Welcome to Abstract Linear Algebra!

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<th>Math 443/543</th>
<th>Fall 2019</th>
<th>2-2:50 MWF</th>
<th>Bexell 416</th>
<th>3 credits</th>
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</thead>
</table>

**Instructor:** Holly Swisher  
**Instructor Website:** [http://people.oregonstate.edu/~swisherh/teaching/](http://people.oregonstate.edu/~swisherh/teaching/)  
**Instructor Email:** swisherh@math.oregonstate.edu  
**Instructor Office:** 058 Kidder Hall  
**Instructor Availability:** Monday 12-1, Wednesday 10-11, Friday 12-1. Also by email!

**Grader:** Martijn Oostrom  
**Grader Email:** oostromm@math.oregonstate.edu  
**Grader Office:** 053 Kidder Hall  
**Grader Availability:** F 1-2pm, and MSLC hours M 12-2, W 1-2

**Texts:** *Linear Algebra*, fourth edition, by Friedberg, Insel, and Spence, and *Linear Algebra*, by Hoffman and Kunze

**Overview:** The course will cover 3 main topics: Abstract Vector Spaces and Linear Transformations, Diagonalization and Canonical Forms, and Inner Product Spaces and Spectral Theory. Your grade will be determined by Homework (25%), Participation/Presentation (15%), Midterms (30%), and a Final Exam (30%). Students in 443 will have fewer problems than 543 students on exams.

**Course Goals:** There are a variety of reasons why all of you are here. Many have expressed personal goals of working with increased abstraction and formality, preparing for qualifying exams, and using linear algebra in future applications/research/classes. I hope that upon completion of this course, each of you feels a sense of accomplishment, and prepared to meet your next goal. In addition, I hope that this course enables you to feel open to learning, capable, engaged, alert, and happy during class. I also hope that that this course enables you to feel a sense of belonging and the power to contribute to and/or create change within the mathematical community.

**Learning Outcomes:**

A successful MTH 443 student will be able to:
1. Understand and apply the theories of abstract vector spaces and linear transformations, diagonalization and canonical forms, and inner product spaces.
2. Demonstrate clear and concise algebraic reasoning in written format.
3. Demonstrate clear and concise algebraic reasoning in oral presentations.
4. Demonstrate effective algebraic reasoning while working with others.

A successful MTH 543 student will be able to:
1. Develop skills and synthesize information for the theories of abstract vector spaces and linear transformations, diagonalization and canonical forms, and inner product spaces.
2. Demonstrate clear and concise algebraic reasoning in written format.
3. Demonstrate clear and concise algebraic reasoning in oral presentations.
4. Demonstrate effective algebraic reasoning while working with others.
Grading and Canvas: In canvas, you will be able to see your scores for all homework assignments, exams, and most participation activities. Note that I do not assign letter grades based on a strict 90/80/70 type scale. Instead, I also consider the histogram of the spread of scores and my assessment of the difficulty of tasks when I assign letter grades to exam scores and at the end of the term. My grading scales are often more generous than a 90/80/70 type scale, and will never be more strict than that. I will share my grading scales after each midterm so that you have an idea of how you are doing in the course. You can also ask me at any time for a general assessment of how you are doing in the course.

Homework (25% of grade, 100 points): You will be given six problem sets, each containing four problems. I recommend starting to generate ideas about the problem sets a week before they are due, to allow yourself time to comfortably think and prepare solutions for submission in canvas. Problem sets need to be uploaded to canvas as a pdf, and should be uploaded before class on Homework Discussion Days. Latexing homework is strongly recommended, but not required. Students will be selected at random to present outlines of solutions, as well as some analysis of the problems at the board. Each presentation should contain 1) an outline of the solution, 2) what you consider the most important parts of the solution to highlight, 3) any particular details which are easy to overlook, and 4) what you learned from doing this problem. You may use your notes, so make sure to bring a copy of your solutions to all the problems. Everyone in class is invited to discuss questions or comments about the homework problems. You will have until Monday at noon to update your homework solutions in canvas if you like, before it will be graded. The lowest homework score will be dropped.

