MATH 110 Linear Algebra. Course Syllabus
with Professor Zvezdelina Stankova
TuTh 8:00 - 9:30pm, Room 2050 Valley Life Sciences
Updated 8/22/2016

CONTENTS

1. INSTRUCTOR AND GENERAL INFORMATION

- **Instructor:** Professor Zvezdelina Stankova (Zvezda)
- **Office:** Evans 713[†]
- **Phone:** (510) 642-3768
- **Tentative office hours:**[‡] TuTh 2:10pm - 4:00pm
- **Email:** (only for emergencies!) stankova@math.berkeley.edu
- **Webpage for $\forall$ TBA:**
  - http://www.math.berkeley.edu/∼stankova/
  - OR bCourses at https://bcourses.berkeley.edu/

• **No laptops, phones, or other electronic equipment** can be used during lecture or discussion sections. The only exceptions are for students with a disability that requires the usage of such equipment in class. Such students must explain the situation to the instructor and to the GSI, and during lecture/section they may sit only in the first 3 rows or in specially designated

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[†]How to remember my office number and why come to office hours? Have you carefully read Harry Potter, Book 1?! Vault 713 is a high security vault at Gringotts Wizarding Bank in London, England. It is located hundreds of miles underground and requires a Gringotts goblin to pass its finger along the length of the door, in order for the door to melt away. It hosted the Philosopher's Stone. Conclusion: there must be something very valuable in Evans 713. Fortunately, you won't need such a high security protocol to enter. Come to office hours! ☺

[‡]To be finalized in the first two weeks of classes.

seats that allow access to students with disabilities. Aids to students with disabilities may also use appropriate electronics during class, after consultation with the instructor/GSI.

2. Enrollment and Section Switching

2.1. **For enrollment questions:** in person during drop-in advising hrs M-F 9am-12pm, 1-4pm:
- Thomas Brown, Evans 965 or Ana Renteria, Evans 964.

2.2. **To switch discussion sections,** students must go to CalCentral at
- https://math.berkeley.edu/courses/enrollment-scheduling
  The switch will be possible only if there is room in the section.

2.3. **No access to enrollment:** Do **not** ask the instructor or the GSI to switch you to another section or to enroll you in the class. We have no control over enrollment in the class and in sections.

3. Prerequisites

3.1. **Required:** MATH 53-54.

3.2. **Recommended:** MATH 55.

4. Discussion Sections

4.1. **Enrollment:** Each student must sign up for a discussion section on Tu or Wed.

4.2. **Attendance:** Discussion sections and lectures are mandatory.

5. Textbooks

5.1. **Required:** *"Linear Algebra,"* by Friedberg, Insel, Spence, 4th edition, ISBN: 9780130084514.

6. Homework

6.1. **Assigned:** HW will be posted on the web every week, usually right before or after lecture.

6.2. **If missed class:** If you miss lecture or discussion section: do NOT e-mail instructor or GSI to ask for missed handouts and announcements. Instead, ask your classmates.

6.3. **HW deadline:** HWs won't be graded/collected but must be done by the following Tuesday.

6.4. **Homework solutions:**
- **Posted:** HW solutions will be ordinarily posted on the web on Mondays, a day or two before the quiz. Do **not** ask for solutions to be posted earlier: you must attempt to do your homework without help from posted solutions.
- **Taken down:** HW solutions will be **taken off** the web in a week or so after being posted; hence make sure that you download them and read them on time. No HW solution files will be sent to students at any time: please, do **not** request them; ask instead your classmates for those missed HW solution files.

7. Reading Assignments

It is the students' responsibility to read carefully and thoroughly the assigned section(s) from the textbook and review their class notes after each class.

8. Quizzes

8.1. **Total number of quizzes:** There will be about 12-13 quizzes in the discussion sections, given on Tuesdays or Wednesdays, whenever the section meets.

