Ordinary Differential Equation
Tentative Topics Schedule

MTH 321 Sections A & B
Fall 2024
University of Portland

See Books & Online Resources Lists for the readings & practice materials.

The reading materials are not mandatory but it is encouraged.

The "Reading" column in the table below contains page numbers (Pg.) or chapters (ch.) on which it refers to a label in the Books & Online Resources List. For example "Pg. 1-5 [H]" refers to pages 1-5 of the first item in the list, which is the textbook titled "Ordinary Differential Equations: A Primer on Dynamics and Systems".

Topics and Materials

Week	Day	Topic	Worksheet	Homework	Reading
1	Tu 8/27	Introduction and Orientation to ODEs	Review Algebra and Calculus	-	Syllabus
	Th 8/29	Modeling Physical Systems,Classification of Equations, &Principles of Solutions	Classify ODEs and Verify Solutions	-	Ch. 1.1 [T]
2	Tu 9/3	1st-Order ODEs,Existence and Uniqueness, &Analyzing Equilibriums of 1st-Order ODEs	Analyze 1st-Order ODEs Qualitatively	Assigned: Homework 1	Ch. 1.2 & 2.1 [T]
	Th 9/5	Nullclines and Isoclines &Euler's Method for solving 1st-Order ODEs	Solve 1st-Order ODEs Graphically and Numerically	-	Ch. 1.3 & 3.1 [T]
3	Tu 9/10	Separation of Variables for Solving 1st-Order ODEs	Separate the Variables	Assigned: Homework 2	Ch. 2.2 [T]
	Th 9/12	Integrating Factors for Solving 1st-Order ODEs	Choose an Integrating Factor	-	Ch. 2.6 [T]
4	Tu 9/17	Laplace Transforms for Solving 1st-Order ODEs	Introduce the Laplace Transform	-	Ch. 8.1-8.2 [T]

Week	Day	Topic	Worksheet	Homework	Reading
	Th 9/19	Bifurcations in One Dimension	Apply Bifurcation Analysis to Physical Systems	-	Ch. 4.1-4.3 [T]
5	Tu 9/24	*Review*	Exam 1 Examples	-	Exam 1 Topics
	Th 9/26	**Exam 1**	-	-	-
6	Tu 10/1	Systems of 1st-Order ODEs,Existence and Uniqueness, &Modeling Physical Processes	Interpret 1st-Order System of ODEs	-	Ch. 10.1 [T]
	Th 10/3	Analyzing Equilibriums to 1st-Order System of ODEs	Find Equilibriums of 1st-Order System of ODEs	Assigned: Homework 3	Ch. 10.2 [T]
7	Tu 10/8	Stability Analysis by Linearization & Eigentheory	Use Eigentheory to Analyze Equilibrium Stability	-	Ch. 10.3 [T]
	Th 10/10	Analytical Solutions to 1st-Order System of ODEs	Use Eigentheory to Solve 1st-Order Linear System of ODEs	-	Ch. 10.4 [T]
8	Tu 10/15	*Fall Vacation*	-	-	-
	Th 10/17	*Fall Vacation*	-	-	-
9	Tu 10/22	Eigenvalues and Eigenvectors for Solving 1st-Order Linear Systems	Use Distinct or Repeated Eigenvalues	-	Ch. 10.5 [T]
	Th 10/24	Complex Solutions of 1st-Order Linear Systems	Use Complex Exponentials	Assigned: Homework 4	Ch. 10.6 [T]
10	Tu 10/29	*Review*	Exam 2 Examples	-	Exam 2 Topics
	Th 10/31	**Exam 2**	-	-	-
11	Tu 11/5	Higher-Order ODEs,Classification of Equations, &Modeling Physical Processes	Find Homogeneous and Particular Solutions	-	Ch. 5.1-5.3 & 6.1 [T]
	Th 11/7	Undetermined Coefficients for Solving Linear Higher-Order ODEs	Determine the Undeter-mined	Assigned: Homework 5	Ch. 5.4-5.5 & 6.2 [T]

Week	Day	Topic	Worksheet	Homework	Reading
12	Tu 11/12	Variation of Parameters for Solving Linear Higher-Order ODEs	Vary the Parameters	-	Ch. 5.7 & 6.3 [T]
	Th 11/14	Laplace Transforms for Solving Linear Higher-Order ODEs	Transform the Derivatives	Assigned: Homework 6	Ch. 8.3 & 8.5 [T]
13	Tu 11/19	Analyzing Higher-Order Linear ODEs	Use Substitutions and Reduce the Order	-	Ch. 5.6 [T]
	Th 11/21	*Review*	Exam 3 Examples	-	Exam 3 Topics
14	Tu 11/26	**Exam 3**	-	-	-
	Th 11/28	*Thanksgiving Vacation*	-	-	-
15	Tu 12/3	Series Solutions for Solving Linear ODEs	Use Power Series	-	Ch. 7.1-7.3 [T]
	Th 12/5	*Review*	Final Exam Examples	-	Final Exam Topics
16	Tu 12/11	**Final Exam Section A**	-	-	-
	Th 12/12	**Final Exam Section B**	-	-	-

Along with the textbook [T], and websites [C] and [P], most of the course materials (contents of worksheets and homework) of each topic was taken from these following sources:

- Inquiry oriented differential equations (IODE) by Rasmussen et al. (2018)
- Differential equations and linear algebra by Strang (2014)
- Applied differential equations: The primary course by Dobrushkin (2022)
- Differential Equations by MIT Open Courseware (2015)

Books & Online Resources Lists

Click on the link to access the resources.

Textbooks

[T] Trench WF (2013). *Elementary Differential Equations*. Faculty Authored, and Edited Books & CDs. 8., https://digitalcommons.trinity.edu/mono/8/.

Websites

[C] Clontz S (2022). "Differential Equations - Checkit.", https://stevenclontz.github.io/checkit-clontz-diff-eq.

[P] Dawkins P (2023). "Paul's Online Notes on Differential Equations.", https://tutorial.math.lamar.edu/Classes/DE/DE.aspx.

References

Dobrushkin, V. A. (2022). *Applied differential equations: The primary course* (2nd ed.). Chapman; Hall/CRC.

MIT Open Courseware. (2015). *Differential equations*. https://ocw.mit.edu/courses/res-18-009-learn-differential-equations-up-close-with-gilbert-strang-and-cleve-moler-fall-2015/

Rasmussen, C., Keene, K. A., Dunmyre, J., & Fortune, N. (2018). *Inquiry oriented differential equations: Course materials*. https://iode.sdsu.edu

Strang, G. (2014). *Differential equations and linear algebra*. Wellesley-Cambridge Press.