Texas Tech University, Department of Mathematics and Statistics

MATH 4354, DIFFERENTIAL EQUATIONS II

COURSE SYLLABUS, Fall 2013

Section #001 (CRN: 14048)

Instructor

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Weekly meeting

MWF 09:00am-09:50am, room 109 Holden Hall

Textbook

Differential Equations with Boundary-Value Problems, by D.G. Zill and W.R. Wright, Cengage Learning. Chapters 8, 10, 11, 12, 13, 14.

Course general description

This course covers topics in ordinary and partial differential equations. Topics to be covered include: systems of linear first-order differential equations; orthogonal functions and Fourier series; boundary- value problems in rectangular coordinates; boundary-value problems in other coordinate systems; integral transforms.

Prerequisite: MATH 3354 or MATH 3350, or consent of department.

Expected Student Learning Outcomes

Students will learn solution techniques for systems of ordinary differential equations. Students will also learn elements of Fourier series and how to apply these series in the solution of boundary value problems for partial differential equations, specifically, the heat equation, wave equation, and Laplace's equation in rectangular and other coordinate systems. In addition, students will obtain a general understanding of transform methods in the solution of initial and boundary value problems for partial differential equations.

Course outline

Systems of Linear First-Order Differential Equations (Chap. 8) [$\sim$4 hours]

(8.1) Preliminary theory - Linear systems (8.2) Homogeneous linear systems

Plane Autonomous Systems (Chap. 10) [$\sim$6 hours]

(10.1) Autonomous systems (10.2) Stability of linear systems (10.3) Linearization and local stability (10.4) Autonomous systems as mathematical models

Fourier Series (Chap. 11) [$\sim$5 hours]

(11.1) Orthogonal functions (11.2) Fourier series (11.3) Fourier cosine and sine series (11.4) Sturm-Liouville problem

Boundary-Value Problems in Rectangular Coordinates (Chap. 12) [$\sim$10 hours]

(12.1) Separable partial differential equations (12.2) Classical PDEs and boundary value problems (12.3) Heat equation (12.4) Wave equation (12.5) Laplace's equation (12.6) Nonhomogeneous boundary-value problems (12.8) Higher-dimensional problems

Boundary-Value Problems in Other Coordinate Systems (Chap. 13) [$\sim$5 hours]

(13.1) Polar coordinates (13.2) Polar and cylindrical coordinates (13.3) Spherical coordinates

Integral Transforms (Chap. 14) [$\sim$5 hours]

(14.1) Error function (14.2) Laplace transform (14.3) Fourier integral (14.4) Fourier transforms

Optional topics may be covered depending on the instructor's preference or expertise, as well as the students' majors and interests.

Assessment of Learning Outcomes

Homework

It will be given regularly through the WebWork system:
`http://webwork.math.ttu.edu/webwork2/f13gborniam4354s001/`.

Students will be informed by the instructor and via email (on the @ttu.edu address) about the homework, which must be completed before the given deadline (generally not more than 10 days). Many of the homework problems will be discussed in class at a later time. Homework is worth **20%** of the final grade.

Examinations

- Exam #1: **September 27, Friday**, worth **20%** of the final grade
- Exam #2: **October 28, Monday**, worth **20%** of the final grade
- Exam #3: **November 25, Monday**, worth **20%** of the final grade
- Final Exam: worth **25%** of the final grade
  Tuesday, December 10, 7:30 am-10:00 am, room 109 Holden Hall

Use of calculators in all the exams is not permitted. Electronic devices which can store formulas, including cell phones, must be turned off and stored during the exams. The instructor will specify what sections must be studied for each exam.

Grading Policy

Let g be the grade in percent: $g < 55$ F, $55 \leq g < 66$ D, $66 \leq g < 76$ C, $76 \leq g < 88$ B, $88 \leq g < 100$ A, $g \geq 100$ A+

The grading policy may be subject to slight adjustments depending on the achievements of the students.

Make-ups

There are usually no make-ups for the examinations, except for reasons of illness, stated in writing by a medical doctor, or observance of a religious holiday, or other very reasonable motivations.

Attendance and Class Policies

Attendance is mandatory. Students with up to 4 missed classes for the entire semester will receive an additional bonus of **3%** on the final grade. If students miss a class, it is their responsibility to find out what they missed (announcements, assignments, notes ...). Also, it is their responsibility to frequently check their e-mail for announcements made by the instructor. Students are strongly encouraged to read each section of the textbook in advance of the lecture.

Classes start and end always on time. Students are not allowed to leave the class before the end of the hour without authorization. During class time it is not allowed to text, chat and sleep. All electronic devices must be put in silent mode.

TTU Operating Policies

Americans with Disabilities Act (TTU OP 34.22)

Any student who, because of a disability, may require some special arrangements in order to meet course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services, during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.

Absence for observance of a religious holy day (TTU OP 34.19)

1. "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code 11.20. 2. A student who intends to observe a religious holy day should make that intention known to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. 3. A student who is excused under Section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

Academic Honesty (TTU OP 34.12)

It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension. "Scholastic dishonesty" includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.

The grade of "I" (TTU OP 34.12)

The grade of "I" is given only when a student's work is satisfactory but, due to reasons beyond his or her control, cannot not be completed. It is not given in lieu of an "F" or "W". The instructor assigning the grade will stipulate in

writing at the time the grade is given the conditions under which the "I" may be removed. The assigned work and a change of grade must be recorded within one calendar year from the date of the "I". Failure to do so results in an "F" for that course.

Important dates

- **August 26, Monday**: classes begin.
- **August 29, Thursday**: last day to add a course.
- **September 2, Monday**: Labor Day. University holiday.
- **September 11, Wednesday**: last day for student-initiated drop on MyTech without academic penalty.
- **October 28, Monday**: last day for student-initiated drop on MyTech with academic penalty.
- **November 26 - December 5, Tuesday - Thursday**: Period of no examinations except for makeup exams or scheduled lab exams.
- **November 27 - December 1, Wednesday - Sunday**: Thanksgiving holiday.
- **December 4, Wednesday**: Last day of classes.
- **December 5, Thursday**: Individual study day.
- **December 6 - 11, Friday - Saturday / Monday - Wednesday**: Final examinations.

Check these dates on the TTU official calendar webpage:
`http://www.depts.ttu.edu/officialpublications/calendar/13-14calendar/13-14detailed.php`