**BIOE 210: Linear Algebra for Biomedical Data Science**  
Spring 2019  
Tu/Th 9:30-10:50am in 1306 Everitt Lab  
[http://courses.engr.illinois.edu/bioe210/sp2019/](http://courses.engr.illinois.edu/bioe210/sp2019/)

**Course Instructor**  
Paul A. Jensen  
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2254 Everitt Lab  
(217) 265-7110

Office Hours: Tuesday, 3:00-4:00pm in 2254 Everitt Lab

**Course Graders**  
Boeun Hwang ([bhwang9@illinois.edu](mailto:bhwang9@illinois.edu))  
Cynthia Liu ([cliu208@illinois.edu](mailto:cliu208@illinois.edu))

**Matlab Technical Help Sessions**  
Monday 4:00-5:00pm in 3213 Everitt Lab  
Tuesday 5:00-6:00pm in 1103 Everitt Lab

**Description**  
Using analytical and computational tools from linear algebra, we will  
- Solve large systems of linear equations, systems of linear ODEs, and linear PDEs.  
- Analyze large, multivariable datasets to quantify relationships between variables.  
- Decompose complex datasets into simpler representations.  
- Introduce and solve common problems in classification, image processing, and machine learning.  
- Develop a geometric understanding of high-dimensional spaces.

**Topics**  
- Vector spaces and field algebra  
- Linear systems, solvability, and rank  
- Basis vectors, eigenvectors, and network matrices  
- Vector and matrix decompositions  
- Singular values and principal components

**Applications**  
- Least squares, regularized, and partial least squares regression  
- Classification  
- Linear and quadratic programming  
- Examples in bioengineering, medicine, and biology
Textbook
*Linear Algebra: An Introduction to Data Science*
Available for free on the course website.

Matlab is required for the course and can be accessed via the EWS machines (https://it.engineering.illinois.edu/ews/lab-information/remote-connections).

Assessments
*Three in-class exams (2/7, 3/14, 4/30).* Any non-electronic materials are allowed during the exam, including the course textbook and notes. Exams are during the lecture period.

*Six homework sets.* Homeworks are due by the assigned date and time (usually 9:00am Wednesday). Homework assignments will typically include both analytical problems plus Matlab-based exercises. Written answers to the analytical problems and Matlab solutions (plus code) must be uploaded using Gradescope (additional details regarding homework submission will be provided).

*Late Work.* Any work submitted after the deadline will be penalized. The penalty is 10% if submitted within 24 hours of the deadline and 50% within 48 hours of the deadline. Homework submitted more than 48 hours after the deadline will not be scored.

Grading
Homework 30% (6 × 5% each)
Exams 70% (3 × 23 1/3% each)

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<th>Letter Grades</th>
<th>Minimum Percentage</th>
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<td>A+</td>
<td>&gt;97%</td>
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Grades will be posted on Gradescope.