ECE 0401: ECE Analytical Methods 02

Fall, 2025

COURSE OBJECTS AND LEARNING OUTCOMES

In this course, you will be expected to:

- Solve systems of equations and use linear algebra techniques to determine linear independence.
- Solve first and second order differential homogeneous and nonhomogeneous equations for arbitrary and specified initial conditions.
- Perform calculations using complex numbers, convert sinusoids to phasors and vice-versa using Euler's identity, and explain the difference between complex numbers and phasors.
- Analyze step, exponential, sinusoidal and composite waveforms.
- Carry out double integrals and carry out partial derivatives of multivariate functions.

INSTRUCTOR

Hao Qin, Room 527
Email: hao.qin@scupi.cn
Office Hours: Wednesday 9:00-11:00 am, Wednesday 1:30-4:30 pm, or by appointment

TEACHING ASSISTANT

Kunyu Wu, email: 2022141520235@stu.scu.edu.cn
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LECTURES

Thursday 8:15-11:00 am
Location: S201 SCUPI Building. In-person attendance is required for all class meetings.

RECITATION

TBA

TEXTBOOK

- *Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition (Wiley), ISBN: 978-0-470-91361-1. (not required)*

COURSE REQUIREMENTS AND GRADING

- Homework: 20%
- Quizzes: 10%
- Projects: 30%
- Final Exam: 40%

HOMEWORK

Homework assignments and their due dates will be given in the lectures. All work should be clearly presented, showing all steps to demonstrate your understanding of the process. While collaboration with classmates is encouraged, the final submission must be your own independent work, and plagiarism is strictly prohibited. **No late homework** will be accepted.

QUIZZES

There will be short quizzes given during the class meetings. Quizzes are designed to test basic skills and prepare you for the exams.

Projects

Projects and their due dates will be given in the lectures. All work should be clearly presented. While collaboration with classmates is encouraged, the final submission must be your own independent work, and plagiarism is strictly prohibited.

EXAMS

There is a midterm exam and a final exam. Each test will focus on the material presented since the previous exam, while also having the potential to include content from earlier sections. Attendance at all exams is mandatory. Make-up exams will only be given in the event of an emergency and only if advance notification is provided.

ACADEMIC INTEGRITY

Maintaining academic integrity is essential in this course. All work submitted must be your own, whether individual or group assignments. Plagiarism, cheating, or any form of dishonesty will not be tolerated and will result in disciplinary action as per the institution's policies. You are encouraged to collaborate with classmates on understanding concepts, but all submitted work must reflect your independent effort. Properly cite any sources or assistance received and uphold the highest standards of academic honesty in all your work.

TENTATIVE COURSE TOPICS (subject to changes)

- Matrices, vectors: addition, scalar multiplication, and transpose, matrix & vector multiplication, linear systems, introductory matrix algebra, Gauss elimination
- Linear dependence and independence
- Rank of matrix, vector space, basis vectors, existence, uniqueness, matrix inversion, determinants, projections, mathematical modeling, separable ODE's
- Linear first order ODEs, integration factor, homogeneous linear second order ODE's: Euler's identity, rectangular & polar coordinates, characteristic equation, two real roots
- Homogeneous linear second order ODE's: Repeated roots, complex roots and damping
- Non-homogeneous second order ODE's: Forcing function and particular solution, method of undetermined coefficients
- Complex arithmetic, step function, exponential function
- Sinusoidal & complex exponential, mean value and RMS value, composite waveforms, phasors
- Transfer function, bode plot, using Laplace transforms to solve circuits and differential equations, non-zero initial conditions
- Double integrals, double integrals over rectangles
- Partial derivatives