

Winter 2015: Math/Mech 358, Section 201: Engineering Analysis

<http://www.math.ubc.ca/~coombs/358/math358.html>

Instructor: Dr. Daniel Coombs.

Office hours: Mathematics Annex, Room 1109. Monday 11.30-1pm and by appointment (contact me via email). Also, I will usually be available for questions right after class.

[Math department tutoring centre](#) is located in LSK 301/302.

Email: coombs (at) math (dot) ubc (dot) ca

Office phone: 604-822-2859

This course is cross-listed as Math 358 and Mech 358.

Text: There is no required textbook for the course, but the following are recommended.

- Elementary Differential Equations and Boundary Value Problems (10th ed.) by W.E. Boyce & R.C. DiPrima.
- The online textbook Diffy Qs by J. Lebl. You can download the book (for free) or order a copy (for cheap) to be sent to you from this page: <http://www.jirka.org/diffyqs>.
- Applied Partial Differential Equations (with Fourier Series and Boundary Value Problems) (4th ed.) by Richard Haberman
- Any of the zillion books with titles like "Differential Equations with Matlab". One such book is Applied Numerical Methods with Matlab (2nd ed.) by Steven Chapra

Important Dates:

- First class: 11am, January 5th, 2015.
- Quiz 1: January 15th
- Quiz 2: January 29th
- Quiz 3: February 12th
- Quiz 4: February 26th (midterm)
- Quiz 5: March 12th
- Quiz 6: March 26th
- Final exam: **TBA** during the regular exam period.

Subject matter:

The study of analytical and numerical solutions of ordinary and partial differential equations, with emphasis on those arising in Mechanical Engineering applications. Prerequisites are multivariable calculus including partial differentiation and integration; linear algebra and matrix theory; a first course in ordinary differential equations; and elementary numerical analysis.

Grading

- The breakdown of marks between course elements will be as follows: Final exam: 30%. Labs: 35% total. Regular quizzes: 25%. Midterm quiz: 10%.
- Quizzes are scheduled for class time on the following dates: January 15th, January 29th, February 12th,

February 26th, March 12th, March 26th. The quiz on February 26th will constitute the midterm for the class and is worth more marks.

- Missing a quiz or midterm normally results in a mark of 0. Exceptions may be granted in two cases: prior consent of the instructor or a medical emergency. In the latter case, the instructor must be notified within 48 hours of the missed test, and presented with a doctor's note immediately upon the student's return to UBC. No make-up quizzes or midterms will be given.
- Homework assignments will be handed out approximately every two weeks. These will contain problems that you should work and understand before completing the computer labs, quizzes and midterms. Most assignments will not be collected or graded so you will need to review the solutions yourself.
- The computer labs should be completed in pairs except as discussed in advance with the instructor. You are welcome (even encouraged) to discuss the labs in larger groups, but each pair must submit **only** their own solutions. UBC policies on cheating and plagiarism are extremely strict. If in doubt, enquire before submitting.
- **Note:** You will have *immense* difficulty with the quizzes, exams and the course if you don't understand the labs and homework.

Homework assignments

Will go here.

Computer lab assignments

- Note **no labs** will be held during first week of term.
- **Week 2:** Optional Matlab review and opportunity to start Lab zero, during regular lab session. Review during 1st hour of lab time. See below for Matlab help links and review files.
- **Week 3:** Lab zero must be completed and handed in (electronically) by 5pm on Friday, Jan 23rd. Download [Lab zero](#) [PDF]. To submit your work, log in to connect.ubc.ca and then access Mech/Math 358.
- **Week 4:** Lab one must be completed and handed in (electronically) by 5pm on Friday, Jan 30th.
- **Week 5 and 6:** Lab two must be completed and handed in (electronically) by 5pm on Friday, Feb 13th.
- **Important: UBC will be closed on Monday, Feb 9th. Plan accordingly.**
- **Week 7 and 8:** Lab three must be completed and handed in (electronically) by 5pm on Friday, March 6th.
- **Week 9 and 10:** Lab four must be completed and handed in (electronically) by 5pm on Friday, March 20th.
- **Week 11 and 12:** Lab five must be completed and handed in (electronically) by 5pm on date TBA.

