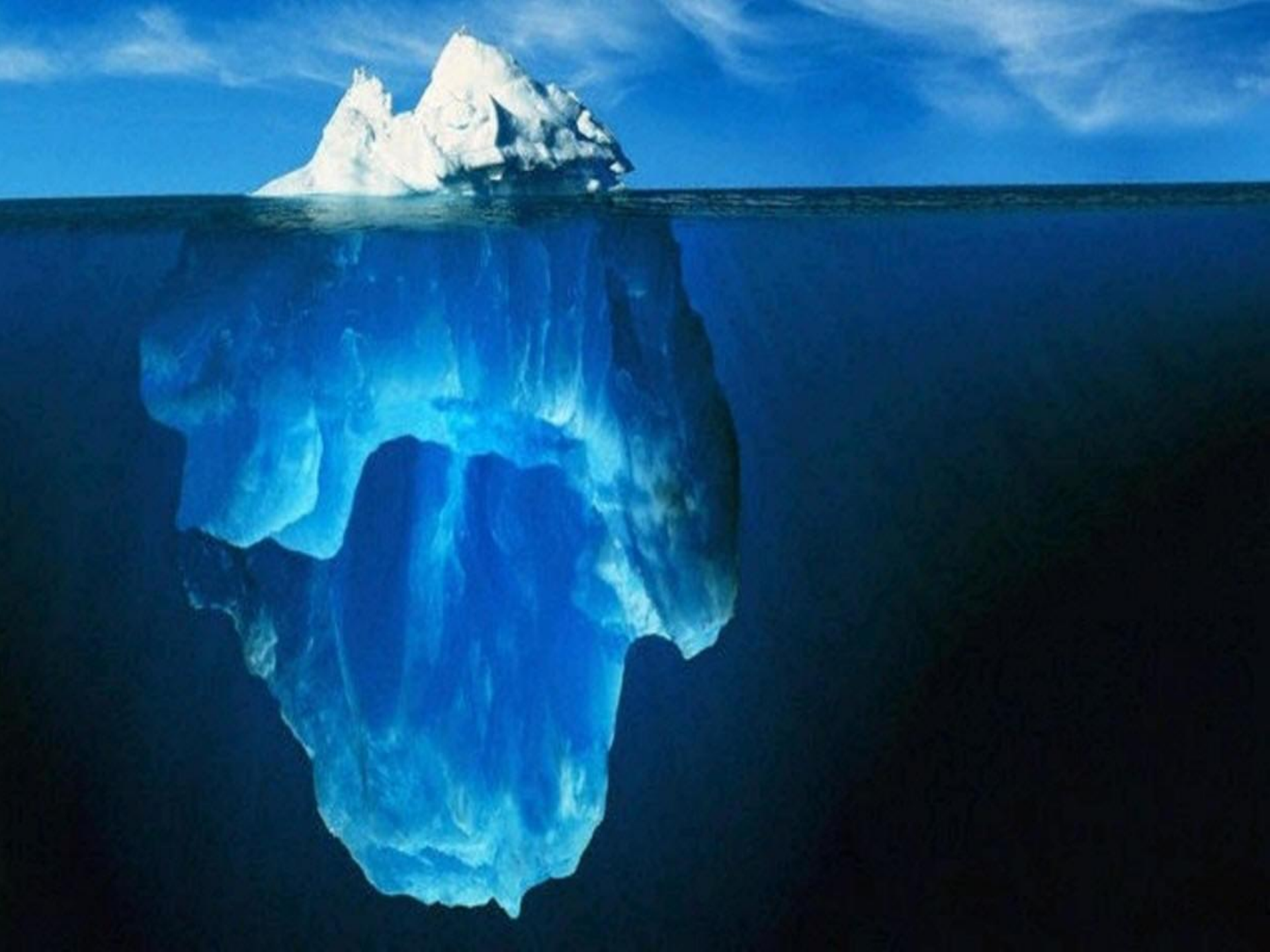


Class Notes 0:

Class Information

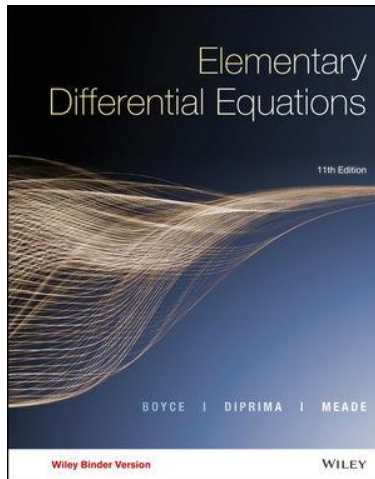
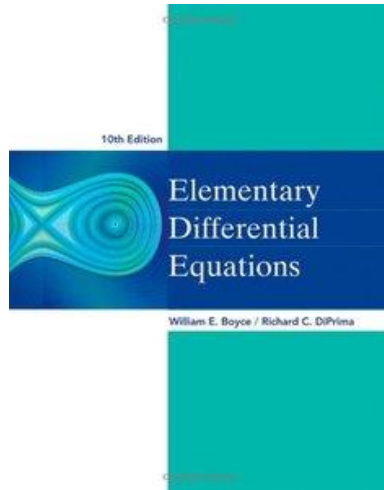
MAE 82 – Engineering Mathematics



