EML 5060   **Fall 2003**

Analysis In Mechanical Engineering
Van Dommelen

1 Catalog Description

This course will familiarize students with methods of analysis in mechanical engineering. Surveys applications of integration and series, ordinary and partial differential equations, and linear algebra.

2 Credit Hours

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3 Prerequisites

Graduate/Senior standing in Mechanical Engineering. (Assumes undergraduate exposure to calculus, and ordinary differential equations, and to some Fourier series, Laplace transforms, linear algebra, and separation of variables for partial differential equations.)

4 Textbooks

1. Ayres, Frank Jr & Mendelson, Elliott, *Calculus* Schaum's Outline Series (McGraw-Hill) 4th edition 1999. ISBN 0-07-041973-6 (Check your book: my copy is missing pages 501-532 and has 533-564 double!)

2. Lipschutz, Seymour, *Linear Algebra* Schaum's Outline Series (McGraw-Hill) 3th edition 2001. ISBN 0-07-136200-2

3. Bronson, Richard, *Differential Equations* Schaum's Outline Series (McGraw-Hill) 2nd edition 1994. ISBN 0-07-008019-4

4. DuChateau, Paul & Zachmann, David W, *Partial Differential Equations* Schaum's Outline Series (McGraw-Hill) 1986. ISBN 0-07-017897-6

5. Spiegel, Murray R, & Liu, John, *Mathematical HandBook of Formulas and Tables* Schaum's Outline Series (McGraw-Hill) 2nd edition 1999. ISBN 0-07-038203-4. (Recommended, but any mathematical handbook is allowed.)

6. Downing, Douglas, *Dictionary of Mathematics* 2nd Ed, Barron's 1995. ISBN 0-8120-3097-4 (not required but useful if you forgot a lot of basic mathematics concepts.)

5 Instructor

Dr. Leon Van Dommelen:

Office hours M 1-2, T 3-4, in A 242 CEB (old building.)

Phone (850) 410-6324. I tend to forget to check my voice mail.

E-mail dommelen@eng.fsu.edu

Web page http://www.eng.fsu.edu/∼dommelen/index.html

Contact information See web page

6 Teaching Assistant

Jason Hendrix

Office hours MW 10:30-11:30

Room 213 CEB

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7 Schedule

Class times: MWF 9:15-10:05 in 226 (A building). Help sessions: MWF 10:10-10:30 in 226 (A building); T 5:00- (after the seminar).

Predetermined dates:

- 08/29/03 Test 1 due
- 09/05/03 HW Calc I due
- 09/12/03 HW Calc II due
- 09/17/03 EXAM I CALCULUS
- 09/22/03 HW Lin I due
- 09/29/03 HW Lin II due
- 10/06/03 HW Lin III due
- 10/13/03 HW Lin IV due
- 10/20/03 EXAM II LINEAR ALGEBRA
- 10/24/03 HW ODE I due
- 10/31/03 HW PDE I due
- 11/07/03 EXAM III ODE (special time)
- 11/10/03 HW PDE II due
- 11/17/03 HW PDE III due
- 11/24/03 HW PDE IV due
- 12/03/03 HW PDE V due
- 12/05/03 HW PDE VI due
- 12/11/03 Final Thursday 3-5pm (changed FSU schedule)

8 Goals

This course has several objectives, including:

- Refresh the student's memory about basic mathematics;

- Show how mathematical techniques fit in the real-life world encountered by a mechanical engineer;

- Introduce some advanced techniques, in particular in linear algebra and partial differential equations;

- Prepare students for departmental exams such as the Ph.D. Qualifying exams.

The specific desired outcomes for the students are:

- Distill the mathematical part of a given problem containing a full mathematical problem in one of the area of calculus, linear algebra, ordinary, or partial differential equations covered in class.

- Solve the problem mathematically.

Listing of specific problems included are in the lecture notes, old eaxms, and in homework assignments.

9 Course Outline

The course will likely cover:

- *Basic procedures.* Calculus and its application to optimization, estimation of area, volume and moments of inertia, approximation procedures, velocity and force fields.

- *Linear systems.* Linear algebra and its application to the determination of static loads, static determinacy, principal axes, and natural frequencies.

- *Systems governed by ordinary differential equations.* Problems giving rise to ordinary differential equations, their classification and solution procedures,

- *Systems governed by partial differential equations.* Classification and corresponding fundamental differences between vibration, unsteady heat conduction, fluid flow and other problems and solution procedures.

