Course Guidelines
University of Puget Sound
Dr. Beezer

Linear Algebra
Math 290A
Spring 2015

Text We will be using *A First Course in Linear Algebra*, by Robert A. Beezer as our textbook. We will follow Version 3.40 throughout the semester as the official version for the course. This may be found in webpage and PDF versions from the book's site at http://linear.pugetsound.edu, where it is made freely available with an open license. If you prefer, you can use the hardcover version, which is Version 3.00, and has only minor differences. See the book's site for information on ordering a physical copy.

The Bookstore also has a **highly** recommended optional text: *The Nuts and Bolts of Proofs* by Antonella Cupillari (Third Edition). The course web page has some recommendations for similar books about proof techniques.

Course Web Page Off of buzzard.ups.edu/courses.html you can find the link to the course web page.

Office Hours My office is in Thompson 303. Making appointments or simple, **non-mathematical** questions can be handled via email—my address is beezer@ups.edu. I rarely do not receive your email, and I read all of my email all of the time, usually very shortly after receiving it. Urgency of replying varies by the hour, day and nature of the message. Office Hours are 10:00–10:50 on Monday and Friday, and 10:30–11:20 on Tuesday and Thursday. Office Hours are first-come, first-served, so I do not make appointments for these times, nor do you need to ask me if I will be present at these times. You may assume I will be there, unless I have announced otherwise in class or by email. You **may** make an appointment for other times, or just drop by my office at other times to see if I am in. Office Hours are your opportunity to receive extra help or clarification on material from class, or to discuss any other aspect of the course.

Computation Linear algebra is at the heart of many large computations in physics, chemistry, economics, statistics and other disciplines. So it is useful to become familiar with relevant software. Futhermore, freed from doing error-prone numerical computations you can concentrate on new ideas and concepts.

For both reasons, we will make extensive use of Sage. Since Sage is open source software, it is available freely in many places. We will be experimenting with the SageMathCloud this semester at http://cloud.sagemath.com. There is an on-campus server at http://sage.pugetsound.edu which will be running the latest version (6.5), but the interface to Sage is different. There are thorough discussions about Sage integrated into the web version your textbook. There is also a PDF version of the Sage material, which is less useful than the online version. We will discuss in class the use of Sage during examinations. In particular, if you do not own a laptop, investigate procedures **now** for borrowing one from the library.

Homework There is a nearly complete collection of exercises in the text. Any (or all) of the problems will be good practice as you learn this material. Many of these problems have

complete solutions in the text to further aid your understanding. Of course, you are not limited to working **just** these problems.

None of these problems will be collected, but instead they will form the basis for our "Problem Sessions" and for discussions in Office Hours. It is your responsibility to be certain that you are learning from these exercises. The best ways to do this are to work the problems diligently as we work through the sections (see attached schedule) and to participate in the classroom discussions. If you are unsure about a problem, then a visit to my office is in order. Making a consistent effort outside of the classroom is the easiest way to do well in this course.

> Mathematics not only demands straight thinking, it grants the student the satisfaction of knowing when he [or she] is thinking straight.
>
> — D. Jackson

> Mathematics is not a spectator sport.
>
> — Anonymous

> I hear, I forget.
> I see, I remember.
> I do, I understand.
>
> — Chinese Proverb

> An education is not received. It is achieved.
>
> — Anonymous

Exams There will be seven 50-minute timed exams—they are all listed on the **tentative** schedule. The lowest of your seven exam scores will be dropped. The comprehensive final exam will be given on Wednesday, May 13 at Noon for Section A.

The final exam cannot be given at any other time and also be aware that I may allow you to work longer on the final exam than just the two-hour scheduled block of time. In other words, plan your travel arrangements accordingly.

As a study aid, I have posted copies of old exams on the course web site. These are offered with no guarantees, since techniques, approaches, emphases and even notation will change slightly or radically from semester to semester. Some of the solutions contain mistakes, and some of the problem statements have typos. In other words, they are not officially part of this semester's course and I do not maintain them. In particular, I do not advocate working old exams as a primary, or exclusive, technique for learning the material in this course. **Use at your own risk**: they have not been reviewed for minor mistakes or inconsistencies with this semester's course. I will not entertain questions about the correctness of these materials via email.

