Math 445 Schedule, Fall 2022

General features:

- The official book is *"Advanced Engineering Mathematics"* by E. Kreyszig, (Wiley, a special custom USC edition, but any edition will work). The book "Mathematics of Physics and Engineering" by Edward K. Blum and Sergey V. Lototsky, World Scientific, 2006, can also work.
- 11 homeworks (due on most Tuesdays) 15% total.
- 10 quizzes (on most Thursdays): 15% total.
- Two computer projects (due Friday, October 21 and Friday, December 2): 5% each.
- 2 midterms (October 12 and November 16): 15% each.
- 1 comprehensive final exam (Friday, December 9): 30%.

Exams and quizzes are your individual effort; with homeworks and computer projects you are welcome to use any help whatsoever. All exams and quizzes are closed book, no calculators.

August 22. Vectors.
August 23. Vectors.
August 24. Curves and Kepler's Laws.
August 25. Vectors and curves.
August 26. Applications to mechanics: tumbling box.

August 29. Integration and differentiation of functions of several variables.
August 30. Integration and differentiation of functions of several variables. HW1 due.
August 31. The three theorems.
September 1. Integration and differentiation of functions of several variables. QUIZ 1.
September 2. Examples.

September 5. *Labor Day, no class.*
September 6. Examples. HW2 due.
September 7. Applications to physics: continuity, transport, Maxwell's equations and more.
September 8. Examples. QUIZ 2.
September 9. Algebra of complex numbers. **Last chance to drop without a "W" and with refund.**

September 12. Functions of a complex variable: Cauchy-Riemann equations.
September 13. Complex numbers. HW3 due.
September 14. Functions of a complex variable: two theorems of Cauchy and more.
September 15. Functions of a complex variable. QUIZ 3.
September 16. Conformal mappings.

September 19. Series of complex numbers.
September 20. Functions of a complex variable. HW4 due.
September 21. Taylor and Laurent expansions.
September 22. Series of complex numbers. QUIZ 4.
September 23. Series solution of ordinary differential equations: regular case.

September 26. Series solution of ODEs: Fuchs-Frobenius theory, Bessel functions.
September 27. Series of complex numbers. HW5 due.
September 28. Residue integration: theory.
September 29. Residue integration. QUIZ 5.
September 30. Residue integration: examples.

OCTOBER 3. Different ways a series of functions can converge.

October 4. Different ways a series of functions can converge. HW6 due.

October 5. Fourier series.

October 6. Fourier series. QUIZ 6.

OCTOBER 7. Computing the Fourier series.

Last chance to drop without a 'W', BUT WITH NO refund.

OCTOBER 10. Midterm review.

October 11. Midterm review. HW7 due.

October 12. Midterm Exam 1. Covers what we did so far.

`October 13,14.` *Fall break, no classes*

OCTOBER 17. Fourier transform.

OCTOBER 18. Fourier transform.

OCTOBER 19. Computing the Fourier transform.

OCTOBER 20. Computing the Fourier transform.

October 21. Applications to signal processing. Project 1 is due.

OCTOBER 24. Classification of PDEs.

October 25. Classification of PDEs. HW8 due.

OCTOBER 26. The transport, heat, and wave equations on the line.

October 27. The transport, heat, and wave equations on the line. QUIZ 7.

October 28. The heat equation on the interval.

OCTOBER 31. Separation of variables and variation of parameters.

November 1. The heat equation on the interval. HW9 due.

NOVEMBER 2. Wave equation on the interval and in higher dimensions.

November 3. Examples. QUIZ 8.

NOVEMBER 4. Laplace's and Poisson's equations.

NOVEMBER 7. Numerical methods.

November 8. Numerical methods. HW10 due.

NOVEMBER 9. Telegraph equation and the transatlantic cable.

November 10. Midterm review. QUIZ 9.

`November 11.` *Veterans Day, no class.* Last chance to drop with a "W".

NOVEMBER 14. Midterm review.

November 15. Midterm review. HW11 due.

November 16. Midterm Exam 2. Covers what we did after Midterm Exam 1.

November 17. Discussion of the exam and the project. QUIZ 10.

NOVEMBER 18. Discussion of the exam and the project.

NOVEMBER 21. Some fun topics.

NOVEMBER 22. Some fun topics.

`November 23, 24, 25.` *Thanksgiving break, no classes.*

NOVEMBER 28. The Weierstrass approximation theorem.

NOVEMBER 29. Final review.

November 30. Schrodinger's equation: quantum harmonic oscillator and the hydrogen atom.

DECEMBER 1. Final review.

DECEMBER 2. Final review. Project 2 is due.

Friday, December 9. Final Exam, 11am–1 pm.

Covers everything we studied. Contributes 30% to the final grade.