Analysis in Mechanical Engineering
EML 5060
Syllabus

Dr. Leon van Dommelen

Fall 2013

Contents

1 Credit Hours

3

2 Course Type

EML 4930: Technical Elective, no track. EML 5060: Core Graduate.

Note: 4930 is a catch-all number used for multiple classes. Make sure you signed up for the right section of 4930!

3 Terms Offered

Fall.

4 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.

5 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.)

6 Instructor

Dr. Leon Van Dommelen:

Office hours W 1-2 pm, F 10-11 am, or by appointment, in A242 CEB

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

E-mail `mailto:dommelen@eng.fsu.edu`

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

Contact information `http://www.eng.fsu.edu/~dommelen/contact`

7 Teaching Assistant

None

8 Class Schedule

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

A number of faculty have asked whether a short exposure to "separation of variables for partial differential equations" can be included in this class. I will try to shorten some parts to make a week available for that. So this schedule might change somewhat here and there.

- 08/26/13 M (Calc I)
- 08/28/13 W (Calc I)
- 08/30/13 F (Calc I)

- 09/02/13 M LABOR DAY ==========
- 09/04/13 W (Calc II) Due: Test 1
- 09/06/13 F (Calc II) Due: HW Calc I

- 09/09/13 M (Calc II)
- 09/11/13 W (Calc III)
- 09/13/13 F (Calc III) Due: HW Calc II

- 09/16/13 M (Lin I)
- 09/18/13 W (Lin I) Due: HW Calc III

- 09/20/13 F (Lin I)

- 09/23/13 M (Lin II long)
- 09/25/13 W (Lin II long) Due: HW Lin I
- 09/27/13 F none

- 09/30/13 M none
- 10/02/13 W (Lin III long)
- 10/04/13 F (Lin III long) Due: HW Lin II

- 10/07/13 M (Lin IV long)
- 10/09/13 W EXAM I Calculus
- 10/11/13 F (Lin IV long) Due: HW Lin III

- 10/14/13 M (Lin V)
- 10/16/13 W (Lin V) Due: HW Lin IV
- 10/18/13 F none

- 10/21/13 M (Lin V)
- 10/23/13 W (ODE I)
- 10/25/13 F (ODE I) Due: HW Lin V

- 10/28/13 M (ODE I)
- 10/30/13 W (ODE II)
- 11/01/13 F EXAM II Linear Algebra

- 11/04/13 M (ODE II) Due: HW ODE I
- 11/06/13 W (ODE II)
- 11/08/13 F (ODE III)

- 11/11/13 M VETERAN'S DAY ==========
- 11/13/13 W (ODE III) Due: HW ODE II
- 11/15/13 F (ODE III)

- 11/18/13 M (ODE IV)
- 11/20/13 W (ODE IV) Due: HW ODE III
- 11/22/13 F (ODE IV)

- 11/25/13 M (ODE V)
- 11/27/13 W (SOCIALIZE I) Due: HW ODE IV
- 11/29/13 F THANKSGIVING ==========

- 12/02/13 M (ODE V)
- 12/04/13 W (ODE V)

- 12/06/13 F (PDE) Due: HW ODE V

- 12/10/13 Tuesday 10:00-12:00 FINAL EXAM ODE (in the usual classroom)
- 12/17/13 Grades due FAMU/FSU 5:00/4:00 pm
- 12/18/13 Grades available online

9 Textbooks

Required:

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; 7th edition, 2011. ISBN: 9781111427412. (Until Fall 2013).
3. *Advanced Engineering Mathematics* by Dennis G. Zill and Warren S. Wright. 5th Ed., 2014. Jones and Bartlett. ISBN-13: 9781449691721. (Starts Fall 2014)

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.)

10 Science/Design

Engineering Science: 100%

11 Course Topics

- *Basic procedures.* Calculus and its application to optimization, estimation of area, volume and moments of inertia, approximation procedures, velocities and forces.
- *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.* Ordinary differential equations and their application to dynamical systems.

12 Assessment Tools

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 exams, but you can study the posted solutions.

See the exam calculator policy.[1]

13 Course Objectives

This course has several objectives, including:

1. Refresh the students' memory about basic mathematics;
2. Show how mathematical techniques fit in the real-life world encountered by a mechanical engineer [1];
3. Introduce some advanced techniques, in particular in linear algebra and ordinary differential equations [1].
4. Help students prepare for the Ph.D. Preliminary exam.

Numbers in square brackets refer to the departmental student program outcomes: `http://www.eng.fsu.edu/me/undergrad/ed_objective.html`

14 Student Learning Outcomes

The specific desired outcomes for the undergraduate students are:

1. Distill the mathematical part of a given problem containing a full mathematical problem in one of the areas of calculus, linear algebra, or ordinary differential equations covered in class [2].
2. Solve the problem mathematically [2,3].

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

Numbers in square brackets refer to the Course Objectives above.

15 Methods of Instruction

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

16 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:

[1] `http://www.eng.fsu.edu/~dommelen/courses/aim/calc`

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

If you are taking this class remotely, contact the FEEDS office[2] for requirements.

17 Important Regulations

17.1 Must Check Dates Immediately

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

17.2 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.

17.3 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.

17.4 Attendance Policy

17.4.1 Initial attendence

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.

[2] http://www.eng.fsu.edu/feeds

17.4.2 Excused absences

You should contact the instructor as soon as possible when the need for an excused absence arrives.