Writing This course has been designated as part of the University's Writing in the Major requirement. Thus, there will be two proofs assigned for each chapter. You will be expected to formulate a proof, and write it up clearly. These will be graded on a pass/fail basis. Each chapter's questions will be returned to you with comments, and if you do not earn a pass, then you can resubmit them at the close of the next chapter. You may resubmit a problem for several consecutive chapters in a row, **so long as you make a serious effort on each**

outstanding problem at each opportunity. Once you miss an opportunity to resubmit, or a retry does not contain any new work, or significant comments and hints are ignored, then it will be scored as a fail. Failure to follow the directions for submitting these can result in a retry with no feedback from me. Please read the instructions and details provided with these problems very carefully.

These will be due the day of the problem session prior to the chapter exam, and submitted **prior to the start of class**. During the first part of the course, we will learn the mathematical typsetting software, LaTeX, and you will be required to use this tool appropriately when writing your proofs, and you may be required to do a retry soley on the basis of incomplete use of LaTeX. I might request your LaTeX source as part of grading your exercises, so make sure you retain these.

These problems **ARE YOUR OWN WORK**. In other words, no collaboration on formulating the proof, no collaboration on writing the proof, no copying content from the book's source, and no discussion **whatsoever** with classmates or others familiar with the subject. In particular, I do not provide consultation in advance of submission, but rather will provide careful comments on your written submitted work. Late submissions will not be accepted and forfeit your opportunity to submit retries.

Reading Questions Each section of the textbook contains three reading questions at the end. Once you have read the section **prior** to our in-class discussion, it will be time to consider these questions. We will use the WeBWorK system for submitting your responses. Note that some questions will be identical, but some will be random variants of those in the book. WeBWorK will grade the computational problems, and I will grade the free-form response questions.

Responses will be due by 6 AM of the day we discuss the section in class, and will not be accepted late. If a question asks for a computation, then it will likely be graded by WeBWorK. If the question requests a yes/no answer, or asks "Why?" then give a thorough explanation in the response box. Cutting and pasting from the textbook without a citation is plagiarism. And even providing a citation with a verbatim quote is generally not going to get you any credit.

WeBWorK can interpret simple LaTeX syntax and interpret that for me as I review your responses. So this is a good place to hone your LaTeX skills. See the hints on the course webpage about using WeBWorK properly, especially when entering mathematics.

Grades Grades will be based on the following breakdown:

- Reading Questions: 10%
- Writing: 15%
- Examinations: 55%
- Final Examination: 20%

Attendance and improvement will be considered for borderline grades. Scores will be posted anonymously on the web at a link off the course page.

Reminders Here are three reminders about important university policies contained in the *Academic Handbook*. These are described thoroughly online at http://www.pugetsound.edu/student-life/student-handbook/academic-handbook/, or a printed copy may be requested from the Registrar's Office (basement of Jones Hall).

"Regular class attendance is expected of all students. Absence from class for any reason does not excuse the student from completing all course assignments and requirements." (Registration for Courses of Instruction, Non-Attendance)

Withdrawal grades are often misunderstood. A Withdrawal grade (W) can only be given prior to the university deadline listed on our course schedule, and after that time (barring unusual circumstances), the appropriate grade is a Withdrawal Failing (WF), **even if your work has been of passing quality**. See the attached schedule for the last day to drop with an automatic 'W'. (Grade Information and Policy, Withdrawal Grades)

All of your graded work is expected to be entirely your own work, this includes Reading Questions and the Writing Exercises. Anything to the contrary is a violation of the university's comprehensive policy on Academic Integrity (cheating and plagiarism). Discovered incidents will be handled strictly, in accordance with this policy. Penalties can include failing the course and range up to being expelled from the university. (Academic Integrity)

Purpose This course is much different from most any mathematics course you have had recently, in particular it is much different than calculus courses. We will begin with a simple idea—a linear function—and build up an impressive, beautiful, abstract theory. We will begin computationally, but soon shift to concentrating on theorems and their proofs. By the end of the course you will be at ease reading and understanding complicated proofs. You will also be very good at writing routine proofs and will have begun the process of learning how to create complicated proofs yourself.

You will see this material applied in subsequent courses in mathematics, computer science, chemistry, physics, economics and other disciplines (though we will not have much time for applications this semester). You will gain a "mathematical maturity" that will be helpful as you pursue upper-division coursework and in any logical, rational, or argumentative activity you might engage in throughout your lifetime. It is not easy material, but your attention and hard work will be amply repaid with an in-depth knowledge of some very interesting and fundamental ideas, in addition to beginning to learn to think like a mathematician.

