Linear Algebra - Math 304

Spring 2022 - Course Coordinator: Quincy Loney

Sec	Instructor	Office	Email(*)	Meets	Room
1	Michael Dobbins	WH-214	Dobbins	MWF:8:00-9:30	CW-321
3	Eugenia Sapir	WH-213	Sapir	MWF:9:40-11:10	S2-G52
4	Olakunle Abawonse	WH-330	Abawonse	MWF:11:20-12:50	UU-215
5	Quincy Loney	WH-332	Loney	MWF:11:20-12:50	SL-302
6	Quincy Loney	WH-332	Loney	MWF:1:10-2:40	SL-302
7	Thomas Kilcoyne	WH-336	Kilcoyne	MWF:2:50-4:20	LH-012
8	Thomas Kilcoyne	WH-336	Kilcoyne	MWF:4:40-6:10	LN-1120

(*): To send an email to your instructor, click on the link in the Email column of the table.

If a section has its own detailed syllabus webpage, a link to that page will be provided under the Instructor column of the table above.

Below is a partial syllabus with information for all sections that you should know. Your instructor may have a more detailed syllabus about how your section will be run.

Health and Safety Procedures Due to COVID Pandemic

Binghamton University follows the recommendations of public health experts to protect the health of students, faculty, staff and the community at large. Safeguarding public health depends on each of us strictly following requirements as they are instituted and for as long as they remain in force. Health and safety standards will be enforced in this course.

Current rules require everyone to wear a face covering that completely covers **both the nose and mouth** while indoors (unless they are eating or alone in a private space like an office). A face shield is not an acceptable substitute. Classroom safety requirements will continue to be based on guidance from public health authorities and will be uniformly applied across campus. If these requirements change, a campus-wide announcement will be made to inform the University.

Instructors and students must follow all applicable campus requirements for use of face coverings. The University recommends and supports swift action and clear consequences since a student’s non-compliance risks the safety of others. Instructors will immediately notify students of any in-class instance of inadvertent non-compliance. Any in-class instance of deliberate non-compliance after warning will result in the student being asked to leave the class immediately. Work missed because of ejection from class for non-compliance may only be made up later with the instructor's permission. All students are responsible for bringing a mask to class in order to comply with campus requirements. If you forget your face covering or it does not meet the requirements, you will be asked to leave the room immediately. You may not return until you meet the requirement.

If a student does not comply with the requirements or the instructor’s direction, the instructor will immediately cancel the remainder of the class session and inform the dean’s office, which will work with the Student Records office to issue a failing grade (“F”) for the course regardless of when in the semester the incident occurs. The dean’s office will also inform the Office of Student Conduct. If a student’s refusal to comply is a second offense, the Office of Student Conduct may recommend dismissal from the University. If the rules for health and safety measures change, the campus will be notified and the new requirements will take effect.

Textbook

``Linear Algebra" by Jim Hefferon, Fourth Edition, available as a free download here:

Linear Algebra by Jim Hefferon.

On can buy a cheap printed version and access more free resources at the textbook's official website.

Here are also some additional books that students and instructors may find helpful.

A First Course in Linear Algebra by Robert A. Beezer

Elementary Linear Algebra by K.R. Matthews

Linear Algebra by D. Cherney, T. Denton, R. Thomas, and A. Waldron

Approximate Exam Schedule (Each section instructor will decide when it is appropriate to give Exams 1, 2, 3.)

Exam 1: The week of February 21

Exam 2: The week of March 28

Exam 3: The week of May 2

Final Exam: TBA

Grades

The course total will be determined as follows:

Quizzes: 20% (Quizzes should be given approximately once per week except in weeks when an exam is given.)

Exam 1: 15%

Exam 2: 15%

Exam 3: 15%

Final Exam: 30%

WebWork Homework (common for all sections): 5%

Quizzes are important for students to keep up with the progress of the course and to provide timely feedback on how the material is being absorbed. By September 27 (designated as ``Assessment Day" by the Administration), enough quizzes should have been taken to evaluate each student's progress and make a risk assessment for early warning about problems.

At the end of the course, your grade in the course will be determined by your instructor based on your course total and the following approximate scale. (Borderline cases will be decided by other factors such as attendance or participation.)

A 90%, A- 85%, B+ 80%, B 75%, B- 70%, C+ 65%, C 55%, C- 50%, D 45%

Homework

Online homework will be done using WebWork. The server address is

https://webwork.math.binghamton.edu/webwork2/304Spring2022/

For students, your WebWork account username is the pre@ portion of your binghamton.edu e-mail account. Your initial password is the same as the username. For example, if your Binghamton e-mail account is xyzw77@binghamton.edu then your username is: xyzw77 and your initial temporary password is: xyzw77

Make sure to change your password as soon as possible to a secure password, and save that choice where it will not be lost.

Important: Besides the WebWork homework sets, you should do problems from the book, as selected by your instructor, see an approximate schedule below. This part of the homework will not be graded, but it will be important to your success in the course.

Expected workload

You are expected to spend about 12.5 hours per week on average for this class, including in-class lectures, watching instructional videos, solving homework problems (graded and ungraded), reviewing the material, and preparing for the tests. Expect the work load to be higher than average in the weeks before the exams.

Expected behavior in class

During classes all students are expected to participate in a way that maximizes their learning and minimizes disruptions for their classmates. If you have any concerns, limitations, or circumstances, please communicate with your instructor to find the most appropriate solution.

