

# **Course Syllabus**

# Math 2420: Differential Equations with Applications

# Fall 2018

Section:	Math 2420.001			
Time and Location:	Tue & Thur 10:00am-11:15am	GR 3.302		
Instructor:	Zalman Balanov	Professor		
<b>Contact Information:</b>	• Office:	FO 2.602E		
	• Phone:	972-883-6591		
	• Email:	balanov@utdallas.edu		
	• Office hours:	Tue & Thur 12:00 pm - 1:00 pm		
Section:	Math 2420.002			
Time and Location:	Tue & Thur 11:30am-12:45pm	n GR 3.302		
Instructor:	Ajaya Paudel	Lecturer I		
<b>Contact Information:</b>	• Office:	FO 2.104		
	• Phone:	972-883-6589		
	• Email:	ajaya.paudel@utdallas.edu		
	• Office hours:	Mon & Frid 12.30pm - 2.30pm		
Section:	Math 2420.003			
Time and Location:	Tue& Thur 2:30pm-3:45pm	GR 3.302		
Instructor:	Wieslaw Krawcewicz	Professor		
Contact Information:	• Office:	FO 2.602F		
	• Phone:	972-883-6620		
	• Email:	wieslaw@utdallas.edu		
	• Office hours:	Tue & Thur $12:00 \text{ pm} - 1:00 \text{ pm}$		

Section:	Math 2420.004		
Time and Location:	Tue & Thur 1:00pm-2:15pm	GR 3.302	
Instructor:	Ajaya Paudel	Lecturer I	
<b>Contact Information:</b>	• Office:	FO 2.104	
	• Phone:	972-883-6589	
	• Email:	ajaya.paudel@utdallas.edu	
	• Office hours:	Mon & Frid 12.30pm - 2.30pm	
Section:	Math 2420.005		
Section: Time and Location:	Math 2420.005 Tue & Thur 8:30am - 9:45am	GR 3.302	
Section: Time and Location: Instructor:	Math 2420.005 Tue & Thur 8:30am - 9:45am Dmitry Rachinskiy	GR 3.302 Professor	
Section: Time and Location: Instructor: Contact Information:	Math 2420.005 Tue & Thur 8:30am - 9:45am Dmitry Rachinskiy • Office:	GR 3.302 Professor FO 2.602D	
Section: Time and Location: Instructor: Contact Information:	Math 2420.005 Tue & Thur 8:30am - 9:45am Dmitry Rachinskiy • Office: • Phone:	GR 3.302 Professor FO 2.602D 972-883-6620	
Section: Time and Location: Instructor: Contact Information:	Math 2420.005 Tue & Thur 8:30am - 9:45am Dmitry Rachinskiy • Office: • Phone: • Email:	GR 3.302 Professor FO 2.602D 972-883-6620 Dmitry.Rachinskiy@utdallas.edu	

#### **Problem Sections:**

Section	Day	Time	Room	TA's Name	@utdallas.edu
2420.301	М	8:00am-9:50am	CB3 1.312	Albelo-Cortes Josean	jxa172430@
2420.302	М	10:00am-11:50am	CB1 1.104	Gudshnikov Ivan	ixg140430@
2420.303	М	1:00pm-2:50pm	FN 2.202	Mankad Het	hym130030@
2420.304	М	3:00pm-4:50pm	FN 2.202	Albelo-Cortes Josean	jxa172430@
2420.305	М	8:00am-9:50am	CB1 1.106	Iudaev Sergei	sxy172530@
2420.306	М	10:00am-11:50pm	CB1 1.106	Ruberu Thanthrige	tmr180000@
2420.307	F	1:00pm-2:50pm	JSOM 11.202	Ruberu Thanthrige	tmr180000@
2420.308	М	3:00pm-4:50pm	FO 2.702	Gudshnikov Ivan	ixg140430@
2420.309	М	8:00am - 9:50am	FN 2.202	Helal Md. Abu	mxh153130@
2420.310	F	10:00am - 11:50am	GR 3.606	Georgii Sechkin	gxs180003@
2420.311	М	1:00pm - 2:50pm	CB3 1.302	Iudaev Sergei	sxy172530@
2420.312	М	3:00pm - 4:50pm	CB2 1.202	Mankad Het	hym130030@

#### 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**

**MATH 2420 - Differential Equations with Applications** (3 semester credit hours) 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 (not graded) – some of the assignment problems will be used for weekly quizzes.

**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	September 24, M	7:00pm-8:15pm	GR 3.420, JO 3.516, SLC 2.303
Exam II	October 22, M	7:00pm-8:15pm	GR 3.420, JO 3.516, SLC 2.303
Final Exam	TBA	8:00pm-10:45pm	GR 3.420, JO 3.516, SLC 2.303

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

#### Grading policy

Weekly Quizzes in Problem Sessions: 20% Midterm Exam I: 25% Midterm Exam II: 25% Final Exam: 30%.

### **Important Dates**

Monday, August 20: Classes begin
Monday, Monday, September 3: University Closing, Labor Day
Wednesday, September 5: Census Day
Wednesday, September 5: Last Day to drop a class without a "W"
Thursday, September 24: Midterm Exam I
November 22-25: University Closing: Thanksgiving holidays
Thursday, October 22: Midterm Exam II
Sunday, December 8: Last Day of Full-Term Session (not including exams)
Thursday, May 3: Final Exam

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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 near an ordinary point, series solutions near a regular singular point, Bessel's equation (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.