Math 2420.701.13F: Differential Equations with Applications

Fall 2013

Course section: Math 2420.001, TR, 1:00-2:15am, GR 3.420
Instructor: Dr. Zalman Balanov
Office: Founders Building 2.408E
Office hours: TR 2:30pm – 3:30pm, or by appointment
E-mail: balanov@utdallas.edu
Phone: (972) 883 6591

Course section: Math 2420.002, TR, 2:30-3:45pm, JO 4.614
Instructor: Dr. Dmitry Rachinskiy
Office: FA 2.404
Office hours: Monday, Thursday 4:00pm – 5:15pm, or by appointment
E-mail: dmitry.rachinskiy@utdallas.edu
Phone: (972) 883 6697

Problem Sections:

Section	Day	Room	Time	TA's Name	Office	Contact
2420.301	M	FN 2.104	9-10:50 AM	Erica Wyman	FO 1.204	elw094020
2420.302	M	SLC 2.203	9-10:50 AM	Hufeng Wang	FO 1.204	hxw096120
2420.303	M	CB3 1.304	11 AM-12:50 PM	Hufeng Wang	FO 1.204	hxw096120
2420.304	M	CB3 1.308	11 AM-12:50 PM	Erica Wyman	FO 1.204	elw094020
2420.305	M	CB3 1.304	1-2:50 PM	Hufeng Wang	FO 1.204	hxw096120
2420.307	M	FO 2.410	3-4:50 PM	Emily Herzig	FO 1.204	elh042000
2420.308	M	CB3 1.304	3-4:50 PM	Erica Wyman	FO 1.204	elw094020

Students MUST be registered for the exam section: Math 2420.701.

Students MUST be registered for ONE of these problem sections: Math 2420.301, Math 2420.302, Math 2420.303, Math 2420.304, Math 2420.305, Math 2420.307 or Math 2420.308.

Textbook

William E. Boyce and Richard C. DiPrima, *Elementary differential equations and boundary value problems*, John Wiley & Sons, Inc. Tenth edition.

Course description

This is an introductory course to the theory of ordinary differential equations (ODEs). Topics to be covered include: first order differential equations, second and higher order linear equations, Laplace transform techniques, systems of first order linear equations, nonlinear systems.

Student Learning Objectives

1. Students will be able to identify different methods of solving differential equations and apply them to obtain solutions for various classes of differential equations.

2. Students will be able to apply their knowledge of differential equations to construct and analyze models arising in applications in mathematics, physics, and engineering.

3. Students will be able to perform quantitative and qualitative analysis of problems described by differential equations.

Assignments, quizzes and exams

Assignments: There will be weekly assignments. All the assignments should be completed independently by the students. Each assignment is due within one week unless otherwise indicated in the assignment. **Late assignments will NOT be accepted**.

Quizzes: Beginning the first week of this course, there will be a weekly quiz during the problem session organized and marked by the teaching assistant.

Exams: There will be three common examinations. Both sections take examinations together. Textbooks, notes, calculators or other electronic devises won't be allowed during examination. However, half-page (one side only) hand written formula sheet (letter size) will be allowed on final exam. No exams and assignment may be dropped except in extraordinary circumstances. Missed exams and assignments are a zero. The midterms and final examinations have been scheduled as following:

	Date	**Time**	**Room**
Exam I	October 4, 2013	8:30PM-9:45PM	HH 2.402
Exam II	November 15, 2013	8:30PM-9:45PM	HH 2.402
Final Exam	December 13, 2013	8:00PM-10:45PM	HH 2.402

MIDTERM EXAMINATIONS TIMES/DATES ARE TENTATIVE!

Grading policy

Graded assignments: 15%
Weekly Quizzes in Problem Sessions: 15%
Midterm exam I: 20%
Midterm exam II: 20%
Final exam: 30%.

Important Dates

August 26, 2013: Classes begin
September 2, 2013: University Closing: Labor Day
September 11, 2013: Census Day
September 11, 2013: Last Day to drop a class without a "W"
October 4, 2013: **Exam I**
November 15, 2013: **Midterm Exam II**
November 25-30, 2013: University Closing: Fall break
December 11, 2013: Last Day of Full-Term Session
December 13, 2013: **Final Exam**.

Further important dates:
http://www.utdallas.edu/academiccalendar/

Detailed course description

No.	Topics	Remarks
1.	Introduction: Some basic examples of models, classification of differential equation, standard forms, initial value conditions. Few remarks on applications. First Order Differential Equations (ODE): Existence and Uniqueness Results. Higher Order ODEs.	
2.	Separable equations, homogeneous equations: techniques of solving.	Review of techniques of integration recommended
3.	First order linear ODEs and Bernoulli's equation: integrating factor method. Exact equation and integrating factor method.	Review of gradient vector fields recommended
4.	Second order linear ODEs: general theory, homogeneous and non-homogeneous equations, Wronskian and linear independence of solutions.	Review of linear algebra: linear independence and basis recommended
5.	Reduction of order for second order linear ODEs (homogeneous and nonhomogeneous).	
6.	Second order linear homogeneous ODEs with constant coefficients: characteristic equation, real characteristic roots, complex characteristic roots, repeated roots. Remarks about higher order linear ODEs with constant coefficients.	Review of complex numbers and complex exponential function recommended
7.	Second order linear nonhomogeneous ODEs: method of undetermined coefficient, variation of parameters method.	
8.	Review of power series (analytic functions, domains of convergence, tests for convergence, basic analytic functions and their power series)	Review of calculus related to infinite series recommended
9.	Second order linear ODEs with non-constant coefficients: series solutions near an ordinary point, recurrence formula and examples	The difficult part of the course
10.	Euler equation: indicial equation, distinct real, complex and repeated roots of indicial equation.	

11.	Laplace transform: definition and its properties, derivation of table of Laplace transforms. Gamma function and its properties, convolution integral. Laplace transforms of discontinue functions and impulse functions. Solving linear nonhomogeneous ODEs (with constant coefficients) using Laplace transforms. Examples.	Review of improper integrals and criteria for their convergence recommended
12.	Second order systems of linear ODEs: Classification of singular points, phase portrait.	
13.	Introduction to nonlinear systems: Equilibrium solutions, linearization, examples from population dynamics.	
14.	Review and practice exam.	

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please go to http://go.utdallas.edu/syllabus-policies for these policies.

These descriptions and timelines are subject to change at the discretion of the Professor.