

Syllabus -- MATH 2331, Linear Algebra, Section 3 (CRN 31278), Spring 2021

Instructor: He Wang
E-mail Address: he.wang@northeastern.edu
Zoom link for meetings: On Canvas. Class time and location: 9:15 am - 10:20 am MWR Kariotis Hall 209
Office Hours: (on Zoom) Tuesday 8-9am. 5-7pm and other time by appointment. Zoom Link for office hours: Join Zoom Meeting
Meeting ID: 979 868 0433 Passcode: HeWang2021
Teaching Assistant: Sean Carroll Email: carroll.sea@northeastern.edu Office Hours: to be announced later Zoom Link For Office Hours: Meeting ID: Passcode:

This syllabus is subject to reasonable changes at the discretion of the instructor. (Check Canvas for the updated version.)

Textbook: Linear Algebra with Applications, 5th Edition, by Otto Bretscher.
(It is **NOT** required that you purchase a printed textbook.)

We will cover Chapters 1-3, 5-8 from the text. The course features basic theory of Linear Algebra. The topics include Matrices, solving linear systems using Gauss-Jordan elimination, determinants, vector spaces, eigen values & eigen vectors, the theory of orthogonal & symmetric matrices.

NUFlex hybrid lectures and learning: This section is taught using NUFlex method. I will lecture in person on campus and the class is available on Zoom lively. We will *approximately* follow the tentative pacing guide at the end of the syllabus. You need to work on Math 2331 every class day. (Detailed suggestions about learning method are on **Canvas**) It is possible to fall behind in a single day. If you miss a lesson for any reason, make an immediate attempt to contact the instructor to discuss how to catch up. **It is your responsibility to be aware of any changes the instructor may make to the syllabus as they are announced on Canvas/email.** Read all emails and announcements.

NOTE: The classes will be broadcast as live Zoom sessions. I intend to record the sessions and make them available on Canvas. If you have any concerns, please let me know.

Homework and take-home quizzes:

Homework is an essential component of the course, and together with some take-home quizzes make up 15% of the course grade. Students should schedule typically around 4-5 hours every week to work on it. It will be assigned at the end of every class (tentative schedule at the end of the syllabus, changes will be announce in advance), and will be due weekly, and graded partially. (Due day and time will be announced on Canvas.) A completeness grade, ranging from 0 to 4 points will be given for the homework/quizzes, and 6 problems, each worth 1 points, will be graded. Students are encouraged to work jointly on the homework, but the write-ups must be done separately. Late homework/quizzes will not be accepted but one lowest score will be dropped. **Only a final result without explanation, or copied answer from solution book will receive no point. To get full points of homework, answer the questions in order, label the section and question number, write the answer clearly and circle the final result. Submit the homework on Canvas/Assignment in a single pdf file.**

Tests: We will have **three 65-minute tests** during the first seven weeks of the semester. No dropped score on tests. However, the lowest test score counts 15%, the other two tests count 20% each. The tentative dates for the three exams are **Thursdays: Feb11, Mar11, April 8.**

Final Exam: The 2 hours required cumulative final exam on the **final exam day (to be scheduled)**.

In the rare event that a student misses one of these tests due to a university sanctioned absence or religious observances, the student will be given a makeup test. If a student misses a test for some other reason, then at the instructor's discretion, the student may be given a makeup test. Check for final exam schedule conflicts as soon as possible. The last day to file a Final Exam Conflict Form with the Registrar is Thursday Feb. 11.

Course Grade:

15%	Homework and take-home quizzes
55%	3 Tests
30%	Final Exam

Letter Grades: Letter grades are determined from the numerical grades as follows:

A: 93-100	A-: 90-92	B+: 87-89	B: 83-86	B-: 80-82	C+: 77-79
C: 73-76	C-: 70-72	D+: 67-69	D: 63-66	D-: 60-62	F: 0-59

0.5 and more will be rounded up to 1, 0 to 0.49 to 0.

