Math 250: Ordinary Differential Equations
Fall 2010

Prerequisite: MATH 141 or MATH 141H. Students who have passed MATH 251 may not schedule this course for credit.


Course description and number of lectures:
The following topics of the text book will be covered (subject to minor changes):

- Chapter 1: Introduction
  - 1.1 Direction fields (1)
  - 1.2 Solutions of some differential equations (.5)
  - 1.3 Classification of differential equations (.5)

- Chapter 2: First order differential equations
  - 2.1 Linear equations; method of integrating factors (1.5)
  - 2.2 Separable equations (1.5)
  - 2.3 Modeling with first order equations (2)
  - 2.4 Differences between linear and nonlinear equations (1)
  - 2.5 Autonomous equations and population dynamics (1)

- Chapter 3: Second order linear differential equations
  - 3.1 Homogeneous equations with constant coefficients (1)
  - 3.2 Fundamental solutions of linear homogeneous equations; the Wronskian (2)
  - 3.3 Complex roots of the characteristic equation (1)
  - 3.4 Repeated roots; reduction of order (2)
  - 3.5 Nonhomogeneous equations; method of undetermined coefficients (3)
  - 3.7 Mechanical vibrations (omit electrical vibrations) (1)

- Chapter 4: Higher order linear equations
  - 4.1 General theory of nth order linear equations (1)
  - 4.2 Homogeneous equations with constant coefficients (1)
• Chapter 6: The Laplace transform
  ◦ 6.1 Definition of the Laplace transform (1)
  ◦ 6.2 Solutions of initial value problems (2)
  ◦ 6.3 Step functions (2)
  ◦ 6.4 Differential equations with discontinuous forcing functions (1)
  ◦ 6.5 Impulse functions (1)

• Chapter 7: Systems of first order linear equations
  ◦ 7.1 Introduction to systems of differential equations (1)
  ◦ 7.5–7.8 Classification of critical points and sketching phase portraits (4)
  ◦ 7.9 Nonhomogeneous linear systems (1)

• Chapter 8: Numerical methods
  ◦ 8.1 The Euler or tangent line method (1)

• Chapter 9: Nonlinear differential equations and stability
  ◦ 9.1 The phase plane: linear systems (1)
  ◦ 9.2 Autonomous systems and stability (1)
  ◦ 9.3 Locally linear systems (2)

• Review Periods = 5 (1 before Exam I, and 2 each before Exam II and the Final.)

A software package which draws direction fields and trajectories is freely available at the site http://math.rice.edu/~dfield/dfpp.html.

MIDTERM EXAMINATIONS: Two 75-minute evening examinations will be given during the semester and a comprehensive final examination will be given during the final examination period. The use of calculators is not permitted. You must bring your Student ID to the exams The dates of the two midterm exams are as follows:

Exam I: September 27, 2010, 6:30 - 7:45 PM in 100 Thomas
Exam II: November 8, 2010, 8:15 - 9:30 PM, Room # TBA

Conflict examinations: For the two mid-semester examinations, there is a conflict examination on the same night as the regular exam.

Conflict Exam I: September 27, 2010, 5:05 - 6:20 PM in 158 Willard
Conflict Exam II: November 8, 2010, 6:50 - 8:05 PM, Room # TBA

You must have a valid reason for taking the conflict exam, and you need to sign up with the Instructor at least five days before the exam date.
You must bring your Student ID to the conflict exam. The ID will be checked by the exam proctor. Although the conflict Exam 1 will end at 6:20pm, no students will be permitted to leave the exam room before 6:25pm. A student who leaves before 6:25 will receive a grade of zero on the exam and will not be allowed to retake it. The same rule applies for the conflict exam II.

**Makeup examinations:** Students who have a valid verifiable reason are permitted to schedule a makeup examination at the discretion of the instructor. **You need to sign up with your instructor at least three days before the exam date.** The date and place will be announced later. If you have not signed up with your instructor, you will not be allowed to take the makeup exam. The student is responsible for knowing the room and time of the makeup examination.

**FINAL EXAMINATIONS** A comprehensive final examination will be given during finals week, December 13-17, 2010. Students may access their final exam schedule Monday, September 27, through their e-lion account. Notification of conflicts is given on the student’s final exam schedule. There are two types of conflict examinations, direct and overload. Direct conflicts are two examinations scheduled at the same time. Overload examinations are three or more examinations scheduled within a fifteen hour period, from the beginning of the first examination to the beginning of the third examination. Students may elect to take the three or more examinations on the same day if they wish or request a conflict final examination. **A student must take action to request a conflict exam through e-lion between September 27 and October 17, 2010.** Conflict final examinations cannot be scheduled through mathematics department, and there will be no sign up sheet in 104 McAllister for the final conflict examination. No make-up final exam will be given. Until the final exam schedule is known, do not arrange to leave University Park before December 17. Notes, books, cell phones, calculators or similar items are not allowed in the final exam.

