

# ACM 100b - ODE's, Fourier series, Fourier transforms and all that

## Course overview

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# Introduction

- Welcome to ACM 100b
- Instructor: Dan Meiron
  - Office: 305 Guggenheim Lab
  - Caltech extension: x4563
  - Cell phone: 626 487 2936
  - e-mail: `dim@caltech.edu`
- Lectures: MWF 11AM in 119 Kerckhoff
- Course web site: Material for the course will be handed out via the Moodle system: `moodle.caltech.edu`
- Please register for the course on Moodle as all class communications will be through this system.
- Course enrollment key: Laplace

# Course text and lectures

- There is no official course text
- Lecture notes will be handed out via the course web site
- Here are some texts which you can consult that cover much of the material of the course:
  - Elementary Differential Equations and Boundary Value Problems - Boyce and DiPrima
  - Ordinary Differential Equations - Carrier and Pearson
  - Nonlinear Ordinary Differential Equations - Jordan and Smith
  - Theory of Ordinary Differential Equations - Coddington and Levinson

# Exams and grading policy

- There will be two exams - a midterm and a final
- They will both be take-home exams and will be 3 hours in length
- No collaboration on the exams
- You may use the class notes and anything else written or typed by you but otherwise no other texts can be used
- Your grade is computed by taking the maximum of two scores:
  - A score computed using just the midterm and final (each counting for 50%)
  - A score computed using the midterm, final and homework, (each counting for 33%)
  - In computing the homework score we will drop your lowest homework score
- No extensions on the midterm or final will be possible without a note from the Dean.

# Homework policy

- Homework assignments will be given out roughly every week (except when exams are due)
- You may collaborate freely on the homework but everyone needs to write the assignment up individually.
- Slavishly copying someone's solution isn't a very good way to reinforce the learning of the material
- Also - some of the problems and their solution (or close facsimiles) are probably out there on the internet. Try hard not to consult these sites.
- Homework will be assigned on Fridays and will be due a week from the following Monday - i.e. you have 9 days
- No credit will be given for late homework without an insanely clever excuse (or a note from the Dean).

# Handing in homework and exams

- Deposit homework in the box in front of Steele House (ACM HQ)
- Homework grades and solutions will be posted on Moodle
- You can pick up the graded homework from your TA in section
- Exam grades and solutions will also be posted on Moodle
- Pick up graded exams and homework from your section TA.

# The first part of the course is review

- The class is made up of undergrads and grad students
- Because not everyone has the same background we will start by reviewing material
- Many of you have seen this in Ma 2 already
- But we'll try to do it at a more advanced level
- And never underestimate how good it feels to be told something you may already know.
- All of the material is new in the second half of the quarter.

# A rough syllabus

- Linear and nonlinear ODE - examples and definitions
- Existence and uniqueness
- Second order linear ODE
- $n$ 'th order ODE's and systems
- The Laplace transform
- Series solutions and singular points
- Boundary value problems
- The Sturm-Liouville ODE and self adjoint problems
- Fourier series and expansions in complete sets of functions
- Regular vs. singular Sturm-Liouville problems
- Fourier transforms
- Greens functions