Incomplete: As a matter of Math Department policy, the I grade (incomplete) will be given only rarely. It is intended to cover real emergency situations in which a student who is doing reasonably well (C- or better) is unable, due to circumstances beyond the student's control, to complete all course requirements (e.g., is unable to take the final exam due to hospitalization). An I grade may not be used to rescue a failing grade or to postpone the final.

Calculators and Computers: On any in-class test, you are NOT allowed to use a calculator or computer with a CAS that can perform matrix operations or solve linear systems, etc. An ordinary scientific calculator is okay for help with arithmetic, though, but unless you show sufficiently detailed steps to justify your work when the answer is not immediately obvious, you will NOT receive any credit, even if your final answer is correct. The point of a math course is to learn concepts and methods, not to push buttons. Of course, once you have proved your competent state of knowledge and capability, technology can be of immense aid in any job requiring linear algebra. MATLAB is recommended for checking your homework results or working on a lab project.

Classroom Recording: This course, or parts of this course, may be recorded by instructor for educational purposes. These recordings will be made available on Canvas only to students enrolled in the course, the TAs and instructors, and other math department or administrative personnel for training, oversight, or evaluation purposes. If you have any concerns, please let me know.

Only students who have arranged an accommodation with the Disability Resource Center (DRC) may use mechanical or electronic transcribing, recording, or communication devices in the classroom. Students with disabilities who believe they may need such an accommodation may contact the DRC.

Issues with the course/instructor: If you have issues with this course or instructor which you are not able to resolve through conversation with your instructor, contact the course coordinator, He Wang at he.wang@northeastern.edu. For matters that remain unresolved, contact the Teaching Director, Prof. Alexander Martsinkovsky, at a.martinkovsky@northeastern.edu

Additional Resources:

The Mathematics Department Tutoring Center is online for Spring 2021. The free tutoring center is expected to start soon after the semester begins. Students sign up through their MyNortheastern (you can look at it here: <https://undergraduate.northeastern.edu/peer-tutoring/>) where they can see the available tutors and the classes that each tutor will be able to help you with.

Official Holidays: (Feb 15 Presidents Day (USA) no class): (April 19 , Patriots Day (Boston) no class). (see <https://registrar.northeastern.edu/app/uploads/2020-2021-UG-Expanded-Calendar-List.pdf>)

Important Dates:

The last day to **drop a course without a W** grade is Monday **Feb 8**.

The last day to **drop a course with a W** grade is Thursday **April 22**.

The last day to **submit a Final Exam conflict form** is Thursday **Feb 11**.

Academic Integrity Policy: Cheating will not be tolerated. All incidents of cheating will be reported. From the Academic Integrity Policy: (see <http://www.northeastern.edu/osccr/academic-integrity-policy/>)

“A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues.”

Title IX Policy: The University strictly prohibits sex or gender discrimination in all university programs and activities. Information on how to report an incident of such discrimination (which includes sexual harassment and sexual assault) is located at <http://www.northeastern.edu/titleix> .

Inclusion and Diversity: I value all students regardless of their background, country of origin, race, religion, gender, sexual orientation, ethnicity, or disability status, and am committed to providing a climate of excellence and inclusiveness within all aspects of the course. If there are aspects of your culture or identity that you would like to share with me as they relate to your success in this class, I would be happy to meet to discuss. Also, if you have any concerns in this area or are facing any special issues or challenges, I encourage you to discuss the matter with me as you feel comfortable, with assurance of full confidentiality (only exception being mandatory reporting of NU Academic Integrity Policy violations and Title IX sex and gender discrimination).

Students with disabilities: Students who have disabilities who wish to receive academic services and accommodations should follow the standard Disabilities Resource Center (DRC) procedures (see <http://www.northeastern.edu/drc/getting-started-with-the-drc/>).