8.2. **Number of quiz scores in final grade:** Only the top 10 quiz scores will be taken into account when determining a student's final grade.

8.3. **No make-up quizzes:** If you miss a discussion section when a quiz is taken, you cannot retake the quiz in another section, and your quiz score will be 0. Thus, when you miss discussion sections (for whatever reasons, including being sick, having a family emergency, etc.), keep in mind that exactly **the top ten** quiz scores will be counted, regardless of your reasons. **No** exceptions will be made to this policy: please, do not bring to me or to your TA notes to be excused from quizzes. The quizzes will be based on the current or previous homework assignments.

8.4. **Purpose of the "Top 10 quizzes":** Keep the few times when you might miss quizzes only for true emergencies. The quizzes to be dropped are not intended as a back-up for slacking off, lagging behind the material, or catching up due to unsatisfactory academic performance on previous quizzes. The quizzes that will be dropped are meant to help you in case of an emergency. No further quiz scores will be dropped.

8.5. **Joining the course late and quizzes:** Again, 10 quiz scores will be used towards the final grade, including some possible 0s if fewer than 10 quizzes have been taken.

8.6. **Content of Quizzes:** Ordinarily, each quiz will be graded out of 15 points and will consist of one problem for 12 points and 3 True/False questions, each graded as follows: 1 point for correct answer, 0 for blank, and -1 for incorrect answer. The T/F questions on the quizzes are intended to prepare you for a problem with many T/F questions on each exam.

9. EXAMS

9.1. **Times of the three exams:**
- **Midterm 1:** Tuesday, September 27, in class.
- **Midterm 2:** Tuesday, November 1, in class.
- **Final exam:** Wednesday, December 14, 3-6pm, scheduled campus-wide.

9.2. **No make-up midterms or final exams:** Every student must take the midterms and the final exam on these dates and at these times.

9.3. **Scheduling or avoiding conflicts with exams?**

• Do **not** buy tickets to leave before or to come after an exam: you must be here at the three exams dates above.

• Do **not** ask for earlier dates for the final exam due to flight reservations or other reasons: the final exams times are assigned campus-wide and there will be no personal exceptions.

• Do **not** take this class if you have a conflict with any of this exam schedule. (Exceptions noted below.)

9.4. **Exam Content.** A substantial part of the exams will be based on versions of problems from:
- **Homework:** problems, both regular and bonus.
- **Class:** problems, theory, and ideas discussed in class.
- **Quizzes:** quiz problems from random sections.

9.5. **Are the exams comprehensive?**

• **Midterms:** The topics for each midterm exam will be based on the portion of the course between exams. Thus, formally, midterms are **not** comprehensive. Yet, you cannot forget previous material since parts of it may come up in the solutions to midterm problems.

• **The final exam is comprehensive.**

10. Grading

10.1. Grading scheme: Grades are computed by taking

- 15% quizzes (using only the top 10 quiz scores). Quiz medians of all sections in the class will be uniformized at the end. Thus, there is no point of being upset that your section is getting harder quizzes or is being graded harsher: it won't make a difference in the end.
- 25% each midterm.
- 35% final exam.
- All three exams will be rescaled to the same median, and then the final exam score will resurrect lower midterm scores.

10.2. Resurrection final. The final exam score will override any lower midterm score, after all three exams have been rescaled to the same class median. This means that

- the final exam may count as 60% or 85% instead of 35%.

10.3. Class curve. The final letter grades will be based on a curve. Class statistics on the midterms and the final exam will be posted on the web.

10.4. Missing the final exam: will result in automatic failure of the course, unless valid reasons are provided for requesting an incomplete grade.

11. Special Accommodations

11.1. Skipping a midterm. You may skip a midterm (but not the final exam!) due to a conflict with **religious creed** or with an **extra-curricular/sports activity**.