Conduct Daily attendance is required, expected, and overall a pretty good idea. Class will begin on-time, so be here, settled-in and ready to go. In other words, walking in the door at the exact time class is to begin is not acceptable. Repeated tardieness and absences will result in grade penalties, in accordance with university policies. Do not leave class during the lecture unless there is a real emergency—fill your water bottles, use the toilet, and so on, **IN ADVANCE**. Come to class prepared to be attentive for 50 minutes. I do not care how much food or drink you bring to class, so long as it does not distract others or make me hungry. Please do not offer me sweets. Please keep phones in your pocket or bag, unless you are using them to read course material. In short, we are here to learn and discuss mathematics. It is your responsibility to not distract your peers who are serious about their education or distract me as I endeavor to make the best use of the class time for everybody.

Student Accessibility and Accommodation "If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Peggy Perno, Director of the Office of Accessibility and Accommodation, 105 Howarth, 253.879.3395. She will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential."

I request that you give me at least two full working days to respond to any requests from this office.

Student Beravement Policy "Upon approval from the Dean of Students Office, students who experience a death in the family, including parent, grandparent, sibling, or persons living in the same household, are allowed three consecutive weekdays of excused absences, as negotiated with the Dean of Students. For more information, please see the Academic Handbook."

Classroom Emergency Response Guidance Please review university emergency preparedness and response procedures posted at http://www.pugetsound.edu/emergency/. There is a link on the university home page. Familiarize yourself with hall exit doors and the designated gathering area for your class and laboratory buildings.

If building evacuation becomes necessary (e.g. earthquake), meet your instructor at the designated gathering area so she/he can account for your presence. Then wait for further instructions. Do not return to the building or classroom until advised by a university emergency response representative.

If confronted by an act of violence, be prepared to make quick decisions to protect your safety. Flee the area by running away from the source of danger if you can safely do so. If this is not possible, shelter in place by securing classroom or lab doors and windows, closing blinds, and turning off room lights. Lie on the floor out of sight and away from windows and doors. Place cell phones or pagers on vibrate so that you can receive messages quietly. Wait for further instructions.

Tentative Daily Schedule

Monday	Tuesday	Thursday	Friday
Jan 19 MLK Day	Jan 20 SageMathCloud LaTeX	Jan 22 SageMathCloud LaTeX	Jan 23 Section WILA No class
Jan 26 Section SSLE	Jan 27 Section RREF	Jan 29 Section TSS	Jan 30 Section HSE
Feb 2 Section NM Last Day to Drop Without Record	Feb 3 Problem Session Writing SLE Due	Feb 5 Exam 1 Chapter SLE	Feb 6 Section VO
Feb 9 Section LC	Feb 10 Section SS	Feb 12 Problem Session	Feb 13 Section LI
Feb 16 Section LDS	Feb 17 Section O	Feb 19 Problem Session Writing V Due	Feb 20 Exam 2 Chapter V
Feb 23 Section MO	Feb 24 Section MM	Feb 26 Section MISLE	Feb 27 Section MINM
Mar 2 Problem Session	Mar 3 Section CRS	Mar 5 Section FS	Mar 6 Problem Session Writing M Due
Mar 9 Exam 3 Chapter M	Mar 10 Section VS	Mar 12 Section S	Mar 13 Section LISS

Spring Break

Tentative Daily Schedule

Monday	Tuesday	Thursday	Friday
Mar 23 Section B	Mar 24 Problem Session	Mar 26 Section D	Mar 27 Section PD Last Day to Drop With Automatic W
Mar 30 Problem Session Writing VS Due	Mar 31 Exam 4 Chapter VS	Apr 2 Section DM	Apr 3 Section PDM
Apr 6 Section EE	Apr 7 Section PEE	Apr 9 Section SD	Apr 10 Problem Session
Apr 13 Exam 5 Chapters D&E	Apr 14 Section LT	Apr 16 Section ILT	Apr 17 Section SLT
Apr 20 Problem Session	Apr 21 Section IVLT	Apr 23 Problem Session Writing LT Due	Apr 24 Exam 6 Chapter LT
Apr 27 Section VR	Apr 28 Section MR	Apr 30 Problem Session	May 1 Section CB
May 4 Problem Session Writing R Due	May 5 Exam 7 Chapter R	May 7 Reading Period	May 8 Reading Period

Final Examination, Section A: Wednesday, May 13, Noon