and additional material to aid your learning. These will be handed out during the lectures and on Canvas. Any course related questions should be sent to the instructor via email at [tgchandler@wisc.edu](mailto:tgchandler@wisc.edu).

The following campus services might also be useful:

- [University Health Services](#)
- [Undergraduate Academic Advising and Career Services](#)
- [Office of the Registrar](#)
- [Office of Student Financial Aid](#)
- [Dean of Students Office](#)
- [Enrollment, Scheduling, & Placement Help](#)

## Academic Policies and Statements

### Academic Calendar & Religious Observances

The academic calendar and religious observances can be found at <https://secfac.wisc.edu/academic-calendar/>. Establishment of the academic calendar for the University of Wisconsin–Madison falls within the authority of the faculty as set forth in [Faculty Policies and Procedures](#). Construction of the academic calendar is subject to various rules and laws prescribed by the Board of Regents, the Faculty Senate, State of Wisconsin, and the federal government. For additional dates and deadlines for students, see the [Office of the Registrar’s pages](#). Students are responsible for notifying instructors within the first two weeks of classes about any need for flexibility due to [religious observances](#).

### Academic Integrity Statement

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin–Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples

of disciplinary [sanctions](#) include, but are not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion.

## **Accommodations for Students with Disabilities Statement**

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy ([UW-855](#)) require the university to provide reasonable accommodations to students with disabilities to access and participate in its academic programs and educational services. Faculty and students share responsibility in the accommodation process. Students are expected to inform faculty of their need for instructional accommodations during the beginning of the semester, or as soon as possible after being approved for accommodations. Faculty will work either directly with the student or in coordination with the McBurney Center to provide reasonable instructional and course-related accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. (See: [McBurney Disability Resource Center](#)).

## **Course Evaluation**

Students will be provided with an opportunity to evaluate their enrolled courses and their learning experience. Most instructors use AEFIS a [digital course evaluation](#) survey tool. In most instances, students receive an official email two weeks prior to the end of the semester, notifying them that anonymous course evaluations are available. Student participation is an integral component of course development, and confidential feedback is important. UW-Madison strongly encourages student participation in course evaluations.

## **Diversity & Inclusion Statement**

[Diversity](#) is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.

## **Mental Health & Well-Being Statement**

Students often experience stressors that can impact both their academic experience and personal well-being. These may include mental health concerns, substance misuse, sexual or relationship violence, family circumstances, campus climate, financial matters, among others. Students are encouraged to learn about and utilize UW-Madison's mental health services and/or other resources as needed. Visit [uhs.wisc.edu](http://uhs.wisc.edu) or call University Health Services at (608) 265-5600 to learn more.

## **Privacy of Student Records & the Use of Audio Recorded Lectures Statement**

View [more information about FERPA](#). Lecture materials and recordings for this course are protected intellectual property at UW-Madison. Students in courses may use the materials and recordings for their personal use related to participation in class. Students may also take notes solely for their personal use. If a lecture is not already recorded, students are not authorized to record lectures without permission

unless they are considered by the university to be a qualified student with a disability who has an approved accommodation that includes recording. [Regent Policy Document 4-1] Students may not copy or have lecture materials and recordings outside of class, including posting on internet sites or selling to commercial entities, with the exception of sharing copies of personal notes as a notetaker through the McBurney Disability Resource Center. Students are otherwise prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

## **Students' Rules, Rights & Responsibilities**

To see the Undergraduate Guide's Rules, Rights, and Responsibilities information, please refer to [Rights & Responsibilities](#).

## **Teaching & Learning Data Transparency Statement**

The privacy and security of faculty, staff and students' personal information is a top priority for UW-Madison. The university carefully reviews and vets all campus-supported digital tools used to support teaching and learning, to help support success through [learning analytics](#), and to enable proctoring capabilities. View the university's full teaching and learning [data transparency statement](#).