MTH492 Special Topics
Applied Linear Algebra
TR 1:30-2:25 RS14

Instructor: Ryan Botts, Ph.D.
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Course Description
What do filtering out static on a phone call, compressing files on your computer, and finding a trendline have to do with each other? Linear algebra. In this course we aim to briefly introduce basic tools in linear algebra including vector space, vectors, matrices, matrix multiplication, inner products, linear combinations, eigenvalues, eigenvectors, singular values, and the SVD. We will use these tools to find trend lines that fit data,

Learning Outcomes
Students will be able to perform the basics of linear algebra: matrix multiplication, inner products, verify whether a space is a vector space, compute eigenvalues and eigenvectors, and compute the SVD.
Students will be able to apply their mathematical knowledge to solve problems.
Students will be able to use technology to solve problems.
Students will be able to speak about their work with precision, clarity and organization.
Students will be able to write about their work with precision, clarity and organization.

Required Materials
Textbook: *Applied Linear Algebra*. Lprenzo Sadun. ISBN-13: 978-0-8218-4441-0
2 small iguanas and a carrot

Course Goals
Students will learn fundamental tools of linear algebra. Using these tools they will learn how to solve several different types of applied problems using these tools. Students will learn how to apply these tools to novel problems.

Grading Policies
Grades will be computed based on your scores on the following assignments:

- **Projects (40%)**- There will be several written projects this semester and a final project, which will require you to use a computer algebra system to perform some task and then write up the results. The final project will be a presentation during the Final Exam time.
- **Presentations (30%)**- Each student will be required to give a minimum of four 5-10 min presentations throughout the semester on one of the course topics.
- **Homework (30%)**-There will be homework problems assigned weekly. Your score will be assigned based on the percent of problems you attempted multiplied by the score you receive on a number of randomly graded problems.

Approximate minimal percentages required to obtain a given grade are:

Grading Scale in percentages	A	B	C	D
+		(87.5, 90)	(77.5, 80)	(67.5, 70)
	[92.5, 100]	[82.5, 87.5)	[72.5, 77.5)	[62.5, 67.5)
-	[90, 92.5)	[80, 82.5)	[70, 72.5)	[60, 62.5)

- **Late work**. A written assignment or computer assignment is late if it is not received at the beginning of class on the due date. Late work will not be accepted. Make-up tests (or the exam) will be given only by arrangement with the instructor for reasons of documented emergency.

- **Format for Projects**. Assignments collected must be prepared in a style suitable for grading. The projects will be graded on clarity and writing quality.
    - the organization must be easy to follow
    - the work must be typed
    - complete solutions must be written for problems (not just answers); solutions must be clearly marked
    - use complete sentences to answer questions

Attendance:
Attendance is expected at each class session. In the event of an absence you are responsible for the material covered in class and the assignments given that day.

Regular and punctual attendance at all classes in which a student is registered is considered essential to optimum academic achievement. Therefore, regular attendance and participation in each course are minimal requirements to be met. There are no allowed or excused absences except as approved in writing by the Provost for specific students participating in certain university-sanctioned activities. Excused absences still count toward the 10%-20% limits, but allow students to make up work, quizzes, or tests missed as a result of a university-sanctioned activity. Activities of a unique nature, such as labs or other activities identified clearly on the syllabus, cannot be made up except in rare instances when instructors have given advanced, written approval for doing so. Whenever the number of accumulated absences in a class, for any cause, exceeds ten (10) percent of the total number of class meetings, the faculty member should send an e-mail to the student and the Vice Provost for Academic Administration (VPAA) warning of attendance jeopardy. If more than twenty (20) percent of the total number of class meetings is reported as missed, the faculty member or VPAA may initiate the student's de-enrollment from the course without further advanced notice to the student. If the date of de-enrollment is past the last date to withdraw from a class, the student will be assigned a grade of W or WF consistent with university policy in the Grading section of the catalog. There are no refunds for courses where a de-enrollment was processed. For more details see the PLNU catalog:
http://catalog.pointloma.edu/content.php?catoid=14&navoid=1089#Class_Attendance

Class Enrollment:
It is the student's responsibility to maintain his/her class schedule. Should the need arise to drop this course (personal emergencies, poor performance, etc.), the student has the responsibility to follow through (provided the drop date meets the stated calendar deadline established by the university), not the instructor. Simply ceasing to attend this course or failing to follow through to arrange for a change of registration (drop/add) may easily result in a grade of F on the official transcript.

