MEC 320: Numerical Methods in Engineering Design and Analysis

Course Syllabus (Spring 2017)

Course Information

Time: Tuesdays and Thursdays: 8:30 – 9:50 AM

Location: Engineering 143 - **Credits:** 3

Pre-requisites: 1) MEC 102 or MEC 111 or MEC 112 or CSE 114 or CSE 130 or 130 or ESG 111 or ESE 124 or BME 120, 2) AMS 261 or MAT 203, 3) AMS 361 or MAT 303

Book: Numerical Methods for Engineers by Steven C. Chapra, 7th edition, REQUIRED

Instructor Information

Name: Professor Benjamin Lawler

Office Location: Light Engineering 131

E-mail: benjamin.lawler@stonybrook.edu

Office Hours: Tue & Thu: 10:00 AM – 12:00 PM

TA Office Hours:

Zhongnan Ran: Mon & Wed: 12:00PM – 1:00PM at the desks **outside** 139 Heavy Engineering

Description: This course emphasizes the implementation of numerical methods for computer-aided solutions to the problems that arise in engineering design and analysis. Methods include interpolation, extrapolation, curve fitting, and integration and techniques solving non-linear equations, systems of linear equations, and differential equations. Optimization in engineering design is covered from the formulation of design specifications and criteria, to analyzable models, through to numerical implementation.

Grading: 10 HW Assignments: 10%

Attendance: 9%

4 Programming Assignments: 38%

Midterm Exam: 18%

Final Exam: 25%

Statement on Academic Dishonesty: Academic dishonesty is an extremely serious offense and will not be tolerated in any form. Academic dishonesty in general is the presentation of intellectual work that is not originally yours. Examples include, but are not limited to, copying or plagiarizing class assignments including homework, reports, designs, and other submitted materials; copying or otherwise communicating

Lecture				Assignment # Due	
#	Date	Description	Chapters	HW	Program.
1	1/24/2016	Intro, Syllabus, and Motivation	1 & 3		
2	1/26/2016	Errors and Taylor Series	4		
3	1/31/2016	Finding Roots	5		
4	2/2/2016	Finding Roots	5…6	1	
5	2/7/2016	Finding Roots	6		
6	2/9/2016	Review: Finding Roots	4…6	2	
7	2/14/2016	Linear Algebraic Equations	9		
8	2/16/2016	Linear Algebraic Equations	9…10		1
9	2/21/2016	Linear Algebraic Equations	10		
10	2/23/2016	Linear Algebraic Equations	11	3	
11	2/28/2016	Optimization	13		
12	3/2/2016	Optimization	14	4	
13	3/7/2016	Optimization	15		2
14	3/9/2016	Midterm		5	
	3/14/2016	Spring Break			
	3/16/2016				
15	3/21/2016	Curve Fitting, Interp., & Fourier	17		
16	3/23/2016	Curve Fitting, Interp., & Fourier	17…18		
17	3/28/2016	Curve Fitting, Interp., & Fourier	18	6	
18	3/30/2016	Curve Fitting, Interp., & Fourier	19		
19	4/4/2016	Flex Day - Review			
20	4/6/2016	Flex Day - Review			
21	4/11/2016	Numerical Integr. & Differ.	21	7	
22	4/13/2016	Numerical Integr. & Differ.	21…22		
23	4/18/2016	Numerical Integr. & Differ.	22…23		3
24	4/20/2016	ODEs and Intro to Finite Element	25	8	
25	4/25/2016	ODEs and Intro to Finite Element	25…26		
26	4/27/2016	ODEs and Intro to Finite Element	26…27	9	
27	5/2/2016	ODEs and Intro to Finite Element	27		
28	5/4/2016	Review		10	4
	5/9/2016	Final Exam: 11:15 AM to 1:45 PM Location: TBD			

answers on exams with other students; bringing unapproved aids, either in physical (written) or electronic form to an exam; obtaining copies of an exam prior to its administration, etc. Academic dishonesty violates both the ethical and moral standards of the Engineering profession and all infractions related to academic dishonesty will be prosecuted to the fullest via the CEAS CASA committee. For you, the honest student, academic dishonesty results in lower class curves, hence a depression in your GPA and class standing, while cheapening the degree you earn.

Course Learning Objectives:

Upon completion of this course, students will be able to:

1) Numerically find roots of nonlinear scalar equations.
2) Numerically solve systems of linear algebraic equations.
3) Interpolate and extrapolate a data set.
4) Differentiate and integrate numerically.
5) Pose and understand the nature of an optimal design problem.
6) Solve unconstrained and constrained optimization problems numerically.
7) Find numerical solutions of two-point BVP's.
8) Find numerical integrations of ODE IVP's.
9) Use methods of curve fitting.

DISABILITY SUPPORT SERVICES (DSS) STATEMENT

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.stonybrook.edu/ehs/fire/disabilities

ACADEMIC INTEGRITY STATEMENT:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

CRITICAL INCIDENT MANAGEMENT:

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.