- The student must notify the GSI in writing at least **10 days prior to the midterm** that he/she will be skipping a midterm and explain the reason. No need for formal documentation.
- The final exam will resurrect the missed midterm. However, this option must be taken only when really necessary. Frivolous skipping a midterm usually leads to poor final exam outcome.
- It is the student's responsibility to learn the missed material due to the absence.

11.2. Special Arrangements for Disabled Student Program (DSP) students.

- If you are a student with **a disability registered by the DSP** on UCB campus and require special arrangements during exams and quizzes, you must provide me and your GSI with the DSP document and contact me and your GSI via e-mail or in office hours at least **10 days prior to the first exam or quiz on which you will need accommodations**, explaining your circumstances and what special arrangements need to be done.
- If you do not contact us at least 10 days in advance, you will have to take the exam (or quiz) along with everyone else under the regular conditions provided for the class. The earlier we are informed about your DSP status, the easier it is to provide appropriate accommodations for you.
- Do NOT ask to be given special accommodations while promising that in the future you will provide a DSP note. Observe this policy: no exceptions will be made.

11.3. Taking the final exam "on the road" for athletes.

- If you have a scheduled athletic competition as a member of an official UCB sports activity during the final exam, you must inform the instructor **at least 10 days prior to the final exam.**
- Final exams "on the road" are not automatically granted: certain conditions must be satisfied and the instructor needs to speak with your coach who will be with you and proctoring the exam. Thus, if you do not inform the instructor at least 10 days prior to the final exam, you will not be granted the privilege of taking the final exams under such special conditions. Take this seriously and act fast and responsibly to ensure that communication has reached the instructor by the deadline.

12. Drop Deadline

The results of the first midterm will likely be known **after** the drop deadline. Do not ask me or the GSIs if I think you are more likely to get, say, B- instead of C+: we will not know. The decision to drop the course will be entirely yours and you will have to make it based on your first several quizzes and the first midterm (if its score is available at that point).

13. Incomplete Grades

13.1. **University policies:** Please, consult the university policies regarding incomplete grades.

13.2. **Reasons for Incomplete:** An Incomplete "I" grade is rarely given. The only justifications for an I grade are:
- **documented serious medical problem,** or
- **a genuine personal/family emergency.**

13.3. **Conditions for giving an incomplete.** When requesting an incomplete, the student must:
- have a passing grade (C- or above) up to that point in the class.
- have completed at least 2/3 of the course work up to that point.
- present a formal document regarding the nature of emergency or the medical problem.

13.4. **Invalid reasons for requesting an incomplete.**

- Falling behind in this course or a heavy work load in other courses are not acceptable reasons for requesting an incomplete.

- If you miss a midterm (for whatever reasons), you will very likely **not** qualify for an incomplete, as your grade before the final exam will include a 0 on that midterm, which will not have been "resurrected" by the final at the time of requesting the incomplete grade.

14. Academic Integrity

The Mathematics Department, and in particular, the instructor and the GSIs in this course, expect that students in mathematics courses will not engage in cheating or plagiarism. The following is adapted from the Math Dept web page to our course.

14.1. **What does cheating mean?** Broadly speaking, cheating means violating the policies of a course or of the university in order to gain an unfair advantage over fellow students. A particular kind of cheating is plagiarism, which means taking credit for someone else's work. Cheating and plagiarism hurt your fellow students in the short term, they hurt the cheater in the long term, and they will not be tolerated. On exams, the most basic type of cheating is copying off of someone else's paper. Graders easily spot when two exam papers look unusually similar, or have similar (wrong or correct) answers, calculations, ideas, or thought structure, even if written in different words or order of words. Even glancing at someone else's paper to check your answer is cheating. If you write the correct answer to a computational problem without any justification or with a bogus justification leading to that answer, this raises strong suspicions that you cheated, on top of not receiving any credit anyways due to the lack of correct justification.

