

MTH 362 - ADVANCED ENGINEERING MATH

Section 0002, Fall 2019

COURSE INFORMATION

Instructor: Erin Denette, Ph.D., edenette@uri.edu, Lippitt 202B, (401)874-2397
Textbook: *Advanced Engineering Mathematics (10th Edition)* by Erwin Kreyszig
You may use either the URI custom edition or full textbook.
Class Times: TTh 12:30-1:45 P.M., Washburn 219
Office Hours: TTh 11 A.M.-12:15 P.M.

COURSE DESCRIPTION

Algebra of complex numbers, matrices, determinants, quadratic forms. Linear differential equations with constant coefficients. (Lec. 3) Pre: MTH 142. Not for major credit in mathematics.

COURSE GOALS AND LEARNING OUTCOMES

This course provides the foundation of the major tools used in some engineering classes. We will cover topics from Complex Analysis, Linear Algebra and Differential Equations. Our main objective is to understand the core concepts and become proficient in the use of the tools needed to solve different types of problems, which will be presented.

- **Complex Analysis:** Become familiar with the notion of complex numbers. Compute powers, roots, exponential and logarithm of such numbers.
- **Linear Algebra:** Understand and solve systems of linear equations, understand the importance of linear independence, bases, rank, and determinants. Understand the importance of eigenvectors, eigenvalues and diagonalization.
- **Differential Equations:** Understand the solutions of ODEs. Solve first and second order linear differential equations with constant and non-constant coefficients by using common techniques as integration factors. Determine linear independence of solutions, compute eigenvalues and eigenvectors, and solve systems of ODEs.

EVALUATION

Final grades will be based on two midterm exams (in class on Tuesdays 10/15 and 11/26), homework, quizzes, and a comprehensive final exam (Thursday 12/12 from 11:30-2:30 in our usual classroom) as follows:

Homework	15%
Quizzes	15%
Exam I	20%
Exam II	20%
Final Exam	30%

Assignments will not be graded on a curve nor will any extra credit be made available. **No late work will be accepted. Missed assignments cannot be made up.** There are situations which warrant exceptions; these are outlined in the University Manual.

LETTER GRADE DISTRIBUTION

Final grades will be determined according to the following scale.

93 - 100	A	87 - 89.99	B+	77 - 79.99	C+	67 - 69.99	D+	0-59.99	F
90 - 92.99	A-	83 - 86.99	B	73 - 76.99	B	60 - 66.99	D		
		80 - 82.99	B-	70 - 72.99	C-				

HOMEWORK

Assigned homework problems from the book will be announced in class daily and will typically be collected at the beginning of the following class day. Students are encouraged to work together but must turn in their own work. Homework questions may be addressed in class as time permits.

It is the student's responsibility to complete all the assigned exercises and to go to office hours or ask in class if there are questions. There are two main components in the grading of the homework. A first component is that all problems were done (completion). A second component is that randomly selected problems from each homework will be graded. Both components will be considered for assigning a grade for the homework. Note that quiz content and most of the test content will be primarily generated from the homework questions.

HOMEWORK POLICIES

The following policies apply to all homework assignments, and no exceptions will be made.

- At the top of the first page of your homework, you must give your name and list the sections and corresponding problems the homework covers; for instance 2.3 - 1,6,7,9.
- Homework must be neat, stapled in order, and *show all work*. Messy assignments or assignments where insufficient work is shown will be given a grade of 0.

TECHNOLOGY

The use of technology, including calculators, is **prohibited** on all in-class assessments and exams. All electronic devices (cell phones, ipads, ipods, laptops, etc.) should be turned off during class. Excepted from this are tablets used for note-taking.

EXAM POLICIES

The following policies apply to all exams, and no exceptions will be made.

- Any books, bags, papers, extra scrap paper, or anything else must be put away in a closed bag and stowed under your desk.
- No calculators of any kind are permitted on exams. No electronic devices of any kind may be used or even accessible to you at any time during the exam.
- You may not leave the room without authorization during the exam. If you leave the room for any reason, your exam will be collected.

EXPECTATIONS

- You are expected to attend every lecture, and to submit your homework on time. We cover a lot of information at a rapid pace; missing a class will result in a large amount of material missed. Students are responsible for all missed work, regardless of the reason for absence. It is also the absentee's responsibility to get all missing notes or materials.
- It is your responsibility to communicate clearly in writing up solutions for homework, quizzes, and exams. Your results must display your understanding well and be written in a correct, complete, coherent, and well organized fashion. The rules of language still apply in mathematics, and they apply even when symbols are used in formulas, equations, etc. Precise communication and neatness count!
- The pace of the class requires that you spend enough time every week doing homework, reviewing notes, reading the textbook, and working out extra problems, all in addition to the time spent in class.

ACADEMIC HONESTY POLICY

Cheating is defined in the University Manual section 8.27.10 as the claiming of credit for work not done independently without giving credit for aid received, or any unauthorized communication during examinations. Students are expected to be honest in all academic work. The resolution of any charge of cheating or plagiarism will follow the guideline set forth in the University Manual sections 8.27.10-8.27.21.