Academic Code of Honor

For all graded assignments and exams, you are not allowed to use any help not explicitly authorized by your instructor. This includes, but is not limited to, problem-solving websites, notes, help from other people, etc. All instances of academic dishonesty will be investigated, penalized, and referred to the appropriate University officials for maximal possible punishment. **Cheating will not be tolerated.**

Getting Help

If you fall behind in class, or need extra help to learn the material, talk to your instructor as soon as you can. They should be able to help you and also point you to other resources. We also encourage you to talk to your classmates, and, in particular, to form informal study groups to prepare for the exams.

Disability Information

If you have a disability for which you are or may be requesting an accommodation, please contact both your instructor and the Services for Students with Disabilities office (119 University Union, 607-777-2686) as early in the term as possible. Note: extended time for the examinations may require special scheduling.

Suggested problems from our textbooks

The table below contains suggested problems from sections of our textbooks (Heffron or Matthews) in the format "Chapter:Section.Subsection.ProblemNumber". Your instructor may suggest other problems or exercises. **These problems are for practice only and are not to be turned in.** There will be graded homework assignments given through WebWork which should be done in the order indicated by your instructor. Instructional videos linked below are **supplementary material**, not intended to replace the regular lectures. The order in which material is presented in class meetings will be determined by your instructor, and may not precisely follow the order in our textbooks.

Topics	Text	Problems
Introduction, preview, examples; linear combination	Ch. 1, I.1	1:I.1.17,19,21
Gaussian elimination (reduction)	Ch. 1, I.1	1:I.1.22,24,27,32
(Augmented) matrix of a system, solution set	Ch. 1, I.2	1:I.2.15,16,17,18,21,25
Basic logic: statements, connectives, quantifiers	Appendix	
Set theory, general functions	Appendix	
Homogeneous and non-homogeneous systems (no formal induction in Lemma 3.6)	Ch. 1, I.3	1:I.3.15,17,18,20,21,24
Points, vectors, lines, planes	Ch. 1, II.1	1:II.1.1,2,3,4,7
Distance, dot product, angles, Cauchy-Schwarz and Triangle Inequalities	Ch. 1, II.2	1:II.2.11,12,14,16,17,21,22
Gauss-Jordan reduction, reduced row echelon form	Ch. 1, III.1	1:III.1.8,9,10,12,13,14,15
Linear combination lemma, uniqueness of RREF (no proofs of 2.5, 2.6)	Ch. 1, III.2	1:III.2.11,14,20,21,24
Matrix operations, including the transpose. Linear system as a matrix equation	Matthews 2.1	3:III.1.13,14,15,16
Linear maps (transformations) given by matrices	Matthews 2.2	3:III.1.19; 3:III.2.12,17,30
Vector spaces: definition, examples	Ch. 2, I.1	2:I.1.17,18,19,21,22,29,30
Linear maps between vector spaces	Ch. 3, II.1	3:II.1.18,19,20,22,24,25,26,28
Subspaces. Span	Ch. 2, I.2	2:I.2.20,21,23,25,26,29,44,45
Linear independence	Ch. 2, II.1	2:II.1.21,22,25,28
Properties of linear independence	Ch. 2, II.1	2:II.1.29,30,32,33
Basis of a vector space	Ch. 2, III.1	2:III.1.20,21,22,23,24,25,26,30,31,34
Dimension of a vector space	Ch. 2, III.2	2:III.2.15,16,17,18,19,20,21,24,25,28
Column space, row space, rank	Ch. 2, III.3	2:III.3.17,18,19,20,21,23,29,32,39
Range space and Kernel (Null space)	Ch. 3, II.2	3:II.2.21,23,24,26,31,35
Invertible matrices: definition, equivalent conditions; inverse matrix	Ch.3, IV.4	3:IV.4.13,14,15,16,17,18,19,26,29
Elementary matrices. Row reduction using elementary matrices	Ch. 3, IV.3; CDTW Ch. 2, 2.3	3:IV.3.24,25,32
Determinant of a matrix, properties	Ch. 4, I.1, I.2	4:I.1.1,3,4,6,9; 4:I.2.8,9,12,13,15,18
More on Determinants	Ch. 4, II.1, III.1	4:III.1.11,14,16,17,20,21,22
Matrix of a linear transformation, matrix of the composition, inverse	Ch. 3, III.1, IV.2	3:III.1.13,17,18,19,21,23
Change of basis, similar matrices	Ch. 3, V.1, V.2; Ch. 5, II.1	3:V.1.7,9,10,12; 5:II.1.5,8,11,13,14

Complex numbers	Matthews 5.1–5.6	Matthews 5.8.1,2,5,6,7,9
Eigenvectors, eigenvalues, eigenspaces for matrices and linear operators. Characteristic polynomial	Matthews 6.1, 6.2; Ch. 5, II.3	5:II.3.23,24,25,26,27,28,29,30,31
Diagonalization of matrices	Ch. 5, II.2, II.3	5:II.3.22,33,36,46
Orthogonal and orthonormal bases of R^n and its subspaces; orthogonal matrices	Ch. 3, VI.1, VI.2	3:VI.1.6,7,17,19; 3:VI.2.10
Orthogonal complement of a subspace, orthogonal projection	Ch. 3, VI.3	3:VI.3.11,12,13,14,26,27
Gram-Schmidt process; orthogonal diagonalization of matrices	Ch. 3, VI.2	3:VI.2.13,15,17,18,19,22

Syllabi from previous semesters

The syllabus for Math 304 in Fall 2021 is available through this link:

Fall 2021 page

The syllabus for Math 304 in Spring 2021 is available through this link:

Spring 2021 page

The syllabus for Math 304 in Fall 2020 is available through this link:

Fall 2020 page