



MATH 322 Mathematical Analysis for Engineers

Location and Times

Description of Course

Linear algebraic equations, linear systems of ordinary differential equations, Fourier series and transforms, partial differential equations.

Course Prerequisites or Co-requisites

No idea. Who decided to leave prereqs out of the on-line catalog?

Instructor and Contact Information

Instructor name, office location, telephone number, e-mail address

Office Hours/"Open Door Policy"

Teaching assistants (if applicable) and their contact information and office hours (if applicable)

Web information, including course home page, instructor home page, and D2L information

Course Format and Teaching Methods

Lecture only.

Course Objectives and Expected Learning Outcomes

This course introduces the mathematical tools for analyzing linear systems: linear algebraic equations, linear systems of ordinary differential equations with constant coefficients (homogeneous and inhomogeneous), Fourier series and transforms, linear partial differential equations.

Absence and Class Participation Policy

Required language: *The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>*

Required language: *The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>.*

Required language: *Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>*

Recommended language: *Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings. Students who miss class due to illness or emergency are required to bring documentation from their health-care provider or other relevant, professional third parties. Failure to submit third-party documentation will result in unexcused absences.*

Makeup Policy for Students Who Register Late (recommended, not required)

Statement on whether students who register after the first class meeting may make up missed assignments/quizzes and the deadline for doing so

Course Communications (recommended, not required)

Means by which online communication will be conducted (e.g., official UA e-mail address, D2L)

Required Texts or Readings

Required: *Advanced Engineering Mathematics* by Erwin Kreyszig, Tenth Edition

Required or Special Materials

None.

Required Extracurricular Activities (if any)

None.

Assignments and Examinations: Schedule/Due Dates

Number of required papers and assignments, with description

Number of quizzes and exams

Recommended, not required: *Policy on revision and resubmission of assigned papers, with appropriate deadlines.*

Final Examination or Project

The date and time of the final exam or project, along with links to the Final Exam Regulations, <https://www.registrar.arizona.edu/courses/final-examination-regulations-and-information>, and Final Exam Schedule, <http://www.registrar.arizona.edu/schedules/finals.htm>

Grading Scale and Policies

Specify the grade distribution for the course. University policy regarding grades and grading systems is available at <http://catalog.arizona.edu/policy/grades-and-grading-system>

Provide a detailed explanation of the methods of evaluation and how the final grade will be calculated, including components/assignments, weightings, evaluation criteria, explanation of how late work will be graded, and description of extra-credit opportunities.

If the course is a 400/500: *Include a grading scale (as per above) that is specific to graduate students. Also include a description of how the experiences of undergraduate and graduate students will be differentiated in addition to information on how this requirement/experience figures in the grading scheme.*

Requests for incomplete (I) or withdrawal (W) *must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.*

Dispute of Grade Policy (recommended, not required): *Provide the acceptable time period for disputing a grade on a paper, project, or exam.*

Honors Credit (recommended, not required)

Recommended language: *Students wishing to contract this course for Honors Credit should email me to set up an appointment to discuss the terms of the contract. Information on Honors Contracts can be found at <http://www.honors.arizona.edu/faculty-and-advisors/contracts>.*

Scheduled Topics/Activities

Week 1

- 13.1 Complex arithmetic
- 13.2 Polar coordinates; 13.5 Complex exponential
- 13.5 Complex exponential

Week 2

- 7.3 Linear systems; 7.1 Matrices, vectors
- 7.2 Matrix multiplication
- 7.2 More on matrix products

Week 3

- 7.3 Gaussian elimination
- 7.3 More examples of Gaussian elimination + geometric interpretation of solutions
- 7.4 Linear independence

Week 4

- 7.5 Existence & uniqueness of solutions
- 7.8 Inverse matrices
- 7.6 Determinants in the 2x2 and 3x3 cases

Week 5

- Review: Inverse matrix theorem
- Exam 1
- 7.9 Vector spaces, inner products

Week 6

- 7.9 More on vector spaces and inner products
- 8.1 Eigenvalue problem
- 8.1 More on eigenvalues and eigenvectors

Week 7

- 8.2 Applications of eigenvalue problems
- 2.2 Const-coeff homogeneous linear 2nd-order ODEs
- 2.7 Nonhomogeneous ODEs

Week 8

- 2.7 More examples; 3.2 Higher-order homogeneous linear ODEs
- 3.2 continued
- 4.1 Linear systems of ODEs

Week 9

- 4.1 continued; 4.2 Basic theory
- 4.2 continued; 4.3 Const-coeff systems
- 4.3 continued

Week 10

- 4.6 Nonhomogeneous systems
- Exam 2
- 11.1 Fourier series

Week 11

- 11.2 More Fourier series
- 11.3 Forced oscillations

- 11.4 Trig polynomial approximations

Week 12

- 11.7 Fourier integral
- 11.9 Fourier transform
- 11.9 More on transforms

Week 13

- 11.10 Tables of transforms
- Exam 3
- 12.1 Basic concepts of PDEs; 12.2 Modeling

Week 14

- 12.2 continued
- 12.3 Separation of variables, Fourier series
- 12.3 continued

Week 15

- 12.5, 12.6 Heat equation
- Review

Bibliography

None.

Classroom Behavior Policy

Recommended language: *To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).*

Additional recommendations depending on instructor preferences: *Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.*

Alternate language for those who want to restrict computers and laptops to an area of the classroom: *Some learning styles are best served by using personal electronics, such as laptops and iPads. These devices can be distracting to other learners. Therefore, students who prefer to use electronic devices for note-taking during lecture should use one side of the classroom.*

Alternate recommended language for those who do not wish to permit laptops in the classroom: *The use of personal electronics such as laptops, iPads, and other such mobile devices is distracting to the other students and the instructor. Their use can degrade the learning environment. Therefore, students are not permitted to use these devices during the class period.*

Threatening Behavior Policy

Required language: *The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.*

Notification of Objectionable Materials (recommended, not required)

Recommended language, if applicable: *This course will contain material of a mature nature, which may include explicit language, depictions of nudity, sexual situations, and/or violence. The instructor will provide advance notice when such materials will be used. Students are not automatically excused from interacting with such materials, but they are encouraged to speak*

with the instructor to voice concerns and to provide feedback.

Accessibility and Accommodations

Required language: Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center (520-621-3268) to establish reasonable accommodations. For additional information on the Disability Resource Center and reasonable accommodations, please visit <http://drc.arizona.edu>.

If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.

Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Code of Academic Integrity

Required language: Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: <http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

Recommended language: The University Libraries have some excellent tips for avoiding plagiarism, available at <http://www.library.arizona.edu/help/tutorials/plagiarism/index.html>.

Recommended language: Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy

Required: The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Recommended language: Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students (recommended links)

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>
Student Assistance and Advocacy information is available at <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

Confidentiality of Student Records (recommended, not required)

<http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa>

Subject to Change Statement

Required language: Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.