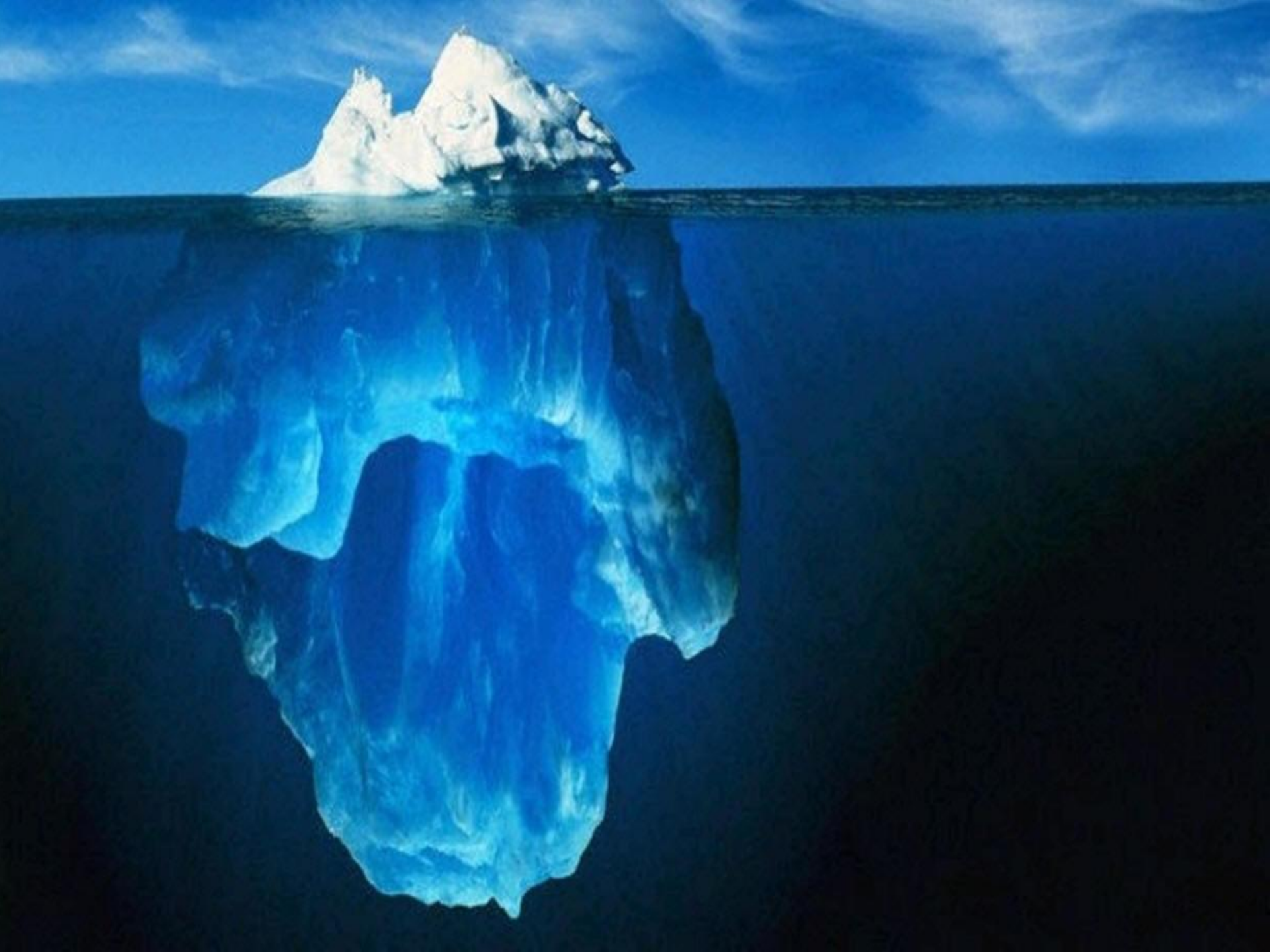
Class Notes 0:

Class Information

82A – 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. Nonlinear differential equations and stability

- **Prerequisite**: None

- Matlab

Class Web Site

- **Website**: http://bionics.seas.ucla.edu/education/MAE_182A.html

Syllabus

1. Classifications of differential equations, linear/nonlinear, order

2. First Order non linear Differential Equations

- Method of Separable equations
- Variation of parameters
- Method of Integrating factor
- Change of variables and parametric solutions

3. Second order Linear Differential equations

- Homogeneous equations with constant coefficients
- Characteristic equation, distinct and repeated solutions
- Nonhomogeneous equations
- Applications to selected engineering problems

Syllabus

4. High order linear equations

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

Midterm

5. Laplace Transform

- Definition and convergence of Laplace Transform
- Solution to initial value problems
- Linear differential equations with discontinuous forcing term (Dirac delta, step function)