**Course Grades:** Grades will be assigned on the basis of 500 points, distributed as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination I</td>
<td>100</td>
</tr>
<tr>
<td>Examination II</td>
<td>100</td>
</tr>
<tr>
<td>Quizzes and Homework</td>
<td>150</td>
</tr>
<tr>
<td>Final Exam</td>
<td>150</td>
</tr>
</tbody>
</table>

**Guideline for letter grades:** $\geq 450$ points guarantees an A or A-, $\geq 400$ points guarantees a B+, B or B-, $\geq 350$ points guarantees a C+ or C, $\geq 300$ points guarantees a D, and below 300 points will get an F.

**NOTE:** Your grade will be based EXCLUSIVELY on the midterm examinations, homework and/or quizzes and final examination. There is no "extra-credit" work.
TUTORS: Free tutoring is available from Penn State Learning. It is opening for the Fall semester on August 30, 2010. Times and location: Sunday through Thursday from 6:00 PM to 10:00PM in 7 Sparks Building. If you need extra help, a list of (paid) tutors is maintained in the Math Department Undergraduate Office in 104 McAllister Building.

Academic integrity statement: “Academic dishonesty includes, but is not limited to, cheating, plagiarizing, ... facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students ... A student charged with academic dishonesty will be given oral or written notice of the charge by the instructor. If students believe that they have been falsely accused, they should seek redress through informal discussions with the instructor, the department head, dean or campus executive officer. If the instructor believes that the infraction is sufficiently serious to warrant the referral of the case to Judicial Affairs, or if the instructor will award a final grade of F in the course because of the infraction, the student and instructor will be afforded formal due process procedures.” From Policies and Rules, Student Guide to the University, Policy 49–20. Please see the Eberly College Academic Integrity homepage for additional information and procedures.

QUESTIONS, PROBLEMS, OR COMMENTS: If you have questions or concerns about the course, please consult your instructor first. If further guidance is needed, you may contact the course coordinator whose contact information is given below.

Dr. Aissa Wade
317 McAllister Building
Tel: 814-865-7311
Email: wade at math.psu.edu
Ordinary Differential Equations, Fall 2010
Math 250, Section 3

Mo, We, Fr, 11:15 - 12:05pm in 108 Tyson

Instructor: Professor Aissa Wade

Office Hours: Mo 4:00 - 5:00pm, We 1:00 - 2:00pm,

Office: 317 McAllister Building

E-mail: wade at math.psu.edu

Website: http://www.math.psu.edu/wade/math250-FA10.html

Policy on homework assignments and quizzes: Homework will be assigned every Friday and collected in class the following Friday. Homework should be neat and stapled. Correct answers without supported work will receive no credit. Bi-weekly quizzes will be given. Due to the limited grading hours allotted to this course, the grader will grade all quiz problems and selected homework problems. There will be no make-up quizzes. Late homework will not be accepted. The two lowest homework scores and one lowest quiz scores will be dropped at the end of the semester. Out of the 150 points assigned to homework and quizzes, 60 points will be for quizzes and 90 points will be for homework.

Quiz dates: 9/8, 9/22, 10/6, 10/20, 11/3, 11/17, 12/1.
Suggested homework problems

Section 1.1: # 3, 7, 9, 15, 16, 18, 19,
Section 1.3: #3, 4, 5, 6, 12, 15, 16, 17, 20
Section 2.1: # 12, 13, 15, 16, 18, 19, 20, 22 (b) and (c), 25 (b) and (c), 30.
Section 2.2: # 1, 2, 4, 5, 6, 7, 9-13 do only (a) and (c), 21, 27
Section 2.3: # 3, 4, 8, 9, 10, 11, 23, 28
Section 2.4: # 1, 2, 4, 6, 7, 9, 13, 12, 15, 23
Section 2.5: # 2, 3, 5, 9, 12
Section 3.1: # 1, 2, 10, 11, 12, 13, 15, 17, 21
Section 3.2: # 2, 3, 9, 11, 17, 25, 27, 31, 32, 34
Section 3.3: # 1, 2, 4, 7, 9, 13, 18, 21, 25(a)
Section 3.4: # 7, 12, 18, 19, 20, 24, 25, 26
Section 3.5: # 1, 2, 3, 5, 8, 11, 13, 18, 23, 25, 27, 28
Section 3.7: # 2, 3, 6, 19
Section 4.1: # 2, 3, 5, 8, 9, 15, 17
Section 4.2: # 3, 11, 12, 18, 20, 23, 29, 37
Section 6.1: # 5, 6, 7, 8
Section 6.2: # 1, 2, 3, 5, 8, 9, 10, 11, 16, 21, 23
Section 6.3: # 7, 8, 9, 10, 11, 13, 14, 15, 17, 18, 24, 25
Section 6.4: # 6, 9, 10
Section 6.5: # 2, 3, 5, 10, 13(a)
Section 7.1: # 1, 2, 4, 5, 8, 10, 11
Section 7.3: # 16, 17, 18
Section 7.5: # 4, 5, 15, 24, 25, 27
Section 7.3: # 16, 17, 18
Section 7.5: # 4, 5, 15, 24, 25, 27
Section 7.6: # 2, 3, 4, 5, 6
Section 7.7: # 3, 5, 6, 7, 11
Section 7.8: # 1, 3, 7
Section 7.9: # 1, 2, 4
Section 8.1: # 1-3 only (a) and (c)
Section 9.1: # 1-3 only (a) and (b)
Section 9.2: # 1-4 only (a) (d)