

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 differential equations, and linear algebra.

2 Credit Hours

3

3 Prerequisites

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

4 Textbooks

1. Ayres, Frank Jr & Mendelson, Elliott, *Calculus* Schaum's Outline Series (McGraw-Hill) 5th edition 2009. ISBN 978-0-07-150861-2.
2. *Advanced Engineering Mathematics* by Peter V. O'Neil. Thomson-Engineering; 6th edition, 2007. ISBN: 0-534-55208-0.

Recommended:

1. 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.)
2. 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 5-6 pm, T 2:30-3:30 pm, F 10-11 am, or by appointment, in A242 CEB¹

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 page²

6 Teaching Assistant

None

¹<http://www.eng.fsu.edu/~dommelen/contact>

²<http://www.eng.fsu.edu/~dommelen/contact>

7 Schedule

Class times: MWF 11:50-12:40 in A235 CEB (A building).

Schedule:

- 08/23/10 M (Calc I)
- 08/25/10 W (Calc I)
- 08/27/10 F (Calc I)

- 08/30/10 M (Calc II) Due: Test 1
- 09/01/10 W (Calc II) Due: HW Calc I
- 09/03/10 F (Calc II)

- 09/06/10 M LABOR DAY
- 09/08/10 W (Calc III)
- 09/10/10 F (Calc III) Due: HW Calc II

- 09/13/10 M (Calc III)
- 09/15/10 W (Lin I)
- 09/17/10 F (Lin I) Due: HW Calc III

- 09/20/10 M (Lin I)
- 09/22/10 W EXAM I Calculus
- 09/24/10 F (Lin II)

- 09/27/10 M (Lin II) Due: HW Lin I
- 09/29/10 W (Lin II)
- 10/01/10 F (Lin III)

- 10/04/10 M (Lin III) Due: HW Lin II
- 10/06/10 W (Lin III)
- 10/08/10 F (Lin IV)

- 10/11/10 M (Lin IV) Due: HW Lin III
- 10/13/10 W (Lin IV)
- 10/15/10 F (Lin V)

- 10/18/10 M (Lin V) Due: HW Lin IV
- 10/20/10 W (Lin V)
- 10/22/10 F (ODE I)

- 10/25/10 M (ODE I) Due: HW Lin V
- 10/27/10 W (ODE I)
- 10/29/10 F EXAM II Linear Algebra and Last day to drop

- 11/01/10 M (ODE II)
- 11/03/10 W (ODE II) Due: HW ODE I
- 11/05/10 F (ODE II)

- 11/08/10 M (ODE III)
- 11/10/10 W (ODE III) Due: HW ODE II
- 11/12/10 F (ODE III)

- 11/15/10 M (ODE IV)
- 11/17/10 W (ODE IV) Due: HW ODE III
- 11/19/10 F (ODE IV)

- 11/22/10 M (ODE V)
- 11/24/10 W (ODE V) Due: HW ODE IV
- 11/26/10 F THANKSGIVING =====

- 11/29/10 M (ODE V)
- 12/01/10 W (ODE VI) Due: HW ODE V
- 12/03/10 F (Review) Due: HW ODE VI

- 12/10/10 Friday 7:30-9:30 am Final (in the usual classroom)
- 12/14/10 FSU grades due 4:00 pm
- 12/15/10 FSU grades available online

8 Goals

This course has several objectives, including:

- Refresh the students' 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.
- Help students prepare for the Ph.D. Preliminary exam.

9 Outcomes

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, or ordinary differential equations covered in class.
- Solve the problem mathematically.

Samples of specific problems are in the lecture notes, old exams, and in homework assignments.

10 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,

11 Methods of Instruction

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

12 Student Evaluation

The course grade will be computed as:

- 05% Test 1 (Separate handout.)
- 20% Homework (See requirements below.)
- 25% Exam 1
- 25% Exam 2
- 25% Final

Historically, the B/B- boundary has been at 75%.

Grading is at the discretion of the instructor.

You can miss two homeworks, their grades will be taken from the average of your other grades. You still need to know the material for the final, but you can study the posted solutions.

