Math 344
Linear Algebra
Fall 2015

Professor: Dr. Peter Goetz

Office: Behavioral and Social Sciences 358

Office Hours: M, 4-5 PM, BSS 358; T, 4-5 PM, BSS 308; W, 9-10 AM, BSS 358;
R, 1-2 PM, BSS 358; F, 9-10 AM, BSS 358; and by appointment

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Course Website: http://users.humboldt.edu/pgoetz/math344fa15.html

Class Time and Place: We meet MWF from 8:00-8:50 AM in HGH 225.

Text: Linear Algebra Done Right, Third Edition, by Sheldon Axler, Springer.

Pre-requisite: Math 240 and Math 241, or consent of the instructor.

Course Overview: This course will further your exposure to the subject of linear algebra. The main focus of the course is to understand the structure of a linear operator on a finite-dimensional vector space.

Course Goals: The following four fundamental goals are what I will keep in mind as I teach the course, design assignments, and assess your work. Your final grade will depend on how well you achieve each of these goals.

(1) Obtain a basic understanding of the theory and techniques of linear algebra.
(2) Gain ability in abstract reasoning, problem solving, and computations.
(3) Gain ability in constructing and writing mathematical proofs.
(4) Be able to clearly communicate and express mathematical ideas.

Class Period Format: I will lecture most days in class. **It is very important that you read the textbook carefully and come to class prepared**. I won't have time to write all the definitions on the board or prove all the theorems. Instead I will talk about the definitions, give examples, sketch proofs of theorems, or give motivation. I'm hoping that this will create a more dynamic and fun classroom experience and that you will learn more linear algebra in the process. One more time for emphasis: to get the most out of the course, **you must read the textbook regularly and repeatedly**. **You should also attempt to verify all assertions made in the textbook**. (Please come talk to me in office hours if you don't understand something in your readings.)

Homework: I will assign one to three problems in class covering the daily lecture material. The assignment will be due the following class period, so expect to be turning in something every day of class. Each problem will be worth 2 points. I will post solutions on the course website.

Homework sets require both problem solving and presentation skills. A solution to a problem or the proof of a theorem should be a clear, concise, logical, written argument using complete English sentences with correct grammar. I will be grading your homework sets on both presentation and mathematical correctness. Some of the homework problems could be difficult. **Be sure to come see me in office hours if you need extra guidance**. I will not accept late homework. If you have to miss class, you need to make an arrangement to turn in your assignment early. Finally, because homework is very important in this course, **not turning in five or more homework assignments is an automatic no-pass**.

Exams: We will have two in-class exams during the semester in addition to a final exam. The dates for these exams are given below. Mark your calendars and plan accordingly as **no makeup exams** will be given. I will hand out a practice exam the week before the actual exam. The practice exam will be very similar to the actual exam. Make sure you can complete it in 50 minutes without notes. You are welcome to discuss the practice exam with your fellow classmates or me.

Exam 1	Monday, October 12, 2015
Exam 2	Monday, November 16, 2015
Final Exam	Wednesday, December 16, 2015, 8:00 -9:50 AM

Grading Components: Your course grade will be based on the following components:

Homework	25%
Exam 1	25%
Exam 2	25%
Final Exam	25%

Daily Schedule:

Date	Topics	Section	Reading	Assignment
8/24	The spaces R^n and C^n	1.A	2-11	HW 1 1.A: 3, 6, 10
8/26	Definition of Vector Space	1.B	12-17	HW 2 1.B: 2, 4, 6
8/28	Subspaces	1.C	18-21	HW 3 1.C: 1(a, c), 3, 4
8/31	Direct Sums	1.C	21-24	HW 4 1.C: 7, 8, 10

9/2	Span	2.A	28-32	HW 5 2.A: 1, 3, 5
9/4	Linear Independence	2.A	32-37	HW 6 2.A: 6, 9, 10
9/7	Labor Day, no class			
9/9	Bases	2.B	39-43	HW 7 2.B: 2(c,d,f), 4, 5
9/11	Bases, Dimension	2.B; 2.C	39-48	HW 8 2.B: 6, 7; 2.C: 1
9/14	Dimension	2.C	44-48	HW 9 2.C: 3, 9, 17
9/16	Vector Space of Linear Maps	3.A	52-57	HW 10 3.A: 2, 4, 10
9/18	Null Space and Range	3.B	59-62	HW 11 3.B: 1, 2, 4
9/21	Fundamental Theorem of Linear Maps	3.B	63-69	HW 12 3.B: 9, 15, 19
9/23	Matrix of a Linear Map	3.C	70-79	HW 13 3.C: 2, 3, 11
9/25	Invertible Linear Maps and Isomorphism	3.D	80-90	HW 14 3.D: 3, 4, 5
9/28	Direct Product of Vector Spaces; Quotient Vector Space	3.E	91-96	HW 15 3.E: 1, 4, 7
9/30	Quotient Space; Dual Space	3.E; 3.F	97-102	
10/2	Dual Map and Rank	3.F	103-116	
10/5	Polynomials	4	117-129	Due: HW 16
10/7	Invariant Subspaces	5.A	132-138	
10/9	Eigenvectors	5.B	143-146	
10/12	**Exam 1** (Chapters 1-3)			
10/14	Upper-Triangular Matrices; Eigenspaces	5.B; 5.C	146-153; 155-158	
10/16	Diagonalizability	5.C	157-161	Due: HW 17
10/19	Inner Product Spaces	6.A	164-170	
10/21	Inner Product Spaces; Orthonormal Bases	6.A; 6.B	171-179; 180-182	Due: HW 18
10/23	Orthonormal Bases	6.B	183-192	
10/26	Orthogonal Complements	6.C	193-196	
10/28	Orthogonal Complements, Minimization Problems	6.C	196-202	Due: HW 19
10/30	Self-Adjoint Operators	7.A	204-207	
11/2	Self-Adjoint and Normal Operators	7.A	208-216	

11/4	The Spectral Theorem	7.B	217-219	Due: HW 20
11/6	The Spectral Theorem; Positive Operators	7.B; 7.C	220-224; 225-226	
11/9	Positive Operators and Isometries	7.C	227-232	
11/11	Veterans Day, no class			
11/13	Polar Decomposition	7.D	233-235	Due: HW 21
11/16	**Exam 2** (Chapters 4-6)			
11/18	Singular Value Decomposition	7.D	236-240	
11/20	Generalized Eigenvectors	8.A	242-247	Due: HW 22
11/23-27	**Thanksgiving Week Holiday**			
11/30	Nilpotent Operators; Decomposition of an Operator	8.A; 8.B	248-251; 252-253	
12/2	Decomposition of an Operator	8.B	254-260	
12/4	Cayley-Hamilton Theorem	8.C	261-263	Due: HW 23
12/7	Minimal Polynomial of an Operator	8.C	263-269	
12/9	Jordan Form	8.D	270-272	
12/11	Jordan Form	8.D	271-274	Due: HW 24
12/16	**Final Exam, 8:00-9:50 AM**			

Academic Integrity: Please see http://www.humboldt.edu/studentrights/academic_honesty.php for HSU's policy on academic honesty.

Emergency Evacuation Procedures: The evacuation plan for the classroom is posted on the orange signs. Review http://www.humboldt.edu/emergencymgmtprogram/campus_emergency_preparedness.php for information on campus Emergency Procedures. During an emergency, information can be found on campus conditions at: 826-INFO or www.humboldt.edu/emergency.