

MATH 54. Linear Algebra and Differential Equations. CCN 53950

Course Syllabus. Updated 1/14/2013

Spring 2013, TTh 11:00am - 12:30pm, Room 155 Dwinelle Hall

Instructor: Professor Zvezdelina Stankova

Office: Evans 713, *Tel:* (510) 642-3768

Tentative office hours (to be finalized by the end of the first two weeks of classes): Tu 12:30-2pm in front of Dwinelle 155, Thur 9:30-11:00am in Evans 713

E-mail: (only for emergencies!) stankova@math.berkeley.edu

Class webpage for all materials: <http://www.math.berkeley.edu/~stankova/>

Questions on Enrollment: Thomas Brown, Evans 965. You need to see them in person to resolve enrollment questions. Students wishing to switch discussion sections will have to do this themselves on TeleBears; the switch will be possible only if there is room in the section. 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.

Prerequisites: Calculus 1A and Calculus 1B, or equivalent. Note: calculus courses at most institutions either have no differential equations, or less than Berkeley's Calculus 1B. Transfer students who have taken such courses need to learn the relevant differential equations material (Stewart, Single Variable Calculus, Early Transcendentals, for UC Berkeley, Chapters 9 and 17) on their own, by approximately the 10th week of the present course MATH 54.

Discussion Sections: Each student will be assigned to a discussion section. The discussion sections, as well as lectures, are mandatory.

Textbooks: Linear Algebra & Differential Equations by Lay-Nagle-Saff-Snider, Pearson Learning Solutions; 2nd Custom Edition for UC Berkeley. This is a special version of the textbook, prepared exclusively for the UCB Math Dept. The correct edition is essential for getting the correct HW and class material.

Homework: HW will be posted on the web every week. If you miss lecture,

- **do NOT e-mail instructor or GSI to ask for missed handouts and announcements.**

Instead, ask your classmates. HWs will not be graded or collected but must be done by the following Wednesday. Homework solutions will be posted on the web a day before the quiz. Do **not** ask for solutions to be posted earlier: you must attempt to do your homework without help from posted solutions. 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.

Quizzes: There will be approximately 14 quizzes in the discussion sections, usually given on Wednesdays. The lowest two quiz scores will be dropped when determining a student's final grade.

- **If you miss discussion sections 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 or having a family emergency), keep in mind that only two quiz scores will be dropped, and **no further quiz scores will be dropped** 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.

- **For a student joining the course late: no quiz scores will be dropped.**

All quizzes from the time when the student joins the class will be counted towards the final grade. Thus, do **not** ask for exceptions to this policy.

Exams: There will be

- two in-class midterm exams on **Thursday, February 21**, and **Thursday, April 4**.
- a final exam on **Thursday, May 16, 8-11am**.
- **no make-up midterms or final exams**.

Every student must take the midterms and the final exam on these dates and at these times. 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 take this class if you have conflicts with any of this exam schedule (exceptions noted below)**. Do not ask for earlier dates for the final due to flight reservations or other reasons: the final exams times are assigned campus-wide and there will be no personal exceptions.

Exam Content: A substantial portion of the exams will be **based on homework assignments**.

• **Exams are not comprehensive**. The topics for each exam will be based on the portion of the course between exams. Yet you cannot forget previous material since parts of it may come up in the solutions.

Grading: Grades are computed by taking 15% quizzes, 25% each midterm, 35% final. The letter grades will be based on a curve. Please, consult the bonus credit appendix for more information and specific examples.

Emergencies: If you miss one of the midterms due to a *documented reason of a medical or family emergency*, the following adjustment will be made in calculating your grade: 15% quizzes, 35% other midterm, 50% final. A *documented reason of an emergency* means an official document on letterhead, dated and with appropriate signatures; such documents must be

- **submitted within a week of the missed midterm**,

or else they will not be accepted and you will receive 0 points on the missed midterm. If you miss one of the midterms due to an *undocumented reason*, your final grade will be computed as: 15% quizzes, 0% the missed midterm, 25% the other midterm, 35% final. Note that a conflict with other exams, classes or activities will not be considered a reasonable excuse for missing a midterm.

• **Missing both midterms, or missing the final exam, will result in automatic failure of the course**, unless valid reasons are provided for requesting an incomplete grade.

