Math 2420.701.17S: Differential Equations with Applications

Spring 2017

Course section: Math 2420.001, Tues & Thurs : 10:00am-11:15am GR 3.302
Instructor: Dr. Wieslaw Krawcewicz
Office: FO 2.602F
Office hours: TR 12:01pm-1:00pm, or by appointment
E-mail: wzk091000@utdallas.edu
Phone: (972) 883 6620

Course section: Math 2420.002, Tues & Thurs : 11:30am-12:45pm GR 3.302
Instructor: Dr. Dmitry Rachinskiy
Office: FO 2.602D
Office hours: TR 4:00pm-5:00pm, or by appointment
E-mail: dmitry.rachinskiy@utdallas.edu
Phone: (972) 883 6697

Course section: Math 2420.003, Mon & Wed : 2:30pm-3:45pm GR 3.302
Instructor: Dr. Jigarkumar Patel
Office: FO 2.104
Office hours:
E-mail: jsp061000@utdallas.edu
Phone: 972-883-6562

Course section: Math 2420.004, Tues & Thurs : 2:30pm-3:45pm GR 3.302
Instructor: Dr. Dmitry Rachinskiy
Office: FO 2.602D
Office hours: TR 4:00pm-5:00pm, or by appointment
E-mail: dmitry.rachinskiy@utdallas.edu
Phone: (972) 883 6697

Problem Sections:

Section	Day	Time	Room	TA's Name	Office	Contact
2420.301	M	8:00am-9:50am	SLC 2.302	Lakmi Wadippuli		lnw140030
2420.302	M	10:00am-11:50am	SLC 2.304	Subas Acharya		sxa169030
2420.303	M	1:00pm-2:50pm	FN 2.106	Subas Acharya		sxa169030
2420.304	M	3:00pm-4:50pm	FO 2.404	Lakmi Wadippuli		lnw140030
2420.305	M	8:00am-9:50am	SLC 2.304	Francis Bilson		fxb130230
2420.306	M	10:00am-11:50am	SLC 2.302	Francis Bilson		fxb130230
2420.307	M	1:00pm-2:50pm	FN 2.104	Tian Jiang		txj160230
2420.308	M	3:00pm-4:50pm	FN 2.106	Elvira Kadaub		exk150230

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 2420.306, Math2420.307, Math 2420.308.

Textbook

William E. Boyce and Richard C. DiPrima, *Elementary differential equations and boundary value problems*, John Wiley & Sons, Inc. Tenth edition; ISBN: 978-0-470-45831-0.

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, engineering, population dynamics.

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.
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. All sections take examinations together. Textbooks, notes, calculators or other electronic devises won't be allowed during examination. However, a half-page (one side only) hand written formula sheet (letter size) will be allowed on the **final exam**. The midterm and final examinations have been scheduled as follows:

	Date	**Time**	**Room**
Exam I	February 9, Thursday	7:00pm-8:15pm	HH 2.402, JSOM 1.217
Exam II	March 9, Thursday	7:00pm-8:15pm	HH 2.402, JSOM 1.217
Final Exam	May 4	8:00pm-10:45pm	SOM 1.212

UTD Course Book: https://coursebook.utdallas.edu/math2420.701.17s

Grading policy

Weekly Quizzes in Problem Sessions: 25%
Midterm Exam I: 25%
Midterm Exam II: 25%
Final Exam: 25%.

Important Dates

Monday, January 9: Classes begin
Monday, January 16: University Closing, Martin Luther King Day
Wednesday, January 25: Census Day
Wednesday, January 25: Last Day to drop a class without a "W"
Monday, February 9: **Midterm Exam I**
Monday, March 9: **Midterm Exam II**
Monday, March 13 – Saturday, March 18: University Closing, Spring break
Sunday, April 30: Last Day of Full-Term Session (not including exams)
Thursday, May 4: **Final Exam I**

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

Detailed course description

1. Introduction: Some basic examples of models, classification of differential equation, standard forms, initial value problems. Few remarks on applications. First order ordinary differential equations (ODEs): existence and uniqueness results. Higher order ODEs.

2. Separable equations, homogeneous equations: techniques of obtaining solutions. (Review of techniques of integration is recommended).

3. First order linear ODEs and Bernoulli's equation: the integrating factor method. Exact equations and equations which can be made exact using integrating factors. (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 non homogeneous).

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: methods of undetermined coefficients and variation of parameters.

8. 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).

9. Review of power series: analytic functions, domains of convergence, tests for convergence, basic analytic functions and their power series. Second order linear ODEs with non-constant coefficients: power series solutions. (Review of calculus related to infinite series recommended).

10. Euler equation.

11. Second order systems of linear ODEs: Classification of singular points, phase portrait. (Review of linear algebra, eigenvalues and eigenvectors recommended).

12. Introduction to nonlinear systems: Equilibrium solutions, linearization, examples from mechanics, electricity and population dynamics.

13. 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.