Course Info

- **Course Summary:** Methods of solving ordinary differential equations in engineering. Review of matrix algebra. Solutions of systems of first- and second-order ordinary differential equations. Introduction to Laplace transforms and their application to ordinary differential equations. Introduction to boundary value problems.
- **Prerequisite:** Mathematics 33A
- **Website:** http://bionics.seas.ucla.edu/education/MAE_182A.html
- **Assignments & Grading:**
 - Problem Sets - 20%
 - Projects - 5%
 - Attendance - 5%
 - Exam 1 Mid - 35% (6th week of class) – First half of the syllabus
 - Exam 2 Final - 35% - Second half of the syllabus

Textbook



Textbook: Elementary Ordinary Differential Equations and Boundary Value Problems”. William E. Boyce & Richard C. DiPrima, 10th Edition, Wiley 2012

ISBN-10: 1118157389

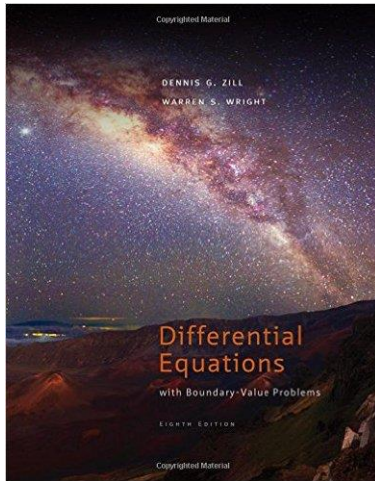
ISBN-13: 978-1118157381

11th Edition

ISBN: 978-1-119-32063-0

September 2016, ©2017

Textbook (Optional)



Textbook: Differential Equations
with Boundary-Value Problems, 8th
Edition

Dennis G. Zill, Warren S. Wright

ISBN-10: 1111827060

ISBN-13: 978-1111827069

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Syllabus

1. Review

1.1 Classifications of differential equations, linear/nonlinear, order

1.2 First order Linear Differential equations

1.2.1 Method of integrating factors

1.2.2 Variation of parameters

1.3. First Order non linear Differential Equations

1.3.1 Separable equations

1.3.2 Integrating factor

1.3.3 Change of variables and parametric solutions

1.4 Second order Linear Differential equations

1.4.1 Homogeneous equations with constant coefficients

1.4.2 Characteristic equation, distinct and repeated solutions

1.4.3 Nonhomogeneous equations

1.4.4 Applications to selected engineering problems

Syllabus

2. High order linear equations

- 2.1 Characteristic equation. Consider distinct and repeated solutions
- 2.2 Variation of Parameters (Wronskian)
- 2.3 Undetermined coefficients

3. Series solution method

- 3.1 Power series solution for a linear equation (general n -th order) with constant coefficients
- 3.2 Introduction to the use of power series when coefficients are not constant
- 3.3 Series solution near an ordinary point
- 3.4 Series solution near a regular point
- 3.5 Error and accuracy of power series solution representation

Syllabus

4. Systems of linear equations

- 4.1 Review of matrices, eigenvalues, eigenfunctions
- 4.2 Homogeneous and non homogeneous linear systems with constant coefficients
- 4.3 Discussion on the function e^{At}
- 4.4 Systems of higher order Linear Equations and state space representation
- 4.5 Nonlinear Systems of Differential equations (Equilibrium points)
- 4.6 Concepts of stability and steady state Solutions
- 4.7 Special functions, Dirac Delta, Step function

Syllabus

5. Laplace Transform

5.1 Definition and convergence of Laplace Transform

5.2 Solution to initial value problems

5.3 Linear differential equations with discontinuous forcing term (Dirac delta, step function)

6. Numerical Methods

Numerical Methods for first order equations

7.1 Introduce Euler Method

7.2 Runge-Kutta Method

7.3 Multistep Methods

7.4 Errors and stability

Syllabus

7. Numerical Methods

Numerical Methods for first order equations

7.1 Introduce Euler Method

7.2 Runge-Kutta Method

7.3 Multistep Methods

7.4 Errors and stability

Homework

- Submission - Submitted weekly on Friday during the section to the TA
- Late Submission – 50% off credit
- Solutions – Released on Friday
- Graded – By the TA / Reader
- Resubmitted – Corrections

- Every week Starting with on the 3ed week.
 - New HW
 - Corrected HW

- Projects

Academic Dishonesty

- Cheating Definition

Intentionally or without authorization from the instructor, using or attempting to use unauthorized materials, information, or study aids in any academic exercise. “Unauthorized materials” include other students’ test papers during examinations.

Academic Integrity

With its status as a world-class research institution, it is critical that the University uphold the highest standards of integrity both inside and outside the classroom. As a student and member of the UCLA community, you are expected to demonstrate integrity in all of your academic endeavors. Accordingly, when accusations of academic dishonesty occur, The Office of the Dean of Students is charged with investigating and adjudicating suspected violations. **Academic dishonesty, includes, but is not limited to, cheating, fabrication, plagiarism, multiple submissions or facilitating academic misconduct.**

<http://www.deanofstudents.ucla.edu/Academic-Integrity>

<http://www.deanofstudents.ucla.edu/Portals/16/Documents/flowchart.pdf>

Time Commitment

- Number of Unites – 4
- Numbers of hours per academic unite per week – 3 hr.
- Number of hours devoted for the class per week – 12 hr.
- Time breakdown
 - Class – 3 hr.
 - Section – 0.75 hr.
 - Independent study – 8.25 hr.