14.2. **Electronic devices on exams/quizzes.** Electronic devices such as phones, ipads, calculators (electronic, mechanical, or any other type), and other devices, are also not allowed on exams/quizzes (unless explicitly allowed by the instructor), not even to tell the time. There are too many ways to cheat using software and the Internet. Exams are not intended to test your ability to find the answer by any means necessary. The questions might be too easy for that! Rather, exams/quizzes are supposed to test your understanding of the course material, which you will need in order to use math correctly in subsequent courses and in the real world.

14.3. **Expectations on exams, quizzes, and HW.** Exams and quiz papers are expected to be your own work. In this class we encourage collaboration on homework, as it won't be graded or collected; but you are carrying your personal responsibility to learn how to do the HW problems independently so as to be able to solve similar problems on exams and quizzes by yourself. When allowed, if you use proofs or calculations from textbooks or class notes, you need to cite these sources, even if you have rewritten the material in your own words; otherwise it is plagiarism.

14.4. **How to avoid cheating?** It is your responsibility to take reasonable precautions to prevent cheating. In exams, you should sit as far away from other students as the room permits, and hold your exam papers in such a way that they are not easily visible to other students.

14.5. **What to do in a case of cheating?** If you suspect that other students are cheating, you should immediately inform the instructor and/or your GSIs. Students may be cheating in ways that the instructor/GSI has never even heard of (unlikely, but possible). Even if you don't mention any names, the sooner you inform the instructor/GSI what is going on, the sooner they can take measures to put a stop to it. You can further report a cheating at:

$$\text{http://sa.berkeley.edu/conduct/reporting/academic}$$

14.6. **Resolution to cheating.** If you are suspected of cheating, the instructor may pursue a variety of actions depending on the particular nature of the incident. If you accept responsibility for academic miscondict, the matter can often be resolved between you and the instructor with possible academic sanctions ranging from losing points on an exam/quiz to failing the class, and a report will be sent to the Mathematics Department and/or Center for Student Conduct. It is not necessary for the instructor to determine whether the student(s) has a passing knowledge of the relevant factual material. It is understood that any student who knowingly aids in cheating is as guilty as the cheating student.

In serious incidents, or if you maintain that you are not responsible for academic misconduct, the instructor has the freedom and responsibility to impose any academic sanctions within the course that she deems appropriate, and the case will very likely be forwarded to the Center for Student Conduct. In such a case, more stringent actions (e.g., dismissing the student from the university) can be initiated by the Office of Student Conduct.

14.7. **Conclusion.** We hope that the above clarifications will help prevent cheating. If you have any questions about the rules or expectations, you should not hesitate to ask the instructor/GSI, or the vice chair for undergraduate affairs in the Mathematics Department.

15. Disrupted Examinations

The following has been adapted from the Mathematics Department advising materials to faculty.

15.1. **State law during fire alarms.** Over the years, several final examinations have been disrupted by false fire alarms. State law requires that buildings must be evacuated during alarms, and the police department suggests that classes do so in an orderly, efficient fashion so that students can return to work as quickly as possible.

15.2. **Penalties for false alarms.** A false alarm is a misdemeanor, with a penalty of up to $1,000 in fines and up to one year in county jail. If the alarm results in bodily injury (e.g., someone has a heart attack), a false alarm can be a felony with a penalty up to $5,000 in fines and three years in state prison.

15.3. **When an alarm does sound during an exam,** we will use the following guidelines:

• If an alarm is pulled after the exam has been going on for more than 2/3 of the overall allotted time, the exam will be considered complete and the grading scale will be adjusted accordingly at the discretion of the instructor.

• If an alarm has been pulled after the exam has been going on for less than 15 minutes, we will evacuate and the students will leave the exams on their desks. After the alarm has been taken care of, the students will proceed back to the classroom and resume the exam. Anyone found carrying his/her exam outside the classroom will not be allowed to continue the exam, and the instructor will be given the freedom to decide how and whether to grade this student's exam.

• During an evacuation, the instructor and the GSIs will visibly monitor the students to cut down on casual exchanges of exam information.