Incomplete grades: Please, consult the university policies regarding incomplete grades. Incomplete "I" grade is rarely given. The only justification for an I grade is a

- **documented serious medical problem or a genuine personal/family emergency**.

The student also must have a passing grade (C- or above) up to the point of being given an incomplete. Falling behind in this course or problems with work load in other courses are not acceptable reasons.

Accommodations of Religious Creed and Conflict with Extra-Curricular Activities: Requests to accommodate a student's religious creed or conflicts of extra-curricular activity by scheduling tests or examinations at alternative times (or other accommodations as reasonably established by the instructor) must be in writing (not email) and submitted in person directly to the instructor during office hours:

- **by January 31, 2013**.

No requests will be considered after that date. It is the student's responsibility to inform him/herself about material missed because of an absence, whether or not he/she has been formally excused.

Special Arrangements: If you are a student with a disability registered by the Disabled Student Services (DSS) on UCB campus, and if you require special arrangements during exams, you must provide me with the DSS document and you must contact me via e-mail or in office hours at least

- **10 days prior to each exam**,

explaining your circumstances and what special arrangements need to be done. If you do not contact me 10 days in advance, you will have to take the exam along with everyone else and under the regular conditions provided for the class. Do **NOT** ask to be given special accommodations, promising that in the future you will provide a DSS note. Observe this policy: no exceptions will be made.

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.

Bonus Work: Exams will consist of regular problems and bonus problems. Bonus problems are **not** substitutes for regular problems; they are usually harder and designed to provide extra challenge. Your final grade will be calculated via the above formulas using only your "regular" scores. After that, all the bonus credit from exams will be added up separately. Depending on what portion of the total bonus credit you have, and on my estimate of the difficulty of the overall assigned bonus work, your final grade may go up a step. However, I reserve the right to be the sole judge of how much (if at all) any bonus work can boost one's grade. Please,

- **don't make a big issue of bonus problems: there are only 3-4 bonus exam problems throughout the whole semester.**

Your midterm letter grades will be first determined based on your regular problems, and then I will decide if any bonus credit is enough to increase your letter grade. The important thing is that the midterm letter grades will disappear once I start calculating your final score, and that bonus credit can never decrease your grade!

- **I shall not discuss bonus credit policy or grading policy with students throughout the semester. Please, do not ask me in the middle of the semester if and how much your bonus problem(s) will increase your final grade: I will not know the answer to this question until after the final exam when the grades are computed.**

Thus, please, consult carefully the appendix for more detailed information on grading.

Drop Deadline: The results of the first midterm will likely be known **after** the drop deadline. The GSIs will inform those students that are failing the course based on their first (approximately) 4 quizzes. If you do not receive your first midterm letter grade by the drop deadline, no other grade information will be available up to that point. So don't e-mail me asking me if I think you are more likely to get, say, B- instead of C+: I will not know. Thus, the decision to drop the course will be entirely yours and you will have to make it based on your first several quizzes before the drop deadline. If you are not happy with this arrangement, you should **not** take this course.

Questions: 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.

Questions and Whom to Ask

#	Type of Questions	Person to Ask	When and How
1	enrollment and section placement	Thomas Brown, Evans 965	office hours
2	quiz and exam scores	the student's GSI	office hours
3	missed handouts and announcements	classmates	
4	other 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

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

- **Administrative questions which are addressed in this handout or answered in lectures or sessions will not be answered on e-mail or otherwise.**

- **For any missed information: ask your classmates.**

- **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.**

GSIs Contact Information

#	Name	Office Hours	Office	E-mail
1	Long Jin	M 10-11am, Tu 9-10am	Evans 835	jinlong@math.berkeley.edu
2	Kuan-Ying Fang	MWF 9-10am	Evans 840	kyfang@math.berkeley.edu
3	Khoa Nguyen	MW 5-6pm	Evans 1093	khoanguyen2511@gmail.com
4	Dominic McCarty	Tu 10-11am, Th 1-2pm	Evans 1070	dominic.mccarty@gmail.com
5	Markus Vasquez	MW 1-2pm	Evans 1056	markusv@math.berkeley.edu
6	Penghui Li	MW 2-3pm	Evans 840	pli@math.berkeley.edu
7	Jia Tian	M 3-4pm, F 10-11am	Evans 866	jtian@berkeley.edu
8	Alvin Moon	F 11-12pm, 4-5pm	TBA	a.moon@berkeley.edu
9	Aditya Adiredja (PDP)	W 11-1pm, Th 4-6pm	230C Stephens	aadiredja@gmail.com
10	Bon-Soon Lin (Adjunct course)	TTh 3:30-5pm, MWF TBA	Math Drop-in area, Chavez	bonsoon@gmail.com

