Math 2420.701.21F: Differential Equations with Applications

Fall 2021

Course section: Math 2420.001, Tues & Thurs : 8:30am-9:55am, GR 3.302
Instructor: Dr. Janos Turi
Office: FO 2.408A
Office hours: Tuesdays/Thursdays 10.00am-11.00am, face to face
E-mail: janos.turi@utdallas.edu
Phone: (972) 883 2183

Course section: Math 2420.002, Tues & Thurs: 11:30am-12:45pm, JO 3.516
Instructor: Dr. Janos Turi
Office: FO 2.408A
Office hours: Tuesdays/Thursdays 10.00am-11.00am, face to face
E-mail: janos.turi@utdallas.edu
Phone: (972) 883 2183

Course section: Math 2420.003, Tues & Thurs: 2:30pm-3:45pm, GR 3.302
Instructor: Dr. Dmitry Rachinskiy
Office: FO 2.602D
Office hours: Tuesdays/Thursdays 12.00pm-1.00pm, Blackboard Collaborate (online), or by appointment
E-mail: dmitry.rachinskiy@utdallas.edu
Phone: (972) 883 6697

Course section: Math 2420.004, Tues & Thurs: 1:00pm-2:15pm, JO 4.614
Instructor: Dr. Zalman Balanov
Office: FO 2.602E
Office hours: Tuesdays/Thursdays, 11:30am-12:30pm, face to face
E-mail: balanov@utdallas.edu
Phone: (972) 883 6591

Course section: Math 2420.501, Tues & Thurs: 5:30pm-6:45pm, JO 4.614
Instructor: Dr. Dmitry Rachinskiy
Office: FO 2.602D
Office hours: Tuesdays/Thursdays 12.00pm-1.00pm, Blackboard Collaborate (online), or by appointment
E-mail: dmitry.rachinskiy@utdallas.edu
Phone: (972) 883 6697

Course section: Math 2420.502, Tues & Thurs: 5:30pm-6:45pm, FO 1.502
Instructor: Dr. Ajaya Paudel
Office: FO 3.611
Office hours: Thursdays/Thursdays, 2.00pm-3.00pm, or by appointment, face to face
E-mail: ajaya.paudel@utdallas.edu
Phone: (972) 883 6589

Problem Sections:

Section	Day	Time	Room	TA's Name	Contact
2420.301	M	10:00am-11:50am	SCI 3.260	Subas Acharya	sxa169030
2420.302	M	1:00pm-2:50pm	SCI 3.260	Subas Acharya	sxa169030
2420.303	M	3:00pm-4:50pm	SCI 3.260	Josean Albelo-Cortes	jxa172430
2420.304	M	8:00am-9:50am	SCI 3.240	Arnaja Mitra	axm190028
2420.305	M	1:00pm-2:50pm	SCI 3.240	Georgii Sechkin	gxs180003
2420.306	F	10:00am-11:50pm	FN 2.104	Georgii Sechkin	gxs180003
2420.307	M	1:00pm-2:50pm	SCI 3.220	Weixi Zhu	wxz190022
2420.310	F	1:00pm-2:50pm	SLC 2.302	Weixi Zhu	wxz190022
2420.313	M	10:00am-11:50am	FN 2.202	Josean Albelo-Cortes	jxa172430
2420.314	M	1:00pm-2:50pm	CB3 1.308	Mohammad Hassan Murad	mxm190101
2420.315	M	3:00pm-4:50pm	FO 1.502	Arnaja Mitra	axm190028

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 2420.310, Math 2420.313, Math 2420.314 or Math 2420.315.

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 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. **Assignments are NOT for grade.**
Quizzes: Beginning the second week of this course, there will be a weekly quiz organized and marked by the teaching assistant.
Exams: There will be three common examinations. 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	Monday, September 27	7:00pm-8:15pm	ECSW 1.315, SLC 1.102, SLC 2.303
Exam II	Monday, November 1	7:00pm-8:15pm	ECSW 1.315, SLC 1.102, SLC 2.303
Final Exam	TBA by Registrar's Office	TBA	TBA

For further info see also UTD Course Book:
https://coursebook.utdallas.edu/search/math2420.701.21f

Grading policy

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

Important Dates

Monday, August 23: Classes begin
Monday, September 6: University Closing, Labor Day
Wednesday, September 8 Census Day

Wednesday, September 8: Last Day to drop a class without a "W"
November 22 – 28: No classes, Fall break and Thanksgiving holidays
Tuesday, December 7: Last Day of Full-Term Session (not including exams)
December 9 – 15: **Final exams**

See also UTD Course Book: https://coursebook.utdallas.edu/math2420.701.19s

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. 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 is 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 root. Remarks about higher order linear ODEs with constant coefficients. (Review of complex numbers and complex exponential function is recommended).

7. Euler equation.

8. Second order linear nonhomogeneous ODEs: methods of undetermined coefficients and variation of parameters.

9. Laplace transform: definition and its properties, derivation of table of Laplace transforms. 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 is recommended).

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

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

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

Class recordings

The instructor may record meetings of this course. These recordings will be made available to all students registered for this class. The intent is to supplement the classroom experience.

Classroom safety and COVID-19

To help preserve the University's in-person learning environment, UT Dallas recommends the following:

All Comets are strongly encouraged to wear face coverings indoors and practice social distancing regardless of vaccination status. Please adhere to the University's CDC Updated Guidelines issued on July 30, 2021. Please note this represents a change in the campus guidance issued on May 20, 2021.

Accommodations for students who must isolate or quarantine due to COVID. To keep the UT Dallas community as safe as possible, the University requires students who test positive for COVID-19 or who are close contacts as determined by the campus contact tracing program to isolate or quarantine as applicable. Video recordings of lectures will be made available for those students.

Verifying COVID-19 isolations or quarantines. Students need to self-report COVID-19 positive results or exposures via an online form so that university campus tracers can verify, record, and take necessary campus precautions. Students should not attend class until cleared by campus tracers.

Vaccinations are widely available, free and not billed to health insurance. The vaccine will help protect against the transmission of the virus to others and reduce serious symptoms in those who are vaccinated. You are encouraged to get a COVID-19 vaccine and register your vaccination status through the voluntary vaccine report form.

Proactive community testing remains an important part of the university's efforts to protect our community. Tests are fast and free. Please check the Comets United webpage for additional information.

Student safety is an important part of the UT Dallas' efforts to protect our community. All students will adhere to the Comet Commitment. Unvaccinated Comets will be expected to complete the mandatory Required Daily Health Screening. Those students who do not comply will be referred to the Office of Community Standards and Conduct for disciplinary action under the Student Code of Conduct – UTSP5003.

Comet creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same: "As a Comet, I pledge honesty, integrity, and service in all that I do."

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: http://go.utdallas.edu/syllabus-policies

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