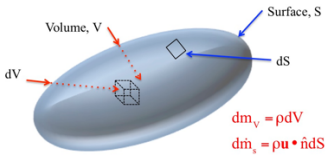
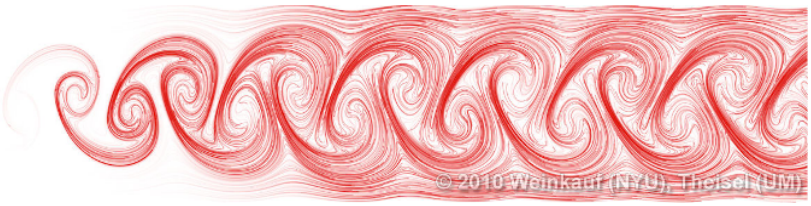




EGR 520 – 64213: Engineering Analysis I

Poly campus | MW | 1:30-2:45pm | AGBC bldg., Room 154

Course Description:

Analytical methods for evaluation of engineering systems. Topics include but not limited to the following: properties of matrices, linear algebra, ordinary differential equations, Laplace transforms, multivariate Calculus, and introduction to partial differential equations.

Credits: 3
Prerequisites: Graduate Standing or enrollment in accelerated Master's program within Ira A. Fulton Schools of Engineering, Multivariate Calculus, and Ordinary Differential Equations.

Instructor: Xianping Li
Contact Info:
Office: Wanner 201D
Email: xianping@asu.edu
Phone #: 4807275894
Office Hours: MW 10:00-11:00AM (or by appointment).

Your success in this class is important to me. Everyone learns differently, so please feel free to let me know if any part of this course prevents you from learning or excludes you. We can develop strategies together to meet both your needs and the requirements of the course.

College Contact:

This course is offered by the Ira A. Fulton Schools of Engineering and taught by the College of Integrative Sciences and Arts (CISA). If you have questions or concerns about this course, please feel free to contact me. If I am unable to address your concerns, you are welcome to send your inquiry to cisa@asu.edu.

Course Learning Outcomes:

At the completion of this course, students will be able to:

- Develop a level of mathematical maturity appropriate for graduate study across all engineering specialties.
- Develop confidence in mathematical problem-solving techniques and strategies.
- Write well-organized and logical mathematical derivations and solutions that can be followed and reproduced by peers.
- Demonstrate an appropriate level of understanding of the fundamental mathematical principles of linear algebra as well as the typical algebraic manipulations necessary to solve problems.
- Demonstrate mastery of elementary solution procedures for Ordinary Differential Equations.

- Develop and manipulate common functions that are defined as series or integrals, such as the Gamma and Beta functions, the error function, and Bessel functions.
- Demonstrate understanding of and proficiency with Fourier series and Fourier Transforms.
- Demonstrate understanding of and proficiency with Laplace transforms.
- Demonstrate mastery of Vector Analysis.
- Develop orthogonal polynomials from generating equations and establish basic properties of these polynomials.
- Demonstrate understanding of Sturm-Liouville theory and classifications of Sturm-Liouville differential equations.
- Understand the fundamental classifications of linear Partial Differential Equations and the initial and boundary values necessary to uniquely define their solution.
- Use Separation of Variables to determine the solution of a homogeneous linear partial differential equation on a convenient finite domain.
- Use a similarity variable (combination of variables) to find the solution of a partial differential equation on a semi-infinite domain.

Textbooks, Required Readings and Materials:

No textbook is required and lecture notes will be provided to class. However, there are many additional accessible resources that can supplement the material that is discussed in this class. Here are some examples.

- Mathematical Methods for Scientists and Engineers, by Donald McQuarrie.
- Advanced Engineering Mathematics, by Erwin Kreyszig (or Wylie and Barrett, or Gustafson and Wilcox, or Peter O'Neil).
- Mathematical Methods for Physicists, by Arfken, Weber and Harris.
- MIT Open Courseware: http://ocw.mit.edu/index.htm. If you can't follow my lectures, perhaps some of these will be of help. For example, see https://ocw.mit.edu/courses/mathematics/18-06sc-linear-algebra-fall-2011/.
- The Kahn Academy: https://www.khanacademy.org/math (mostly basic material, but great for reviewing).

Course Access:

Canvas can be accessed by my.asu.edu or asu.instructure.com.