Academic Accommodations:
While all students are expected to meet the minimum academic standards for completion of their courses as established by the instructors, students with special needs may require academic accommodations. At Point Loma Nazarene University, students requesting academic accommodations must file documentation with the Disability Resource Center (DRC), located in the Bond Academic Center. Once the student files documentation, the Disability Resource Center contacts the student's instructors and provides written recommendations for reasonable and appropriate accommodations to meet the individual needs of the student. This policy assists the university in its commitment to full compliance with Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities (ADA) Act of 1990, and ADA Amendments Act of 2008, all of which prohibit discrimination against students with special needs and guarantees all qualified students equal access to the benefits of PLNU programs and activities. For more details see the PLNU catalog:
http://catalog.pointloma.edu/content.php?catoid=14&navoid=1089#Academic_Accommodations

Students with learning disabilities who may need accommodations should discuss options with the instructor during the first two weeks of class.

Academic Honesty:
The Point Loma Nazarene University community holds the highest standards of honesty and integrity in all aspects of university life. Any violation of the university's commitment is a serious affront to the very nature of Point Loma's mission and purpose. Violations of academic honesty include cheating, plagiarism, falsification, aiding academic dishonesty, and malicious interference. The details of PLNU's meaning of each of these

words can be found in the PLNU catalog at:
http://catalog.pointloma.edu/content.php?catoid=14&navoid=1089#Academic_Honesty

A student remains responsible for the academic honesty of work submitted in PLNU courses and the consequences of academic dishonesty beyond receipt of the final grade in the class and beyond the awarding of the diploma. Ignorance of these catalog policies will not be considered a valid excuse or defense. Students may not withdraw from a course as a response to a consequence.

A student who is caught cheating on any item of work will receive a zero on that item and may receive an "F" for the semester. See the PLNU Catalog for a further explanation of the PLNU procedures for academic dishonesty (http://catalog.pointloma.edu/content.php?catoid=14&navoid=1089#Academic_Honesty).

Final Exam: Date and Time **Final Exam: 1:30-4:00 Dec. 18, 2012**
The final exam date and time is set by the university at the beginning of the semester and may not be changed by the instructor. Only in the case that a student is required to take three exams during the same day of finals week is an instructor authorized to change the exam date and time for that particular student.

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Tentative Schedule

Week	Assignment and Activity			
1	3-Sep	No School	4-Sep	Ch. 2.1 Vector Spaces and Bases
2	9-Sep	Ch. 2.1 Vector Spaces and Bases	11-Sep	Ch. 2.2 Linear Independence
3	16-Sep	Properties of a Basis	18-Sep	Ch. 2.4 Change of Basis
4	23-Sep	Applications:: Compression	25-Sep	Ch. 3.1 Linear Trans.
5	30-Sep	Ch. 3.2 The matrix of a Linear Transformation	2-Oct	Ch. 3.3 Infinite Dimensional Vector Spaces
6	7-Oct	Ch. 3.4 Kernels,Ranges, and Quotients	9-Oct	Applications: Strange Vector Spaces
7	14-Oct	Ch. 6.1 Real Inner Products	16-Oct	Ch. 6.4 Expansion in Orthonormal Bases
8	21-Oct	Ch. 6.5 Projections and Gram-Schmidt	23-Oct	Ch. 6.6. Orthogonal Complements
9	28-Oct	Ch. 6.7 Least Squares Solutions	30-Oct	Applications: Regression
10	4-Nov	Applications: Regression	6-Nov	Applications: Regression
11	11-Nov	Applicatiions: PCA	13-Nov	Ch 4.1, 4.2 and 4.3 Eigenvalues
12	18-Nov	Ch 4.1, 4.2 and 4.3 Eigenvalues	20-Nov	The SVD
13	25-Nov	The SVD	27-Nov	No School
14	2-Dec	Applicatiions: PCA	4-Dec	Applications: Fourier Seriest
15	9-Dec	Applications: Fourier Seriest	11-Dec	Applications: Wavelets
16	16-Dec		18-Dec	**Final Presentations 1:30-4:00**