Furthermore, course content and outlines, exams, and assignments created by instructors shall be considered the instructors' intellectual property. Course materials shall not be distributed, shared in any public domain or third party website, or sold without prior written consent of the instructor. See the University Manual section 8.27.22.

SPECIAL NEEDS

Any student with a documented disability is welcome to contact their instructor as early in the semester as possible so that reasonable accommodations may be arranged. As part of this process, please be in touch with Disability Services for Students Office at 302 Memorial Union, 401-874-2098 (<https://web.uri.edu/disability/>).

ACADEMIC ENHANCEMENT CENTER

This is a challenging course. Success requires that students keep pace with the work, understand course concepts, and study effectively. The Academic Enhancement Center helps URI students succeed through three services: Academic Coaching, Tutoring, and The Writing Center. To learn more about any of these services, please visit <https://web.uri.edu/aec/> or call 401-874-2367 to speak with reception staff.

NO WORK SUBMITTED AND INCOMPLETE GRADES

University of Rhode Island regulations concerning no work submitted and incomplete grades will be followed. See the University Manual section 8.53.12 regarding no work submitted and sections 8.53.20 and 8.53.21 regarding incomplete grades for details.

RELIGIOUS HOLIDAYS

It is the policy of the University of Rhode Island to accord students, on an individual basis, the opportunity to observe their traditional religious holidays. Students who plan to be absent from classes or examinations for religious holy days that traditionally preclude secular activity shall discuss this with the appropriate instructor(s) in advance of the holy day. See the University Manual section 8.51.11 for details.

STANDARDS OF BEHAVIOR

Students are expected to treat faculty and fellow classmates with dignity and respect. Students are responsible for being familiar with and adhering to the published "Community Standards of Behavior: University Policies and Regulations" which can be accessed in the University Student Handbook

<https://web.uri.edu/studentconduct/university-student-handbook/>

MTH 362 SECTION 0002 HOMEWORK PROBLEMS

Other sections may be covered and additional homework may be assigned as time allows.

Sections	Assigned Problems
13.1 - Complex Numbers and Their Geometric Representation	2, 6, 10, 14, 16, 20
13.2 - Polar Form of a Complex Number	5, 11, 13, 15, 21, 23, 29
13.5 - (Complex) Exponential Function	2, 5, 9, 13, 15, 16, 19, 21
13.7 - (Complex) Logarithm	5, 8, 13, 15, 19, 23, 24
7.1 - Matrices, Vectors: Addition, Scalar Multiplication	6, 11, 14, 16, 17, 18
7.2 - Matrix Multiplication	4, 5, 7, 8, 12, 18, 24
7.3 - Linear Systems of Equations, Gauss Elimination	1, 3, 8, 11
7.4 - Linear Independence, Rank, Vector Spaces	28, 30, 33
7.5 - Solutions of Linear Systems: Existence, Uniqueness	To Be Announced
7.7 - Determinants, Cramer's Rule	5, 7, 9, 11, 17, 21, 24
7.8 - Inverse of a Matrix, Gauss-Jordan Elimination	5, 7, 11, 13, 15
8.1 - The Matrix Eigenvalue Problem; Eigenvalues, Eigenvectors	2, 5, 7, 10, 11, 15, 21, 22
8.4 - Eigenbases, Diagonalization, Quadratic Forms	2, 4, 7, 9, 14, 16, 24
1.1 - Basic First Order ODE Concepts, Modeling	2, 5, 13, 17, 19, 20
1.3 - Separable ODEs, Modeling	2, 5, 7, 8, 16, 19, 24, 25
1.4 - Exact ODEs, Integrating Factors	3, 5, 7, 10, 12, 13, 14, 15
1.5 - Linear ODEs, Bernoulli Equation, Population Dynamics	5, 7, 11, 12, 18, 22, 25, 28, 31
2.1 - Homogeneous Linear ODEs of Second Order	1, 5, 7, 9, 11, 16, 17
2.2 - Homogeneous Linear ODEs with Constant Coefficients	2, 11, 14, 16, 18, 23, 25, 33, 35
2.5 - Euler-Cauchy Equations	2, 5, 8, 11, 13, 17, 18
2.6 - Existence and Uniqueness of Solutions, Wronskian	4, 6, 9, 12, 16f
2.7 - Nonhomogeneous ODEs	3, 5, 8, 12, 14, 16
2.10 - Solution by Variation of Parameters	3, 4, 5, 6, 10, 11, 13
3.1 - Homogeneous Linear ODEs	1, 4, 6, 9, 13
3.2 - Homogeneous Linear ODEs with Constant Coefficients	1, 3, 5
3.3 - Nonhomogeneous Linear ODEs	2, 5, 9, 11, 13
4.1 - Systems of ODEs as Models in Engineering Applications	1, 2, 5, 10, 12
4.2 - Basic Theory of Systems of ODEs, Wronskian	To Be Announced
4.3 - Constant-Coefficient Systems, Phase Plane Method	1, 4, 9, 14, 18