• For exams that have been going on between 15 minutes and less than 2/3 of the total allotted time, the students will leave their papers in the classroom and evacuate. It will be up to the instructor to decide if there is enough time to resume the exam or to reschedule it.

16. QUESTIONS

16.1. **Whom to Ask?** Please, refer to the following list for contact when you have questions regarding the course. Contacting the wrong people will simply result in redirecting you to the appropriate contact person, and thus, will waste your and our time. GSIs are instructed **not** to answer any questions outside of their realm of expertise as listed below.

#	Type of Questions	Person to Ask	When and How
1	enrollment and section placement	Thomas Brown, Evans 965 Ana Renteria, Evans 964	drop-in office hours M-F 9am-12pm, 1-4pm
2	quiz and exam scores	the student's GSI	office hours
3	missed handouts and announcements	classmates	
4	admin. questions not addressed elsewhere	professor	office hours
5	math questions	GSIs, professor	sections, office hours
6	emergencies only	professor	office hours, e-mail, phone

16.2. **Email is only for emergencies!** The professor will not answer any math or grading policy questions on e-mail: **professor's e-mail is only for emergencies!**

16.3. **No repeats.** Administrative questions that are addressed in this handout or answered in lectures or sessions will not be answered on e-mail or otherwise.

16.4. **Missed information.** For any missed information: ask your classmates.

16.5. **For final exam room and time assignment:** check the UCB final exam scheduling on the web; do not send e-mail to professor or GSIs.

17. GSIs CONTACT INFORMATION

#	Name	Office Hours	Office	E–mail
1	Benson Au	M 1-2, 4-6	747 Evans	bensonau@math.berkeley.edu
2	Chris Miller	W 10-12	1044 Evans	chrismiller@berkeley.edu
3	Doosung Park	W 9-10, 12-2	814 Evans	doosung@math.berkeley.edu
4	Harrison Chen	Tu 12-2, W 3-4	1049 Evans	chenhi@math.berkeley.edu
5	Qiao Zhou	W 5-6, F 1-3	1097 Evans	qzhou@math.berkeley.edu

• Any student is welcome to visit any GSI with math questions. The GSI's and instructors office hours do not overlap, and hence there are lots of office hours during the week that one can use to get answers to questions. You do **not** necessarily have to come to the instructor's office hours with math questions: all GSIs are qualified to answer math questions related to the course.

- Direct in person admin. questions (not answered in class) to your GSI or the instructor.
- **Reserve email for emergencies only!** "Emergencies" are urgent and important situations that are **not** caused by a student's procrastination, negligence, or disorganization.
- Be organized, responsible, and hard-working: these traits will take you half of the way to performing well and getting a lot out of this course.

18. Tentative Plan of the Course

1) Definition of vector space. Properties. Examples
2) Subspaces. Examples
3) Linear Dependence and Independence.
4) Basis and Dimension. Replacement Theorem
5) Linear Transformation. Nullspace and Range
6) Dimension Theorem. Problems
7) Matrix of Linear Transformation. Multiplication of Matrices
8) Isomorphism. Inverse Matrix
9) Change of Basis. Problems
10) Dual Space. Matrix of Dual Transformation
11) Problem Solving
12) Midterm I (in-class)
13) Review of Linear Equations
14) Review and Summary of Determinants' Properties
15) Eigenvalues, Eigenvectors and Characteristic Polynomials
16) Diagonalization I
17) Diagonalization II. Problems
18) Cayley-Hamilton Theorem
19) Jordan Canonical Form I
20) Jordan Canonical Form II.
21) Minimal Polynomials. Problems
22) Markov Chains
23) Problem Solving
24) Midterm II (in-class)
25) Linear Differential Equations
26) Inner Products, Orthonormal Bases
27) Adjoint Operators
28) Self-adjoint and Normal Operators
29) Einstein's Special Theory of Relativity
30) Review for Final Exam