Matlab

- [Click here](#) for the zip-file containing the materials for Matlab review, including some sample m-files. Written by Ida Karimfazli.
- [Click here](#) for just the powerpoint slides.
- [Click here](#) for the ODE tutorial.
- UBC Math [Matlab resources page](#).

Course notes and readings

- An approximate [SCHEDULE](#) of topics.
- Class notes will be posted here as we go along.

Quizzes

- Information on quizzes, including solutions will be posted here.
-
-
-
-

Information from 2014:

Course notes from 2014:

- [Class notes Jan 7](#)
- [Class notes Jan 9](#)
- [Class notes Jan 14](#)
- [More than you want to know about rounding and floating point numbers.](#)
- [Class notes Jan 16](#)
- [Class notes Jan 21](#)
- [Class notes Jan 23](#)
- [Class notes Jan 28](#)
- [Class notes Jan 30](#)
- [Class notes Feb 4](#) (hopefully with fewer +/- mistakes than in class). Updated Apr 11 to remove error in Parseval's formula.
- [Class notes Feb 6](#)
- [Class notes Feb 11](#)
- [Class notes Feb 13](#). Also: swf animations for the two heat equation examples, solved via forward difference central space, from class: [Stable h- and k- choices](#). [UNstable h- and k- choices](#).
- [Class notes Feb 27](#)
- [Class notes Mar 4](#)
- [Class notes Mar 6](#) includes solutions to midterm one.
- [Class notes Mar 11](#)
- [Class notes Mar 13](#)
- **Review problems on heat equation:** See the current [course site](#) for Math 257/316. Suggested homework: Homework 6, 7 and 8. Many other high quality problems and solutions are available from this site.
- Some suggested problems from another free online book ([Trench](#)): s12.1 (heat): 10, 11, 13, 43-46, 48-53; s12.2 (wave): 2, 8, 17, 20, 28, 35, 56; s12.3 (Laplace): 7, 10.
- **(More) Notes and Review, including problems with solutions** on separation of variables (heat, wave, Laplace, etc) from Anthony Peirce's version of Math 257/316. Suggested homework sets: 6, 7 (Heat), 8 (wave) and 9 (Laplace). [Course site](#). Note that we have not yet covered alternative coordinate systems so a few of the problems are not yet relevant.
- [Class notes Mar 18](#)
- [Class notes Mar 20](#)
- [Class notes Mar 27](#)
- [Class notes Apr 1](#). [Midterm 2 solutions](#)
- [Class notes Apr 3](#)
- [Class notes Apr 8](#). [Solutions to multiple choice questions](#).

2014 Midterms

- [List of topics for midterm one](#)
- [Formula sheet for midterm 1.](#)
- Midterm one and solutions: see March 6 class notes above.
- [List of topics for midterm two.](#)
- [Formula sheet for midterm 2.](#)

2014 Final Exam Information

- [Final list of topics for the 2014 exam.](#)
- The math department offers the course Math 257/316 which is reasonably close to this course. You can find a range of past exams for that course, many of which have solutions available. You can safely ignore any question from that course that involves the words "singular point", "Bessel function" or "Frobenius".
- [Math dept past final exams](#)
- [Math Exam and Education Resources wiki](#)
- [MATH 257 collection maintained by UBC's Engineering Physics Student Association.](#)
- There are a few solved past final exams on [Professor Peirce's MATH 257/316 pages](#).
- The UBC Math Club has packets of past final exams with solutions for sale in the Math Annex. [Math Club website](#).
- Don't forget the [Math Learning Centre](#) in rooms 300–302 of the L. S. Klinck building.
- The final exam will contain this [formula sheet](#).
- Here are the final exam and midterm two from 2013. [Last year's final](#); [Last year's midterm](#).

[Daniel Coombs](#) / [Department of Mathematics](#) / [University of British Columbia](#)