Syllabus

6. Series solution method

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

7. Systems of linear equations

- Review of matrices, eigenvalues, eigenfunctions
- Homogeneous and no homogeneous linear systems with constant coefficients
- Discussion on the function e^At
- Sytems of higher order Linear Equations and state space representation
- Nonlinear Systems of Differential equations (Equilibrium points)
- Concepts of stability and steady state Solutions
- Special functions, Dirac Delta, Step function

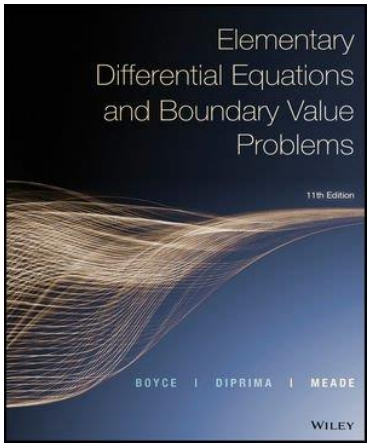
Syllabus

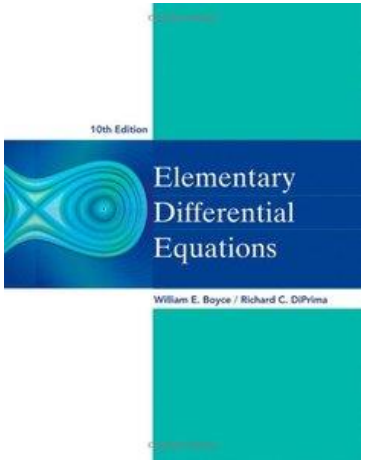
8. Numerical Methods

- Introduce Euler Method
- Runge-Kutta Method
- Multistep Methods
- Errors and stability

Final

Textbook – Primary





Elementary Ordinary Differential Equations and Boundary Value Problems".

William E. Boyce & Richard C. DiPrima,

11th Edition, Wiley 2017

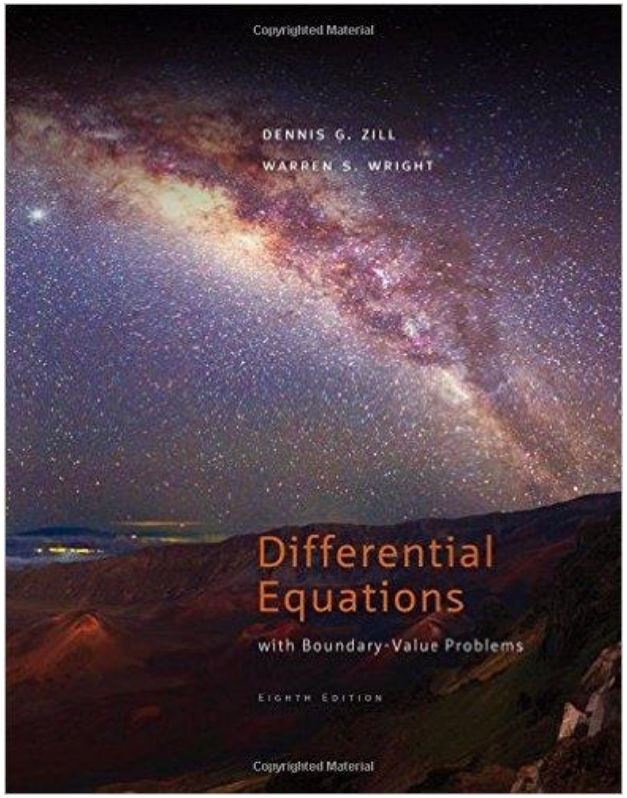
ISBN: 978-1-119-32063-0

10th Edition, Wiley 2012

ISBN-10: 1118157389

ISBN-13: 978-1118157381

Textbook – Scondery



Differential Equations with Boundary-Value Problems,

8th Edition

Dennis G. Zill, Warren S. Wright

ISBN-13: 978-1111827069

ISBN-10: 1111827060

Contact Info

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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.

Assignment / Homework

- Pre-class assignment: Attendance
- HW 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 (Voluntary)
  - Full credit for correcting initial attempt
  - Partial credit for partial submission
- Every week Starting with on the 3ed week.
  - New HW
  - Corrected HW

- Projects

Grade – Four Plans

Plan / Load	Content	Grading
A / High	10 Textbook Problems 1 Project Matlab Required: Yes	Problem Sets - 20% Projects - 9% Attendance - 5% Exam 1 Mid - 33% Exam 2 Final - 33%
B / Med	5 Textbook Problems 1 Project Matlab Required: Yes	Problem Sets - 10% Projects - 9% Attendance - 5% Exam 1 Mid - 38% Exam 2 Final - 38%
C / Med	10 Textbook Problems Matlab Required: No	Problem Sets - 20% Attendance - 5% Exam 1 Mid - 37.5% Exam 2 Final - 37.5%
D / Low	5 Textbook Problems Matlab Required: No	Problem Sets - 10% Attendance - 5% Exam 1 Mid - 42.5% Exam 2 Final - 42.5%

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