10 Methods of Instruction

Lectures, problem solving sessions, examinations, web-based information.

11 Student Evaluation

The course grade will be computed as:

- 05% Test 1 (Separate handout.)

- 30% Homework (See requirements below.)

- 15% Exam 1

- 15% Exam 2

- 15% Exam 3

- 20% Final

Grading is at the discretion of the instructor.

12 Important Regulations

1. Immediately check the dates listed above for any conflicts.

2. Homework must be handed in at the *start* of the lecture at which it is due. It may *not* be handed in at the departmental office or at the end of class. Homework that is not received at the start of class on the due date listed above cannot be made up unless permission to hand in late has been given *before* the homework is due, or it was not humanly possible to ask for such permission before the class. If there is a chance you may be late in class, hand the homework in to the instructor the day before it is due. (Shove it under his door if necessary.) This also applies to Web students: they must E-mail the homework before the time the class starts.

3. Homework should be neat.

4. Students are bound by the rules and regulations in their University bulletin, as well as by those specified in this syllabus, and by the usual standards applied by the College of Engineering. Read your academic bulletin. Violations of the rules and regulations in your bulletin may result in reduced grades and/or other actions.

5. Students are bound by the honor code of their university. It requires you to uphold academic integrity and combat academic dishonesty. Please see your student handbook. Violations of your honor code may result in reduced grades and/or other actions.

6. *Copying* of homework, assignments, or tests is never allowed and will result in a failing or zero grade for the copied work. It will also result in a failing or zero grade of the person whose work is being copied if that person could reasonably have prevented the copying. However, *working together* is typically allowed and encouraged for most homeworks, (and sometimes for other take-home assignments,) as long as you present the final results in your own words and using your own line of reasoning. Since close similarities between solutions will reduce credit, it is better not to formally put down anything until you have figured out the problem, and then let each person write their own solution. If it is unclear whether working together is allowed on any assignment, check with the instructor beforehand.

7. Attendance is required. Exams missed, even when rescheduled from the original date and surprise tests, or homework not handed in on time due to unexcused absence or lateness will result in a zero grade for that exam and/or homework. Failure to properly complete homework, tests, assignments, etcetera due to changes in date, assignment, etcetera, that you did not know about due to unexcused absence, lateness, or inattentiveness will not be excused and cannot be made up.

8. For excused absences where the student has given advanced notice of the absence at the earliest opportunity, the instructor will work with the student to arrange for make-up work and tests.

9. The total grade is further reduced due to unexcused absences or lateness. See the instructor for details. Even a few absences will make it impossible to pass the class. Typically, four unexcused absences result in an F grade regardless of numerical performance. Conscientious attendance is required for a confident determination of your mastery of the subject matter to be made. In other words, this class cannot be taken like a DIS unless a faculty member will allow you to do so under formal DIS rules with appropriately modified grading and testing standards.

10. The College of Engineering has a restrictive interpretation of what is considered a valid excuse for an absence. If an absence is to be excused, make sure you at least get official confirmation by phone that it will be granted beforehand.

11. The instructor will make sure that make-up tests are no simpler than the original, but he will try to make them similarly difficult. However, he cannot make allowances for increased difficulty due to the small sample size.

12. The College of Engineering has a more restrictive drop-add period than you might think based on your bulletin. Check both your bulletin and the Dean's office to determine whether drop-add will be allowed.

13. Some of these rules may not apply if you fall under the Americans with Disabilities Act. FAMU students with disabilities needing academic accommodations should contact Student Health Services for confirmation of permanent physical disability, FSU students should register with and provide documentation to the Student Disability Resource Center. Next bring a letter to the instructor from the Services or Center indicating you need academic accommodations. This should be done during the first week of classes.

14. The instructor might wave some regulation on a case-by-case basis depending on his subjective determination of fairness and appropriateness. This will occur only under exceptional circumstances and should not be assumed. Especially, never assume that a seemingly minor regulation will be waived because the instructor has waived it in the past. A second appeal to waive a minor regulation will probably indicate to the instructor that the regulation is not being taken seriously and most likely refused. Any appeal to the instructor will further be refused a priori unless it is done at the earliest possible moment by phone and/or by E-mail. Do not wait until you are back in town, say.

13 Computer Requirements

Students must have an E-mail address and daily check their E-mail. Students must be able to use a Web browser such as Netscape. The class web page can be accessed at

http://www.eng.fsu.edu/ dommelen/courses/aim/index.html

If you are taking this class remotely, see the departmental web page for requirements.