See the exam calculator policy.³

³<http://www.eng.fsu.edu/~dommelen/courses/aim/calc>

13 Important Regulations

Must check dates

Immediately check all dates listed in this syllabus for any conflicts.

Honor policy

Students are expected to uphold the Student Code of Conduct, Academic Honor Code published in their University Bulletin and/or Student Handbook. You must read your honor policy if you have not yet done so. Violations of your honor code may result in reduced grades and more serious actions.

Students are bound by their university's Academic Honor Code and are subject to sanctions if they are found in violation of the Code. Possible sanctions include but are not limited to: (1) a failing grade on an exam or assignment, (2) a failing grade in the course, (3) dismissal from the academic program, or (4) dismissal from the university.

Florida A&M Student Code of Conduct as published in the Student Handbook. Academic Dishonesty.⁴

The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to "... be honest and truthful and ... [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy⁵.)

Homework

Homework should be neat.

Working together on homework is encouraged, but copying is not allowed.

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.

Copying

Copying of homework, assignments, or tests is never allowed and will result in a failing or zero grade for the copied work, and other actions. 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.

Attendance

FSU students are dropped if not present the first day of classes. FAMU students are dropped if not attending at the end of the first week.

Excused Absences: Absence for participation in recognized university activities, properly certified personal illness, or recognized emergencies may be excused by the Dean's office. Please note that the College of Engineering has a restrictive interpretation of what is considered a valid excuse for an

⁴<http://www.famu.edu/index.cfm?judicialAffairs&StudentCodeofConduct>

⁵<http://www.fsu.edu/~dof/forms/honorpolicy.pdf>

absence. If an absence is to be excused, make sure you check beforehand. In case of excused absence, the instructor will work with you to help you make up for missed time and catch up or have an I grade assigned.

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.

Unexcused Absences: An undergraduate student having more than four unexcused absences will be dropped from the course and assigned the grade F. Tests and exams missed because of unexcused absence receive the grade 0.

Daily e-mail check: Students must daily check their e-mail at the address they provided at the start of class. They must ensure that they receive an welcome e-mail at the beginning of the semester, or contact the instructor to correct their recorded e-mail address immediately. Any test, exam, or homework that the student did not know about since the student did not check their e-mail that day receives a zero grade. No exceptions.

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.

Departmental

The Department's Policy is clearly outlined at the following web location:

<http://www.eng.fsu.edu/me/ugradpro/classes/policy/index.html>

College

College of Engineering Undergraduate Policy: As current policy, the College does not use plus +, or minus – grades in engineering courses (page 4, COE Handbook⁶). A student may continue in the B.S. degree program unless one or more of the following conditions arise (page 5, COE Handbook⁷):

1. A grade below C in the second attempt of the same engineering course
2. More than three (3) repeat attempts in engineering courses.
3. Violation of academic honor code as defined in university bulletin or catalog
4. Use of grade forgiveness (currently available for FAMU students only) in more than two (2) courses.

ADA

Some of these rules may not apply if you fall under the Americans with Disabilities Act.

Students with disabilities needing academic accommodation should:

- register with and provide documentation to the appropriate university office. For FAMU students, this is the Learning Development and Evaluation Center (LEDC). For FSU students this is and Student Disability Resource Center (SDRC);
- bring a letter to the instructor indicating the need for accommodation and what type.

This should be done during the first week of class.

For more information about services available to students with disabilities:

- FAMU Students should contact the Learning Development and Evaluation Center (850)599-3180;
- FSU Students should contact the Student Disability Resource Center (850) 644-9566.

⁶<http://www.eng.fsu.edu/documents/handbook1.pdf>

⁷<http://www.eng.fsu.edu/documents/handbook1.pdf>

Exceptions

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 made at the earliest possible moment by phone and/or by E-mail. Do not wait until you are back in town, say.

Change policy

Except for changes that substantially affect implementation of the grading policy or grading scale, this syllabus is a guide for the course and subject to change with advance notice.

14 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 Firefox. The class web page can be accessed at:

`http://www.eng.fsu.edu/~dommelen/courses/aim`

If you are taking this class remotely, contact the FEEDS office⁸ for requirements.

⁸<http://www.eng.fsu.edu/feeds>