Math 253 – Linear Algebra  
Fall 2015  
Course Procedures

Professor: Josh Laison  
Ford 215, x6689, jlaison@willamette.edu

Office Hours:  
Tuesday and Thursday 10:30-11:30, Friday 2:30-3:30 in my office,  
Monday 9:30-11:00, at the Bistro,  
and anytime by appointment or by catching me in my office.  
My available times are on my webpage http://www.willamette.edu/~jlaison

Class Meetings: Ford 201, 2:30-4:00 Tuesday, Thursday

Text: Contemporary Linear Algebra, Howard Anton and Robert Busby

Course Web Page: http://www.willamette.edu/~jlaison/linear.html

Graded components of the course:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Class participation and presentations</td>
<td>10%</td>
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<tr>
<td>Homework assignments (approximately 12)</td>
<td>30%</td>
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<tr>
<td>Quizzes (approximately 6)</td>
<td>20%</td>
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<tr>
<td>Take-home exams (2)</td>
<td>25%</td>
</tr>
<tr>
<td>Group final project</td>
<td>15%</td>
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<tr>
<td>Total</td>
<td>100%</td>
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Homework assignments:
You will have two types of homework assignments:

**Exercises:** More straightforward, not graded, but a few students will be asked to present solutions to them in class the day they’re due. These presentations will count towards the **class participation and presentations** portion of your grade.

**Challenges:** More interesting, graded, and written in LATEX. Note that while these problems should still be well-written, the written form of them will not be scrutinized as closely as in a Foundations of Advanced Mathematics course.

**Quizzes:** The quiz problems will look similar to the homework exercises, testing whether you understand the basic ideas of each two weeks of class. They will each take about half an hour of class time.

**Attendance at the Math Department Colloquium**
According to math department policy, since you are enrolled in a 200-level mathematics course, you are required to attend at least 2 mathematics department colloquium talks. With these talks, the department hopes to show you a wider range of mathematical topics than is offered at Willamette.
Course conduct
All persons in the class, the students and the professor, should treat one another with respect. This includes attending class, using technology only for class-related activities, avoiding offensive or insulting behavior, and acting honestly. If your cell phone rings during class, you will bring treats for the next class.

Collaboration
Collaboration is an integral part of mathematics. Talking to classmates and to your professor about homework problems should be your routine, not an exception or a last resort. However, copy/pasting from another’s work and representing it as your own is not collaboration, it is plagiarism. Please make sure you understand this most important distinction.

Disability accomodations
Willamette University and this class welcome people of differing abilities. If you have a disability for which accommodations may be required, please contact me and the Bishop Wellness Center to discuss your needs.

Religious accommodations
(From the Office of the Chaplain) Willamette University recognizes the value of religious practice and strives to accommodate students’ commitment to their religious traditions whenever possible. If you anticipate missing class for religious reasons, please contact me to discuss your needs.

Academic honesty
If you have not already done so, please familiarize yourself with the student-written Willamette University Honor Code.
Cheating and plagiarism are very serious offenses with serious consequences, and an insult to your professor and your classmates. In this course, cheating and plagiarism include:

On submitted homework: Representing someone else’s written work as your own, even in a paraphrased form, or making your work available for others to use in this way.

On the take-home exams: Discussing the problems or solutions with anyone other than your professor, or consulting a written source (paper or electronic) other than your textbook and class notes, or making your notes available for others.

On quizzes: Using resources other than those specifically allowed on each quiz, or making resources available for others to use in this way.
Topics Covered:

**Fundamental ideas**
- Review of vectors, lines, and planes in 2D and 3D  
  Sections 1.1, 1.2, 1.3
- Systems of linear equations  
  Sections 2.1, 2.2
- Matrices and matrix algebra  
  Sections 3.1, 3.2, 3.3
- Subspaces  
  Sections 3.4, 3.5
- Linear transformations  
  Sections 6.1, 6.2, 6.3, 6.4
- Bases and dimension  
  Sections 7.1, 7.2, 7.3
- Fundamental theorems  
  Sections 7.4, 7.5

**Additional important topics, as time warrants**
- Determinants  
  Sections 4.1, 4.2
- Eigenvalues and eigenvectors  
  Section 4.4
- General vector spaces  
  Sections 9.1, 9.3
- Projection  
  Sections 7.7, 7.8
- Coordinates and change of basis  
  Sections 7.11, 8.1
- Similarity and diagonalizability  
  Section 8.2

**Applications, to be presented in the final project**
- Dynamical systems and Markov chains (Many fields)  
  Section 5.1
- Leontief input-output models (Economics)  
  Section 5.2
- Gauss-Seidel and Jacobi iteration (Applied math)  
  Section 5.3
- The Power method and internet search (Computer science)  
  Section 5.4
- Computer graphics (Computer science)  
  Section 6.5
- Best approximation and least squares (Statistics)  
  Section 7.8
- Quadratic forms (Analysis)  
  Section 8.4
- Singular value decomposition and image processing (Applied math)  
  Section 8.6
- Systems of differential equations (Applied math and physics)  
  Section 8.10
- Inner product spaces and Fourier series (Applied math and physics)  
  Section 9.2
- Graph eigenvalues (Graph theory)  
  Resource TBA
- Fast Fourier transforms (Applied math and analysis)  
  Resource TBA
- Coding theory (Applied math and computer science)  
  Resource TBA
- Finite affine planes and SET (Geometry)  
  Resource TBA
- Splines (Applied math, engineering)  
  Resource TBA
- Collaborative filtering and Netflix (Applied math, marketing)  
  Resource TBA