MATH 54 - SYLLABUS

PEYAM TABRIZIAN

Welcome to Math 54! This is the syllabus for the course. Here you can find all the info about office hours, grading, etc., as well as an outline for the course.

- **Instructor:** Peyam Ryan Tabrizian
- **E-mail:** peyam@math.berkeley.edu or tabrizianpeyam@hotmail.com
- **Office:** 1008 Evans
- **Class meeting times:** This course meets for 8 weeks (June 18 - August 10), MTWTF from 12:10 pm to 2 pm in 4 Evans. Unlike what the schedule says, there will be no separate discussion section; instead I will mix lecture and discussion together. From 1 pm to 2 pm, we might have to move to 75 Evans (**not** 6 Evans), although we'll try to stay in the same room.
- **Office Hours:** TuTh 2-3 pm and W 11-11:50 am in 1008 Evans. In addition, on the day before each exam, my office hours will be 11-11:50 am and 2-4 pm.
- **Waitlist:** I have no control over the waitlist! The person you should contact is Thomas Brown. His office is in 965 Evans (if that doesn't work, try 967 Evans), and his e-mail is brown@math.berkeley.edu.
- **Important Dates:**
  - Friday, 06/22: Deadline to withdraw or add/drop with refund
  - Friday, 06/29: Deadline to withdraw or add/drop without refund
  - Wednesday, 07/04: Holiday (Independence Day), no class
  - Friday, 07/27: Deadline to change grading option
  - Friday, 08/10: Last day of classes / Final Exam

Date: Monday, June 18th, 2012.

- **Online resources you can use:**

  - www.math.berkeley.edu/∼peyam: This is the most important resource. It contains handouts, all the homework assignments, a schedule, practice exams, and study guides.
  - bspace.berkeley.edu: Use this to check your grades. I will also send important announcements which you should receive in your e-mail inbox.
  - www.piazzza.com: This is a really cool and interactive forum tool. Whenever you have a question, post it on this site, and I (or one of your classmates) will do my best to answer it. Plus, we can have chatroom-like discussions, which will be especially useful before the exams.

- **Textbook:** *Linear Algebra and Differential Equations*, Custom Berkeley Edition, Pearson Publishing, ISBN-13: 978-0-558-66889-1

  This book combines the following:
  – David Lay, *Linear Algebra and Its Applications*, Addison-Wesley, 3rd edition Update, ISBN-13: 978-0-321-28713-7

  – Nagle, Saff and Snider, *Fundamentals of Differential Equations and Boundary Value Problems*, Addison-Wesley, 4th edition, ISBN-13: 978-0-321-14571-0

  Here's my suggestion: Get the Linear Algebra book because it's actually pretty good, but don't buy the Differential Equations book, just make photocopies of the homework problems from a friend and look at the handouts from my website. **On the exams, I will NEVER ask you anything that is in the book but not on the homework/practice exams or that I haven't covered in lecture**.

- **Prerequisites:** None! The awesome thing about this course is that we're starting from scratch, so you can give your love (or hate) for math a fresh new start! The only thing you'll really need is mathematical maturity, and you should know how to differentiate and integrate functions (towards week 5, you'll need to know how to integrate by parts). However, unlike what the course catalog says, you do **NOT** need Math 1B!

- **What people make you believe this course is about:** The official description includes "Basic linear algebra. Matrix arithmetic. Determinants. Vector spaces. Inner product spaces. Eigenvalues and eigenvectors. Linear transformations. Homogeneous ordinary differential equations. First-order Systems of differential equations with constant coefficients. Fourier series and partial differential equations." We will cover the following topics in the following order:

Part I: Linear Equations, Matrices, Determinants

1. Linear Equations
2. Matrix Algebra
3. Determinants

Part II: Vector Spaces and Differential Equations

4. Vector Spaces and Linear Transformations

4., 6. Second-Order and Higher-Order Differential Equations

Part III: Diagonalization and Systems of Differential Equations

5. Diagonalization
9. Systems of Differential Equations

Part IV: Orthogonality and Partial Differential Equations

6. Orthogonality and Least-Squares
10. Fourier Series and Partial Differential Equations
7. Symmetric Matrices

Note: You might notice that I am mixing the linear algebra-part and the differential equations-part! In this way you can more easily understand the beautiful relationship between the two seemingly different topics. Also, you will soon notice that the techniques in each section are similar, which also means less memorization required!

- **Grading:**
  - Homework (20 $\%$, due on Tue/Th, graded on **completeness**)
  - Midterm 1 (20 $\%$, Fri 06/29)
  - Midterm 2 (20 $\%$, *tentatively* on Fri 07/13)
  - Midterm 3 (20 $\%$, Fri 07/27)
  - Final Exam (20 $\%$, Fri 08/10, **NOT** cumulative!!!)

