Department of Mathematics   **Sergey Lototsky**

PUBLICATIONS
HOME
AWARDS
CONTACT
PROBABILITY GROUP @ USC
TEACHING

MATH445: Mathematics of Physics and Engineering II, Spring 2022

Everything can change with little or no notice at any moment...

In particular, a class (lecture and/or discussion) can be moved to on-line mode on a very short notice, so please check your e-mail before every class.

Mathematics of Physics and Engineering II
Spring 2022
Class number 39665R
(1pm MWF, THH 118)
The final exam is Wednesday, May 4, 2--4pm

Our Math 445 in Spring 2022 semester: Key dates

- January 10: first day of classes

- January 17: MLK Day, no class

- January 28: Last day to drop without a `W' AND with refund

- February 21: Presidents' Day, no class

- February 25: Last day to drop without a `W', BUT WITH NO refund

- March 2: Midterm Exam 1

- March 11: First computer project is due

- March 13-20: Spring break

- April 8: Last day to drop with a `W'

- April 20: Midterm Exam 2

- April 29: Second computer project is due; Last day of classes

- May 4: Final exam

Class Schedule
Homework problems
Some homework answers
Computer Projects
Crank-Nicolson scheme for the heat equation
Implicit method for the wave equation

Extended summary

- **Instructor:** Dr. Sergey Lototsky
  Office: KAP 248D.
  Phone: 213--740-2389.
  E-mail: lototsky (at) USC (dot) edu
  URL: https://dornsife.usc.edu/sergey-lototsky/
  Office hours: MWF 11:30am-12:30pm [in-person/on zoom]

  Walk-ins and appointments at other time are welcome.

Please do not hesitate to talk to me about your problems, questions, or concerns in this class.

- **Teaching Assistant:** Gin Park
  E-mail: ginpark [at] usc (dot) edu
  Office hours: TBD all in the Math Center (KAP 263)

Discussion Sections: Tu, Th, 4pm in KAP 147 and 5pm in GFS 111.

Beside the discussion sections, the TA is responsible for quizzes (making, administering, and grading) and for collecting and grading homeworks.

- **Textbook:** ``Advanced Engineering Mathematics'' by E. Kreyszig, Wiley. Any edition will work. The official version is the custom USC edition.

- **Supplement:** ``Mathematics of Physics and Engineering'' by Edward K. Blum and Sergey V. Lototsky, World Scientific, 2006 (ISBN-13: 9789812566218)

- **Course goal:** To realize that there is a lot of beautiful and useful mathematics out there beyond calculus and ordinary differential equations. In particular, we will cover all the material promised in the catalogue description of the course (Vector field theory; theorems of Gauss, Green, and Stokes; Fourier series and integrals; complex variables; linear partial differential equations; series solutions of ordinary differential equations), altough not necessarily in this order. Here is an alternative look at it.

Save the dates! There will be two in-class one-hour exams (March 2 and April 20, both Wednesdays, during regular lecture period). The two-hour final exam is Wednsday, May 4, 2-4pm.

Homework, Quizzes, etc.: There will be 14 weekly quizzes (every Thursdays during the discussion sections), 10 homeworks (due also on Thursday), and two computer projects (due Friday, March 11 and Friday, April 29). You should understand every solution to every homework problem and be ready to reproduce every solution without any help and in reasonable time. You are welcome to use any help whatsoever with the homework problems and the projects, but not with the quizzes.

Grading:

- Quizzes 15% total

- Homeworks, 15% total

- The projects, 10% total [5% each]

- Two Mid-Term Exams, 30% total [15% each]

- Final Two-Hour Exam, 30%

Approximate Grading Scheme. A: 90 and up; B: 80-89; C: 70-79. Pluses/minuses (As in A-, B+, etc.) will mostly be decided on a case-by-case basis.

Missed work. The general rule: no make-up exams or quizzes, and no late submissions of homeworks or the project (but early submissions, especially in electronic format, are welcome). **Emergencies will be handled on a case-by-case basis.** If you miss the final exam, with a valid excuse, you get an incomplete in the class; an

incomplete is a major inconvenience for a number of people, including yourself, so, please, do not miss the final.

To encourage and reward consistent performance throughout the semester, I will not automatically drop any scores (such as the two lowest quizzes, etc.)

Students Requiring Special Accommodation

Any student requesting academic accommodations based on special needs is required to register with DSP each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in GFS 120. To contact DSP: (213) 740-0776 [tel.], ability@usc.edu [e-mail], on the web.

Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. Scampus (the Student Guidebook) contains the Student Conduct Code in Section 11.00, while the recommended sanctions are in Appendix A.

Academic Support The Kortschak Center for Learning and Creativity

Supplementary materials

Sample exams

MT1   MT1-S2022-problems MT1-S2022-sol

MT2   MT2-S2022

Final

Other materials

My notes

- Lecture 1
- Some names and faces behind some formulas
- Motion in the central field
- Grad, Div, Laplacian, and Curl in non-cartesian coordinates
- PDEs descrbing fluids

- Fourier and Laplace Transforms

- Applications of Fourier analysis

- PDEs (Transport, Heat, Wave, Laplace) in the whole space

- PDEs in a bounded domain

- Telegraph equation

- Inhomogeneous equations and inhomogeneous boundary conditions

- Solving PDEs: Separation of variables and the method of characteristics

- On Music
  Basic
  PDEs: a summary
  PDEs: details

- The Weierstrass Approximation Theorem

- Elementary Quantum Meachincs

Other Notes

- An article about the mathematics of the tumbling box (and also a tennis racquet)

- How to write Greek letters (by Olga Korosteleva, CSULB)

- Basic exercises on ruler-compass construction (by Olga Korosteleva, CSULB)

- An article about the sampling theorem

- The book **Fourier Analysis** by T. Korner (Cambridge University Press, 1988) is a great reference for many topics in this class. Here are some examples from the book:
  A nowhere differentiable function
  Analysis of the Gibbs phenomenon
  Non-uniqueness for the heat equation
  Heat equation on the half-line

More

- Why do we need a note taker? A variation

- What makes an expert?

- No optional material

USC Math Department Homepage