BME 5704 Advanced Mathematics for BME

Catalog Description: This course covers advanced mathematics from a biomedical engineering perspective. Linear and nonlinear systems, partial differential equations, optimization and inverse problems will be discussed. Advanced mathematical techniques are increasingly needed in today's biomedical engineering. For example, one needs a nonlinear system to describe a model or problem in neural engineering. Finite element has been a powerful numerical method to deal with many problems in biomechanics and biomaterials where partial differential equations are involved. Inverse problems are common almost everywhere in the field of biomedical imaging. This course is geared towards the applications of the advanced mathematical techniques to various biomedical engineering problems.

Credits: 03

Prerequisites:
Only a basic knowledge of physics and calculus is required.

Instructor: Huabei Jiang, J. Crayton Pruitt Family Professor
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Class Meeting: Tuesday, 5th and 6th periods (11:45-1:40) and Thursday 6th period (12:50-1:40)

Reference book:
Numerical Recipes, W. H. Press., S.A. Teukolsky, W.T. Vetterling, B.P. Flannery, Cambridge University Press, 1992. ISBN: 0-521-43064-X

Course Objectives:
Major topics include:

- Linear Systems (Gaussian elimination, LU decomposition, iterative methods)
- Nonlinear Systems (Newton method, conjugate gradient methods, globally convergent methods)
- Partial differential equations (finite difference method, finite element method)
- Optimization and Inverse Problems (Least square criteria, regularization methods)

Grade Determination:
30% Homework
30% Midterm Exam
40% Final Exam

The grading scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
≥92	90-91	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	< 60

The grading policies*:*

Undergraduate students, in order to graduate, must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. Graduate students, in order to graduate, must have an overall GPA of 3.0 or better (B or better). Note: a B- average is equivalent to a GPA of 2.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:
http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html

Policies:
Late policy for homework: 20% deducted per day, unless prior arrangements were made with the instructor. Students are encouraged to work together on the homework, but the work that's handed in must be individual work.

Academic Honesty:
In adopting this Honor Code, the students of the University of Florida recognize that academic honesty and integrity are fundamental values of the University community. Students who enroll at the University commit to holding themselves and their peers to the high standard of honor required by the Honor Code. Any individual who becomes aware of a violation of the Honor Code is bound by honor to take corrective action. A student-run Honor Court and faculty support are crucial to the success of the Honor Code. The quality of a University of Florida education is dependent upon the community acceptance and enforcement of the Honor Code. We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

Students with Disabilities:
Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.