- **Course Grades:**
  - $A = [90, 100]$
  - $B = [75, 90)$
  - $C = [60, 75)$

  The above scale is a guarantee, i.e. you are guaranteed to get some sort of an A with an 90 $\%$, no matter how everyone else is doing. At the end of the course, I will *also* curve the class (see below), and your final grade will be the **maximum** of the grade based on the above scale, and the grade based on curving the class. So, depending on how everyone else is doing, it is entirely possible to get an A with just a 70 $\%$.

- **My curve (provided you work hard and don't slack off!):**
  - $40 - 45\%$ A's
  - $30 - 35\%$ B's
  - $20 - 25\%$ C's
  - A couple of D's and F's (but only if you don't do your work)

- **How to ace the class:** All you have to do is do your homework seriously, look at the study guides, and do a couple of the mock exams which I'll post on my website. If you follow those steps, then **there won't be any surprises on the exams!**

- **Homeworks:** Homeworks are due **at 3 pm** in my office (1008 Evans) on the given due date in the schedule below. You can find the homework problems on a separate document or on my website. You are allowed to work on your homework with your friends, but remember that on the exams, you are on your own! Homework will graded on completeness, so it doesn't matter if you get the correct answer or not. However, you really *do* need to show all your work! Just writing down the final answer will give you no credit. The exception are the T/F questions, for those questions it's ok just to write T or F.

- **Cheating: Don't!** I *will* catch you, and you will be prosecuted by the full extent of the UC Berkeley law!

- **DSP Students:** 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 email or office hours at least the Monday prior to each exam, explaining your circumstances and what special arrangements need to be done. If you do not contact me, then I will not have time to make arrangements and you will have to take the exam along with everyone else and under the regular conditions provided for the class.

- **Incomplete Grades:** Incomplete "I" grades are almost never given. The only justification is a documented serious medical problem or genuine personal/family emergency. Falling behind in this course or problems with workload on other courses are not acceptable reasons.

- **Pizza Lunches:** On the Fridays when we don't have an exam, I'm inviting you for free pizza at LaVal's from 2 pm to 3 pm! Come and mingle with your favorite Math 54 instructor! :)

- **Schedule:** A schedule can be found on the next page. It's subject to change as the course progresses. 'Lag time' is basically an opportunity to catch up whatever I didn't have time to finish.

		Linear Algebra	Diff Equations		
Week 1	M	1.1		Intro, Systems of linear equations	
	T	1.2		Row-reduction	
	W	1.3 - 1.5		Vector equations, The eqn $A\mathbf{x} = \mathbf{b}$, Solutions of Systems	
	Th	1.7, 2.1		Linear Independence, Matrix Operations	HW1
	F	2.2, 2.3		The Inverse of a Matrix, The Invertible Matrix Theorem	
Week 2	M	3.1 - 3.3		Determinants, Properties, and Applications	
	T	4.1, (2.8)		Vector Spaces and Subspaces	HW2
	W	4.3		Bases	
	Th			Lag Time	HW3
M1	F	4.4		**MIDTERM 1**, Coordinate Systems	**M1**
Week 3	M	1.8, 1.9		Linear Transformations	
	T	5.4		More on Linear Transformations	HW4
	W			Holiday!	
	Th	4.2, 4.5		Nullspace, Column Space, The dimension of a vector space	
	F	4.6, (2.9)		Rank	HW5
Week 4	M	4.7		Change of Basis	
	T		4.3, 4.4, 6.1, 6.2	ODE theory, Hom. Lin. Eqns, Complex Roots	HW6
	W		4.5, 4.6	Undetermined Coefficients and Variation of Parameters	
	Th			Lag time / Review	HW7
M2	F			**MIDTERM 2**	**M2**
Week 5	M	5.1, 5.2		Eigenvalues and Eigenvectors, The Characteristic Equation	
	T	5.3, (5.4)		Diagonalization	
	W	5.5		Complex Eigenvalues, Systems of ODE	
	Th		9.5, 9.6	Hom. Systems with Const. Coeffs, Complex Eigvs	HW8
	F		9.7, 9.8	Nonh. Lin. Systems, The Matrix Exponential Function	
Week 6	M	6.1, 6.2		Inner Product, Orthogonal Sets	
	T	6.3		Orthogonal Projections	
	W	6.4		The Gram-Schmidt Process	
	Th			Lag Time	HW9
M3	F	6.5		**MIDTERM 3**, Least Squares Problems	**M3**
Week 7	M	6.6, 6.7		Applications to Linear Models, Inner Product Spaces	
	T		10.2	Separation of Variables	HW10
	W		10.3	Fourier Series	
	Th		10.4	Fourier Cosine and Sine Series	HW11
	F		10.5	The heat equation	
Week 8	M		10.6	The wave equation	
	T		10.5, 10.6	More heat and wave equations	
	W	7.1, 7.2		Symmetric Matrices and Quadratic Forms	
	Th			Lag Time / Review	HW12
F	F			**FINAL EXAM**	**F**