Participation and Presentation (15% of grade, 60 points): Attendance and participation in course activities are extremely important to creating a successful course experience for us all. Participation in the course will take many forms, including presenting and analyzing homework problems in class (10 points each of two times), attending class and participating in active learning exercises (25 points), and taking surveys in canvas outside of class (15 points).

Midterms (30% of grade, 120 points): You will be given two midterms, the first covering Abstract Vector Spaces and Linear Transformations, and the second covering Diagonalization and Canonical Forms. Each midterm will be given in class, and worth 15% of your total grade (60 points). If it benefits you, your (weighted) final exam score will replace that of your lowest midterm.

Final Exam (30% of grade, 120 points): The final exam is cumulative, covering all sections from the course.

Exam Schedule: All exams will be held in our usual classroom unless notified.
Midterm 1: Wednesday, Oct. 16, covering Vector Spaces and Linear Transformations
Midterm 2: Friday, Nov. 8, covering Diagonalization and Canonical Forms
Final Exam: Thursday Dec. 12, 9:30 - 11:20 am, covering all topics

Missed Exam Policy: If you are in danger of missing an exam due to an emergency, please contact me immediately to reschedule. I may only choose to reschedule within a short time frame, and only if contacted promptly.
Schedule:

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<th>Week</th>
<th>Monday</th>
<th>Wednesday</th>
<th>Friday</th>
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<tbody>
<tr>
<td>0</td>
<td><strong>No Class</strong></td>
<td>Abstract Vector Spaces</td>
<td>Abstract Vector Spaces</td>
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<tr>
<td>1</td>
<td>Abstract Vector Spaces</td>
<td>Linear Transformations</td>
<td><strong>HW 1 Discussion Day</strong></td>
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<tr>
<td>2</td>
<td>Linear Transformations</td>
<td>Linear Transformations</td>
<td><strong>HW 2 Discussion Day</strong></td>
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<td>3</td>
<td>Ranks/Determinants</td>
<td><strong>Midterm 1</strong></td>
<td>Diagonalization</td>
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<td>4</td>
<td>Diagonalization</td>
<td>Diagonalization</td>
<td><strong>HW 3 Discussion Day</strong></td>
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<tr>
<td>5</td>
<td>Canonical Forms</td>
<td>Canonical Forms</td>
<td><strong>HW 4 Discussion Day</strong></td>
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<tr>
<td>6</td>
<td>Canonical Forms</td>
<td>Canonical Forms</td>
<td><strong>Midterm 2</strong></td>
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<td>7</td>
<td><strong>Holiday: No Class</strong></td>
<td>Inner Product Spaces</td>
<td><strong>HW 5 Discussion Day</strong></td>
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<td>8</td>
<td>Inner Product Spaces</td>
<td>Inner Product Spaces</td>
<td><strong>HW 6 Discussion Day</strong></td>
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<tr>
<td>9</td>
<td>Inner Product Spaces</td>
<td><strong>No Class</strong></td>
<td><strong>Holiday: No Class</strong></td>
</tr>
<tr>
<td>10</td>
<td>Inner Product Spaces</td>
<td>Inner Product Spaces</td>
<td><strong>Final Review</strong></td>
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Additional Information:

Statement Regarding Students with Disabilities: Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at [http://ds.oregonstate.edu](http://ds.oregonstate.edu). DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Student Conduct Expectations link: [http://studentlife.oregonstate.edu/code](http://studentlife.oregonstate.edu/code)

Reach Out for Success: University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it's important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success at [https://counseling.oregonstate.edu/reach-out-success](https://counseling.oregonstate.edu/reach-out-success). If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Human Services Resource Center (HSRC) for support [https://studentlife.oregonstate.edu/hsrc](https://studentlife.oregonstate.edu/hsrc). The HSRC has a food pantry, a textbook lending program and other resources to help.