Excused absences include documented illness, deaths in the immediate family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. Accommodations for these excused absences will be made and will do so in a way that does not penalize students who have a valid excuse. Consideration will also be given to students whose dependent children experience serious illness. See however the notification requirements below.

Please note that the College of Engineering has a restrictive interpretation of what is considered a valid excuse for an absence. See:
`http://www.eng.fsu.edu/current/undergraduate/guide.html`
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, subject to the notification requirements below.

Classes are not suspended at the College of Engineering unless they are suspended at both institutions. If you are required to attend a university event, you can receive an excused absence. Otherwise, your absence is considered unexcused.

You must notify me in the first week of the semester if you will need an excused absence during a scheduled examination for observance of a religious holy day. If you will need such an absence for a planned event, you must notify me at the start of the semester, or the day that the event is scheduled if later. If an emergency prevents you from attending a scheduled examination, you must notified me at your earliest opportunity, by e-mail (check that you get a timely response from me), phone, or in person. Please provide official documentation of event or emergency. In case the notification procedures are not followed, no make up examination will be given and a zero will be assigned.

17.4.3 Unexcused absences

A student having more than four unexcused absences will be dropped from the course and assigned the grade F. No exceptions. Tests and exams missed because of unexcused absence receive the grade 0. No exceptions.

Other projects and activities missed completely receive the grade 0 for those projects or activities. No exceptions except as may be noted elsewhere in this syllabus. Homework handed in after the due date and time will receive a zero or greatly reduced credit depending on circumstances and any regulations elsewhere in this syllabus.

17.4.4 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.

17.4.5 Consequential loss of credit

Failure to properly complete homework, tests, assignments, etcetera due to changes in date, assignment, etcetera, that you did not know about due to failure to check e-mail, unexcused absence, lateness, or inattentiveness will not be excused and cannot be made up.

17.5 Extract of Departmental Policy

An undergraduate student may continue in the B.S. in ME degree program unless one or more of the following conditions arise;

1. A grade below C in the second attempt of the same engineering course.
   `http://www.eng.fsu.edu/me/resources/pdf/ME_Prerequisite_Policy.pdf`
2. More than three (3) repeat attempts in engineering courses.
   `http://www.eng.fsu.edu/me/resources/pdf/ME_Excessive_Repeat_Policy.pdf`
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.

Non-ME undergraduate students should contact their home department for corresponding regulations.

17.6 Extract of College Policy

It is the policy of the College not to assign "plus and minus (+/-)" grades for undergraduate engineering courses.
`http://www.eng.fsu.edu/current/undergraduate/guide.html`

Any student who has repeated attempts in one or more engineering courses may be subject to academic sanctions including but not limited to warning, probation, suspension, or dismissal from their engineering program. Students should contact the department of their engineering major for more information regarding this policy.

17.7 Learning outcomes/compacts

Mechanical engineering student outcomes:
`http://www.eng.fsu.edu/me/undergrad/ed_objective.html`

Engineering program outcomes/student learning outcomes:
`http://www.eng.fsu.edu/outcomes`

Engineering academic learning compact:
`http://www.eng.fsu.edu/about/accreditation/outcomes.html`

Florida State University academic learning compact:
`http://learningforlife.fsu.edu/smalcs/learningCompact.cfm?smalcId=57339`

17.8 Honor Policy

Students are expected to uphold their University Student Code of Conduct and/or Academic Honor Code. You must read this code if you have not yet done so.

- Florida A&M University is committed to academic honesty and its core values which include scholarship, excellence, accountability, integrity, fairness, respect, and ethics. These core values are integrated into its academic honesty policy. Being unaware of the Academic Honesty Policy is not a defense to violations of academic honesty. Academic Honesty Policy violations shall be reported and appropriate actions taken by the department chair and associate dean for student affairs and curriculum. The complete Florida A&M Student Code of Conduct - Regulation 2.012 (10) (s) can be found at
  `http://www.famu.edu/index.cfm?judicialAffairs&StudentCodeofConduct`
- 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."The complete Florida State University Academic Honor Policy can be found at
  `http://fda.fsu.edu/Academics/Academic-Honor-Policy`

Possible sanction for violations of your code of conduct and/or honor code 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,
4. dismissal from the university.

17.9 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 the 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:

  Learning Development and Evaluation Center (LDEC)
  677 Ardelia Court
  Florida A&M University
  Nathaniel Holmes, Director
  Donna Shell, Asst. Director
  (850) 599-3180 (voice)
  (850) 561-2512 (fax)

(850) 561-2783 (TDD)
http://www.famu.edu/index.cfm?a=EOP&p=ADA

- FSU Students should contact:

  Student Disability Resource Center (SDRC)
  874 Traditions Way
  108 Student Services Building
  Florida State University
  Tallahassee, FL 32306-4167
  (850) 644-9566 (voice)
  (850) 644-8504 (TDD)
  sdrc@admin.fsu.edu
  http://www.disabilitycenter.fsu.edu/

17.10 Non-Discrimination Policy Statement

- The Florida A&M University statement can be found at:
  http://www.famu.edu/index.cfm?EOP&NON-DISCRIMINATIONPOLICYSTATEMENT
- The Florida State University statement can be found at:
  http://www.hr.fsu.edu/PDF/Publications/diversity/EEO_Statement.pdf

17.11 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.

17.12 Syllabus Change Policy

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice.