INSTRUCTOR
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EMAIL & DISCUSSION BOARD POLICY
It is expected that you will check your university email at least once every 2 business days. Email only private questions such as those pertaining to your grade or attendance. Post your questions regarding homework, course subject matter or other general questions in the appropriate discussion board (blog) on D2L rather than sending an email. The course instructor will receive email notifications of your post and will respond so the entire class can review the answer whenever appropriate. Questions can be posted anonymously and other students can also join the discussion. DO NOT POST SOLUTIONS TO PROBLEMS. You can sign up to receive email notifications of posts.

COURSE WEB SITE
https://ecat.montana.edu/
1) Login with your Desire2Learn (D2L) username and password (Refer to the following web page for assistance with MSU account usernames and passwords: https://www3.montana.edu/myprofile/)
2) Under courses select EGEN 506.

CATALOG DESCRIPTION
EGEN 506 NUMERICAL SOLUTIONS TO ENGINEERING PROBLEMS
S 3 cr. LEC 3
PREREQUISITE: EGEN 505
-- Numerical methods used to solve common chemical and mechanical engineering research problems. Solutions to nonlinear equations. Optimization methods.
Section: EGEN 506-001
Semester: Spring 2013
Time: MW 3:10-4:30 PM
Place: ROBH 209

REQUIRED TEXTBOOKS:

REFERENCE BOOKS: FREE access to the following e-books is available through the MSU library:

ADDITIONAL REFERENCE BOOKS:
ONLINE REFERENCE RESOURCES:
MIT Open Courseware: Numerical Methods Applied to Chemical Engineering – Prof. Kenneth Beers
MIT Open Courseware: Numerical Methods for Partial Differential Equations SMA 5212
MIT Open Courseware: Numerical Computation for Mechanical Engineers
Oakland University: ME 549 Numerical Methods for Mechanical Engineering
Holistic Numerical Methods: E-Sources for Numerical Methods for Mechanical Engineering

GRADING
Participation & HW: 20%
Group Projects: 40%
Midterm Project: 20%
Final Project: 20%

STUDENT COMPUTER LABS
All student computer labs on campus should now have Matlab. http://studentlabs.montana.edu/
ME CAD Lab Schedules: http://www.coe.montana.edu/me/faculty/cosgriff/Lab_Schedules.html

SOFTWARE
Matlab can be purchased at the bookstore for significantly discounted rates and installed on a personal computer. The student version has virtually all the same features as the full professional versions!

BEHAVIORAL EXPECTATIONS
Montana State University expects all students to conduct themselves as honest, responsible and law-abiding members of the academic community and to respect the rights of other students, members of the faculty and staff and the public to use, enjoy and participate in the University programs and facilities. For additional information reference see MSU’s Student Conduct Code at: http://www2.montana.edu/policy/student_conduct/cg600.html.

COLLABORATION
University policy states that, unless otherwise specified, students may not collaborate on graded material. Any exceptions to this policy will be stated explicitly for individual assignments. If you have any questions about the limits of collaboration, you are expected to ask for clarification.

PLAGIARISM
Paraphrasing or quoting another’s work without citing the source is a form of academic misconduct. Even inadvertent or unintentional misuse or appropriation of another’s work (such as relying heavily on source material that is not expressly acknowledged) is considered plagiarism. If you have any questions about using and citing sources, you are expected to ask for clarification.

ACADEMIC MISCONDUCT
Section 420 of the Student Conduct Code describes academic misconduct as including but not limited to plagiarism, cheating, multiple submissions, or facilitating others’ misconduct. Possible sanctions for academic misconduct range from an oral reprimand to expulsion from the university.

ACADEMIC EXPECTATIONS
Section 310.00 in the MSU Conduct Guidelines states that students must:

A. be prompt and regular in attending classes;
B. be well prepared for classes;
C. submit required assignments in a timely manner;
D. take exams when scheduled;
E. act in a respectful manner toward other students and the instructor and in a way that does not detract from the learning experience; and
F. make and keep appointments when necessary to meet with the instructor.

Withdrawal Deadlines
After 4/12/2013, requests to withdraw from this course with a “W” grade will only be supported if extraordinary personal circumstances exist.

Students with Disabilities
If you have a documented disability for which you are or may be requesting an accommodation(s), you are encouraged to contact your instructor and Disabled Student Services as soon as possible.

Student Educational Records
All records related to this course are confidential and will not be shared with anyone, including parents, without a signed, written release. If you wish to have information from your records shared with others, you must provide written request/authorization to the office/department. Before giving such authorization, you should understand the purpose of the release and to whom and for how long the information is authorized for release.

Students have the right to access their educational records by appointment. This information is protected by the Family Educational Rights and Privacy Act (FERPA). For more information contact the Dean of Students office at 994-2826.

Course Objectives

1. Demonstrate proficiency in fundamental Matlab programming techniques to employ advanced numerical methods.
2. Utilize advanced numerical methods to solve linear and non-linear systems.
3. Understand the limitations and potential sources of error associated with numerical methods.
4. Demonstrate an ability to solve ordinary and partial differential equations in 2-D and 3-D space utilizing Matlab and numerical methods.
Course Topics

- **Introduction to Numerical Methods**
  - Chapra: pgs. 1-23

- **Matlab Fundamentals and Programming**
  - Chapra: pgs. 24-87
  - Attaway: pgs. 1-171

- **Numerical Optimization**
  - Chapra: pgs. 182-204
  - Beers: pgs. 212-257

- **Linear Systems and Matrices**
  - Chapra: pgs. 205-283
  - Beers: pgs. 1-60

- **Nonlinear Systems & Iterative Methods**
  - Chapra: pgs. 284-302
  - Beers: pgs. 61-103

- **Eigenvalues**
  - Chapra: pgs. 303-320
  - Beers: pgs. 104-153

- **Curve Fitting**
  - Chapra: pgs. 321-379

- **Fourier Analysis**
  - Chapra: pgs. 380-404
  - Beers: pgs. 436-460

- **Ordinary Differential Equations - Initial Value Problems, Adaptive Methods and Stiff Systems**
  - Chapra: pgs. 547-615
  - Beers: pgs. 154-211

- **Boundary Value Problems - Finite Difference, Finite Volume and Finite Element Methods, (Parabolic and Elliptic Partial Differential Equations)**
  - Chapra: pgs. 616-640
  - Beers: pgs. 258-316
  - Haberman: Pgs. 222-274

- **Probability Theory – Brownian Dynamics and Monte Carlo Methods**
  - Beers: pgs. 317-371

- **Model Development and Parameter Estimation**
  - Beers: pgs. 372-435