

R, CAREY MATH

TUESDAY, AUGUST 23, 2011

Calculus IV: Ordinary Differential Equations

MA 214-004

Spring 2012

Instructor: Prof. Richard Carey

MWF 12:00-12:50 CB 337 Office POT 965

Office Hours: MW 11:15

-11:50 & by appt. Phone 257-3745

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URL is <http://www.calculli.blogspot.com/>

Text: Differential Equations with Applications and Historical Notes by
George Finlay Simmons,

Course content:

During the semester we will cover parts of
Chapter 1 The nature of differential equations.
Chapter 2 First order equations.
Chapter 3 Second order linear equations.
Chapter 5 Power series and special functions.
Chapter 7 Systems of first order equations.
Chapter 10 Laplace transforms.

Chapter 1 is an overview exhibiting basic examples from physics-Newton's second law; geometry- orthogonal trajectories, calculus of variations; and biology and chemistry – growth and decay. The question of existence and uniqueness of solutions is addressed in the form of Picard's theorem.

Chapter 2 introduces several techniques for solving first order equations including reduction to a first order equation.

Chapter 3 looks at second order linear equations, and motivated by linear algebra introduces the important notion of the Wronskian. The Wronskian is used to determine whether a set of solutions is linearly dependent, and is used to compute the inverse of the differential operator. Examples of forced vibrations, electric circuits, gravity and the motion of the planets are studied.

Chapter 5 deals with power series solutions and the method of Frobenius using the notion of regular singular points and the indicial equation.

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Chapter 7 talks about systems of first order equations; in particular how an ordinary differential equation of high order can be recast as a first order system.

Chapter 10 introduces the method of Laplace transforms .The Laplace transform is often interpreted as a transformation from the *time-domain*, in which inputs and outputs are functions of time, to the *frequency-domain*, where the same inputs and outputs are functions of complex angular frequency, in radians per unit time. Given a simple mathematical or functional description of an input or output to a system, the Laplace transform provides an alternative functional description that often simplifies the process of analyzing the behavior of the system, or in synthesizing a new system based on a set of specifications. It provides a means for giving a physical interpretation to the differential operator.

Grading: Exams. There will be two term exams, a collection of weekly quizzes and a final. The term exams count 100 points each, the quizzes contribute a total of 100 points, and the final 130 points. The Final Examination is on Wednesday May 2 @ 1:00pm. All exams will be in this classroom. Dates of the exams will be determined by schedule. The grading scale for the term exams is as follows:

90-100 A

80-89 B

70-79 C

60-69 D

Below 60 E

The grading scale for the final exam will be as follows:

117-130 A

104-136 B

91-103 C

78-90 D

below 78 E

Your course score will be the sum of your exam scores and quizzes. The grading scale for the course will be as follows:

Cumulative score Grade

387-430 A

344-386 B

301-343 C

258-300 D

below 258 E

Exams, Quizzes, and Attendance: It is very important to take each exam on schedule. You will be allowed 4 unexcused absences,

then every missed class after that you will lose 5 points on your final grade (that is half a letter grade). Attendance will be taken every lecture beginning January 23. Missed work may be made up only due to illness with medical documentation or for other unusual (documented) circumstances. (See your Student Rights and Responsibilities <http://www.uky.edu/StudentAffairs/Code/%20>. Students who have university excused absences or who have university-scheduled class conflicts with uniform examinations may arrange with their instructor to take the exam at an alternate time. Work-related conflicts are neither university excused absences or university-scheduled absences. If you miss an exam, you receive a zero. You will be eligible for a make-up only if you present a valid excuse to me before the exam. If you cannot find a reasonable arrangement for a make-up, contact the department DUS David Royster.

Excused Absences: S.R. 5.2.4.2 defines the following as acceptable reasons for excused absences:

1. serious illness;
2. illness or death of family member;
3. University-related trips;
4. major religious holidays;
5. other circumstances you find to be "reasonable cause for nonattendance."

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day for adding a class. Information regarding dates of major religious holidays may be obtained through the religious liaison, and Associate Dean of Students, Mr. Jake Karnes (257-2754).

Cheating: Cheating will not be tolerated, and you are responsible for knowing University policy on cheating. The University's minimum policy for cheating is failure in the course. (Yes, the chair of the department does spend time each semester prosecuting students who thought they'd never get caught!) Cheating can lead to expulsion from the university. For a complete description of University policies on excused absences, cheating, and student responsibilities see UK's New Academic Offenses Policy can be found at

<http://www.chem.uky.edu/research/grossman/acadoffenses/index.htm>

For instance, Senate Rule 6.4.11 states:

The minimum penalty for an academic offense is an E in the course in which the offense took place. The repeat option may not be used to remove an E

given for an academic offense. If a prior academic offense has been recorded in the Registrar's Office, the minimum penalty shall be suspension for one semester (or a minimum of four months in those colleges in the Medical Center where the semester system is not in use. Penalties more severe than the minimum may be imposed where warranted by the circumstances.

Our class is a cell phone-free zone. Cell phones must be off & out of sight for the entire class period.

Note: There is an official procedure for dropping a course. You haven't withdrawn if you simply quit attending. A student who drops a class before September 14 will receive no grade. A student who withdraws after September 14 will receive a grade of W. After April 1 no student will be allowed to withdraw unless his/her dean determines that unusual circumstances merit the withdrawal.

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