College of Science Policies: The current College of Science Academic Course Policies is available at <https://cos.northeastern.edu/wp-content/uploads/2012/10/COS-teaching-policies-April-2017.pdf> .

TRACE: Every student is expected to complete the online TRACE survey at the end of the semester.

MATH2331 PACING GUIDE, Spring 2021

(TENTATIVE GUIDELINE: SUBJECT TO CHANGE)

Week 1 (Jan. 18-22)

1.1 Introduction to Linear systems (Homework: 1, 7, 10, 21, 24, 25, 36)

1.2 Matrices, Vectors, and Gauss-Jordan Elimination (Homework: 2, 4, 5, 7, 18, 21-24, 31-33, 36, 37)

Week 2 (Jan. 25-29)

1.3 On The Solution of Linear Systems (Homework: 1-8, 11-15, 21-31, 34, 36, 47, 55)

2.3 Matrix Products (Homework: 3, 5, 11, 13, 16-23, 25, 29, 47)

Week 3 (Feb. 1-5)

2.1 Intro. to Linear Transformations and Their Inverses (Homework: 1-3, 5, 6)

2.4 The Inverse of a Linear Transformation (Homework: 1-3, 5, 6, 17, 19, 35-41 (odd))

Week 4 (Feb. 8-12)

2.2 Linear Transformation in Geometry (Homework: 1, 4, 6, 7, 8, 10, 19, 21, 26abc, 53)

Test 1 (Feb11)

Week 5 (Feb. 15-19)

Feb 15 Presidents Day (USA) no class

3.1 Image and Kernel of a Linear Transformation (Homework: 1, 3, 5, 7, 12, 15, 16, 23, 25, 33, 35)

3.2 Subspaces of \mathbb{R}^n ; Bases and Linear Independence (Homework: 1, 3, 11-33(odd), 26, 37, 39, 46, 49, 52)

Week 6 (Feb 22-26)

3.3 The Dimension of a Subspace of \mathbb{R}^n (Homework: 1, 3, 5, 7, 11, 13, 17, 21, 23, 27, 37, 39)

5.1 Orthogonal Projections and Orthonormal Bases (Homework: 1, 3, 5, 15, 17, 27, 35)

Week 7 (Mar. 1-5)

5.2 Gram-Schmidt Process and QR Factorization (Homework: 5, 7, 19, 21, 33, 35)

5.3 Orthogonal Transformations and Orthogonal Matrices (Homework: 5-8, 13-17, 27, 29, 37)

Week 8 (Mar. 8-11)

5.4 Least Squares and Data Fitting (Homework: 1, 5, 7, 17-25 (odd), 31-33)

6.1 Introduction to Determinants (Homework: 1-11(odd) , 17, 27, 29-32)

Test 2. (Mar11)

Week 9 (Mar. 15-19)

6.2 Properties of Determinants (Homework: 1, 5, 6, 11, 13, 15, 30, 37-42.)

7.1 Diagonalization (Homework: 1-7, 9, 15-21 (odd), 34)

Week 10 (Mar.22-26)

7.2 Finding the Eigenvalues of a Matrix (Homework: 1-13(odd), 16)

7.3 Finding the Eigenvectors of a Matrix (Homework: 1-13(odd) , 21)

Week 11 (Mar. 29-Apr.2)

7.4 Dynamical Systems (Homework: 1-7 (odd), 11, 17, 21, 25)

Week 12 (April. 5-9)

8.1 Symmetric Matrices (Homework: 1, 3, 7, 9, 11 22)

Test 3. (April8)

Week 13(April12-16)

8.2 Quadratic Forms (Homework 1 – 11, 27, 28, 37) (depending on time)

8.3 Singular Value Decomposition (Homework: 1, 2, 4, 6, 12, 13, 14) (depending on time)

Week 14 (April19-23)

Review

April 19 , Patriots Day (Boston) no class

April.22: Reading Day: No Classes

Final Exam Day: (To be announced.)