http://slc.berkeley.edu/math_stat/math54.htm

Discussion Sections

DIS#	Time	Place	GSI
DIS 101	MWF 8-9A	41 EVANS	Dominic McCarty
DIS 102	MWF 8-9A	61 EVANS	Long Jin
DIS 103	MWF 9-10A	35 EVANS	Dominic McCarty
DIS 104	MWF 9-10A	51 EVANS	Long Jin
DIS 105	MWF 10-11A	55 EVANS	Penghui Li
DIS 106	MWF 11-12P	31 EVANS	Penghui Li
DIS 107	MWF 11-12P	55 EVANS	Kuan-Ying Fang
DIS 108	MWF 12-1P	55 EVANS	Jia Tian
DIS 109	MWF 12-1P	35 EVANS	Dominic McCarty
DIS 110	MWF 1-2P	31 EVANS	Jia Tian
DIS 111	MWF 2-3P	39 EVANS	Markus Vasquez
DIS 112	MWF 3-4P	55 EVANS	Markus Vasquez
DIS 113	MWF 3-4P	41 EVANS	Khoa Nguyen
DIS 114	MWF 4-5P	35 EVANS	Khoa Nguyen
DIS 115	MWF 10-11A	121 LATIMER	Kuan-Ying Fang
PDP 116	TTh 6-8pm	230D Stephens	Aditya Adiredja
DIS 117	MWF 5-6P	61 EVANS	Alvin Moon
DIS 118	MWF 12-1P	3105 ETCHEVERRY	Alvin Moon
Adjunct MATH 98	TTh 2-3:30pm	113 Chavez	Bon-Soon Lin

What is Adjunct MATH 98? MATH 98 will be taught by Bon-Soon Lin. Math 98 is a 1-unit course taken in conjunction with Math 54. The adjunct instructor integrates academic content from the lecture with study strategies techniques in order to improve problem-solving skills, develop self-management and study-strategies, and promote academic success. Students must enroll or be on the waiting list of the lecture that the adjunct course is supporting. To add the adjunct course, attend the first class meeting of the adjunct course, and the instructor will distribute the course control number (CCN). Students can then enroll in the adjunct course through Telebears. Enrollment is limited to 25 students, so students that attend the first session are more likely to get into the adjunct course.

For more information, please, go to http://slc.berkeley.edu/math_stat/math54.htm. If you have more questions, please, direct them to Bon-Soon Lin, bonsoon@gmail.com. **The instructor for MATH 54, Professor Stankova, cannot resolve any enrollment questions** for MATH 54, discussion sections of MATH 54, the PDP section of MATH 54, or the adjunct MATH 98 course. Please, refer for enrollment to the corresponding Math Dept staff.

Tentative Plan of the Course ¹²

1. Systems of linear equations. Row reduction and echelon forms.
2. Vector and matrix equations. Solution sets of linear systems. Linear Independence
3. Linear transformations and their matrices
4. Matrix operations, inverses, invertible matrices
5. Determinants, properties, Cramer's Rule
6. Vector spaces and subspaces; null and column spaces
7. Connection w/ Linear transformations. Linearly independent sets and bases
8. Coordinate systems. Dimension of a Vector space
9. Rank. Change of basis
10. Midterm 1
11. Eigenvectors and eigenvalues. Characteristic equation
12. Diagonalization. Eigenvectors and linear transformations
13. Inner products, length and orthogonality
14. Orthogonal sets. Orthogonal projections. The Gram-Schmidt process
15. Least-square problems
16. Inner product spaces
17. Symmetric matrices. Diagonalization of symmetric matrices
18. Quadratic forms. Applications
19. Homogeneous 2nd order DEs: the general solution. Auxiliary equations w/ complex roots
20. Midterm 2
21. Non-homogeneous 2nd order DEs: via undetermined coefficients, variation of parameters
22. Theory of higher-order DEs. Homogeneous linear DE with constant coefficients
23. Matrix method for linear systems. Normal form. Hom. linear systems w/ constant coefficients
24. Complex eigenvalues. Non-homogeneous linear systems. The matrix exponential function
25. PDE: model for heat flow. Method of Separation of Variables
26. Fourier series. Fourier cosine and sine series.
27. The heat equation. The wave equation
28. Laplace's equation
29. Review for Final Exam
30. Final Exam.

