

MATH 250 ORDINARY DIFFERENTIAL EQUATIONS

FALL 2007

CATALOG DESCRIPTION: Ordinary Differential Equations (3:3:0) First- and second-order equations and applications; Laplace transform solutions; systems of first order equations. Students who have passed Math 251 may not schedule this course for credit.

PREREQUISITE: Math 141 GQ.

TEXT: *Elementary Differential Equations*, 8th Edition, by Boyce and DiPrima, published by John Wiley & Sons, Inc., ISBN: 978-0-471-43339-2

COURSE DESCRIPTION and NUMBER of LECTURES

INTRODUCTION

- 1.1-2 Direction fields, Solutions of Some DE's 1
- 1.3 Classification of DE's 1

FIRST ORDER DE's

- 2.1 Linear Equations with Variable Coefficients 2
- 2.2 Separable Equations 1
- 2.3 Modeling with First Order Equations (do mixture, interest and air resistance) 3
- 2.4 Differences Between Linear and Nonlinear Equations 1
- 2.5 Autonomous Equations and Population Dynamics 1

SECOND ORDER LINEAR EQUATIONS

- 3.1 Homogeneous Equations with Constant Coefficients 1
- 3.2 Fundamental Solutions of Linear Homogeneous Equations 1
- 3.3 Linear Independence and the Wronskian 1
- 3.4 Complex Roots of the Characteristic Equations (also review complex arithmetic) 2
- 3.5 Repeated Roots; Reduction of Order 2
- 3.6 Nonhomogeneous Equations; Method of Undetermined Coefficients 3
- 3.8 Mechanical Vibrations (omit electrical vibs) 1
- 3.9 Forced Vibrations 2

THE LAPLACE TRANSFORM

- 6.1 Definition of the Laplace Transform 1
- 6.2 Solution of Initial Value Problems 2
- 6.3 Step Functions 3
- 6.4 Differential Equations with Discontinuous Forcing Functions 2
- 6.5 Impulse Functions 1

SYSTEMS OF FIRST ORDER LINEAR EQUATIONS

- 7.1-3 Introduction to Systems of Differential Equations and review of eigenvalues and eigenvectors 2
- 7.5-8 Classification of critical points and sketching phase portraits 3

NONLINEAR DIFFERENTIAL EQUATIONS AND STABILITY

- 9.1 Phase portraits and stability 1
- 9.2 Autonomous systems and stability 1
- 9.3 Almost linear systems 2

REVIEW PERIODS = 3 (before each exam)

TOTAL PERIODS = 44

NOTES: A superb piece of software called dfield, which draws direction fields and trajectories (with initial condition defined by a click of the mouse), is freely available at the site

<http://math.rice.edu/~dfield/dfpp.html>

EXAMINATIONS: Two 75-minute evening (6:30-7:45pm) examinations will be given during the semester and a comprehensive final examination will be given during the final examination period. No books or notes may be used on the examinations unless otherwise stated by the instructor. **The use of calculators is not permitted. You must bring your University ID to the exam.** The two exams are scheduled on the following dates:

EXAM I: Sept 27, 2007 EXAM II: Oct. 30, 2007

CONFLICT EXAMINATIONS: For the two mid-semester examinations, there is a conflict examination from 5:05 to 6:20 PM on the same night as the regular exam. If you have a conflict with the regular exam time, such as a class or other scheduled activity, you may sign up to take the conflict exam. You must have a valid reason for taking the conflict exam, and **you need to sign up by one week before the exam date.** You will be given the room for the conflict exam when you sign up. **Students must bring their University ID to the conflict exam.** The ID will be checked by the exam proctor. Although the conflict exam will end at 6:20, no student will be permitted to leave the exam room before 6:25. A student who leaves before 6:25 will receive a grade of zero on the exam and will not be allowed to retake it.

MAKEUP EXAMINATIONS: Students who have a valid verifiable reason, such as illness or a class during both the conflict and regular exam times, are permitted to schedule a makeup examination at the discretion of the instructor. Students who do not have a valid reason, such as forgetting the date, time, or room of an exam, are also allowed to schedule a make-up exam, but 20 points will be deducted from their score. The make-up exam will take place one week after the regular exam. In order to take a makeup exam, **students must sign up at 104 McAllister building at least one working day before the makeup examination date and pick up a permission slip from 104 McAllister. The permission slip should then be signed by the instructor and brought to the makeup examination room.** Students who have not signed up for the makeup exam will not be allowed to take it. **The students are required to show their University ID to the proctor of the makeup exam.** If a student misses the regularly scheduled examination and the makeup examination, it may be possible to take a makeup examination by appointment with your instructor **only if there is an unavoidable medical emergency.** With a valid, verifiable reason, these examinations will be given by your instructor, with the approval of the course coordinator, and must be completed no later than one week after the scheduled examination.

FINAL EXAMINATION: The final exam will be given during Finals Week, December 17-21. When the final exam schedule is released, you will be given information on filing for conflict exams if you have two exams at the same time, or three or more exams during a 15 hour period. These are the only valid reasons for filing for a conflict exam. **No make-up final exam will be given.** Until schedule is known, do not arrange to leave University Park before Dec. 21.

COURSE GRADES: Grades will be assigned on the basis of 450 points, distributed as follows:

Examination I: 100 points
 Examination II: 100 points
 Quizzes and homework: 100 points
 Final Examination: 150 points

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.

Based on the *University’s Faculty Senate Policy 49-20*, a range of academic sanctions may be taken against a student who engages in academic dishonesty. Please see the *Eberly College Academic Integrity* homepage for additional information and procedures.

TUTORS: If you need extra help, (paid) tutors list is maintained in the Math Department Undergraduate Office in room 104 McAllister building. It is available online at <http://www.math.psu.edu/ug/PrivateTutorList.htm>.

MATH 250 – Fall 2007**INSTRUCTOR:** Vitaliy Gyrya**OFFICE HOURS:** MTW 11:10am-12:10pm**OFFICE:** 418 McAllister Building**e-MAIL:** gyrya@math.psu.edu**CLASS HOME-PAGE:** <http://www.math.psu.edu/gyrya/fall2007/math250.htm>

POLICY ON HOMEWORK ASSIGNMENTS AND QUIZZES: Homework will be assigned weekly in class and on the class home-page, and collected every Wednesday. There will be some number of quizzes. Due to the limited grading hours allotted to this course, the grader will grade all quiz problems, but only some selected homework problems.

THERE WILL BE NO MAKE-UP QUIZZES. Late homework (no later than 3 days) might be accepted under special circumstances. However, the instructor and the grader reserve the right of acceptance.