¹*Note:* Particular topics may change without prior notice, depending on how the course proceeds. Hence, I shall **not** honor excuses such as "I tried to follow the syllabus, but different topics were covered in class, and that's why I wasn't prepared to do well on the quiz/exam this week." If a student misses class/discussion, it is the student's responsibility to find out from classmates what is currently covered in class/discussions and to stay on top of the material.

² The two midterms and the final exam are included in the above Tentative Plan; the actual dates for all exams are indicated earlier in this handout.

Appendix on Bonus versus Regular Credit

The main points of the scoring (regular and bonus) are illustrated below via three hypothetical examples. **100r** means “100 regular points”, **20b** means “20 bonus points”. Student *X*, *Y* and *Z* receive the following scores:

Total	Midterm 1	Midterm 2	Final Exam	Quizzes
Student	100r, 20b	100r, 20b	140r, 27b	200r
Student X	85r, 8b	92r, 12b	128r, 2b	110r
Student Y	95r, 10b	95r, 19b	114r, 11b	123r
Student Z	90r, 14b	95r, 20b	134r, 22b	130r

To calculate final percentages, use the **weight formulas**

$$\frac{20(M1 + M2 + F) + 6Q}{80} \text{ for regular points, and } \frac{3(M1 + M2 + F)}{40} \text{ for bonus \%}.$$

Total	Regular%	Regular Grade	Bonus%	Adjusted %	Final Grade
Student	max 100%		max 5%	max 105%	
Student X	84.50%	B+	1.65%	86.15%	B+
Student Y	85.23%	B+	3.00%	88.23%	A-
Student Z	92.00%	A-	4.20%	96.20%	A

Important points to remember: All numbers above are made solely for the sake of this example.

- (1) The “weight formulas” are made under the assumption that the maximal total scores for the exams and quizzes are as shown in the second row of the table. These totals may change somewhat during this particular course; hence you can imagine that there will be a different weight formula reflecting again the relative weight of 25% each midterm, 35% final exam and 15% quizzes.
- (2) The “regular grades” in the table above are determined solely on the regular scores, according to the following **hypothetical** cut-off points: • A: above 94%; • A-: above 88%; • B+: above 83%, and so on. The cut-off points for this course will most probably be different, and they will be determined solely by me at the end of the semester.
- (3) The bonus total is set for 5% in the example, and is subject to change depending on my estimate of the overall difficulty of the bonus exercises.
- (4) The final grades are computed first based **solely** on the regular points. Only then the bonus adjustment is made, and whoever gets into the next grade range receives a grade bump. For example, student X did not have sufficient bonus work to make the bracket for A-, so no raise here; on the other hand, students Y and Z got bumps in their final grades since they entered the next grade brackets with their bonus work.
- (5) On the actual grading for this class, a bump of more than one step on account of bonus will not be allowed, e.g. B to A- will not be possible, but B+ to A- will be possible.
- (6) Note that one can actually end up with more than 100% total, which will result in one simple A+. Finally, **one can earn 100% without doing any bonus problems.**

The reason for the above *unconventional* grading system is two-fold: To give a chance to medium and poor students to be able to get the best grade they can get without feeling any extra pressure to do harder problems; and to give an incentive to more advanced students to do harder problems and challenge themselves to the level of their own ability.

The *traditional* bonus systems do in effect one of two things: either equalize very hard with not so hard problems (by giving students a choice of, say, 5 out of 7 problems on the exams), or force weaker students to sweat over very hard problems (by adding up all scores on exams). However, I want to be fair to all groups of students as much as possible. If one really wants to be fair to everyone, a more complicated system has to be designed, and the one described above is the best system I can think of in terms of fairness to everyone.

Remember that I and the GSIs will not discuss any grading or bonus policies during the semester. You are smart students - you can answer all your questions regarding grading policies from the examples above.