MATLAB Software:

MATLAB will be used to demonstrate some of the topics; however, you will not be required to write programming code for this course. If you are interested, ASU provides MATLAB license to all students. You can go to MyApps and search for "matlab" to download it on your computer. Also, make sure you click on "Student Licensing" to get the licensing info. All students have also the option to run MATLAB via the Web. Users just need to click on the "Run App" link in My Apps.

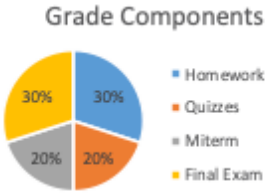
Student Success:

To be successful in this course, I encourage you to

- check Canvas daily for course announcements, HW assignments and posted files
- complete assignments by the due dates specified
- communicate regularly with your instructor and peers
- create a study and/or assignment schedule to stay on track
- access ASU Online Student Resources or CISA Academic Resources

Grade Criteria and Scale:

Your grade will be determined by the total points you accumulate based on the grading schema.



Grading Scale			
A+	> 98 %	B	80 – 85%
A	90 – 98%	B-	75 – 80%
A-	88 – 90%	C	70 – 75%
B+	85 – 88%	E	< 70%

The scale above reflects a limit for the minimum score necessary to achieve a specified grade. Except for the requirement of 98% or greater for an A+, which will not change, at the instructor's discretion the scale may be lowered to reflect challenging assignments or exams. This can result in confusion over your current standing in the class. If this occurs, please contact the instructor for clarification.

Assignment Details:

There will be weekly homework assignments. Please check Canvas for details.

Submitting Assignments:

For your own protection, I encourage you to keep a copy of everything you hand in, and keep your graded assignments at least until grades are finalized at the end of the semester. Assignment due dates follow Arizona Standard time. The following link Time Converter helps you to account for the difference in Time Zones. Note: Arizona does not observe daylight savings time.

Late or Missed Assignments:

I encourage you to notify me before an assignment is due if an urgent situation arises and you are unable to submit the assignment on time. Late assignment without advance notice will not be accepted. Please follow the appropriate University policies to request an accommodation for religious practices, or to request accommodation for missed assignments due to University-sanctioned activities or active military service.

Attendance and Quiz Policy:

Attendance will not be taken for grade; however, I highly encourage you to attend classes so you will not miss important announcements/quizzes/course materials. Please notify me in advance if you have to miss a class so that a make-up quiz, if any, can be arranged. No make-up quiz will be given due to absence without advance notice or proper documentation.

General Comments on This Course:

The mathematical background of students in this class varies considerably, but it is assumed that everyone has completed a multi-semester sequence in calculus, ordinary differential equations, and is familiar with fundamental concepts of linear algebra. For those of you that have had additional mathematics much of this material will be a review, while for others even the basic topics may be challenging. The goal is for everyone to leave this class with the level of mathematical maturity necessary to study advanced topics in engineering.

The pace of this course will be faster than some of you are accustomed to, especially if you are just entering graduate school. Some of the assignments will be challenging, and some will purposely cover topics that are not described in the lectures or the text, requiring you to search out and learn material necessary to complete the assignments. I recommend you to rewrite your results and write up your solutions in a coherent fashion, otherwise, they may be difficult to follow and you may lose points. Consequently, **it is very important that you budget the time necessary to successfully complete this course.**

Classroom Community:

Except for viewing lecture notes, no other usage of cellphone nor laptop are allowed during class time.

In order to build a course climate that is comfortable for all, I encourage you to (1) display respect for all members of the class – including the instructor and students; (2) pay attention to and participate in all interactive student partner/instructor sessions and activities; and (3) observe the rules of appropriate online behavior (also known as netiquette). This term is defined by the instructor and includes keeping course discussion posts and oral communication with other students (or the instructor) focused on the assigned topics. I hope you can maintain a cordial atmosphere and use tact in expressing differences of opinion; in addition, you should avoid racist, sexist, homophobic, or other negative language that may unnecessarily exclude course members. This is not an exhaustive list of behaviors; rather, it represents examples of the types of things that can have a dramatic impact on the course environment. Your final grade may be reduced each time you engage in the types of negative behaviors indicated above.

Email:

ASU email is an official means of communication among students, faculty, and staff. I recommend you to read and act upon email in a timely fashion and check your ASU-assigned email regularly. ***All instructor correspondence will be sent to your ASU email account.***

Drop and Add Dates/Withdrawals:

If you are unable to take this course for any reason, be aware that there is a limited timeline to drop or add the course. I recommend you to consult with your advisor and notify your instructor to add or drop this course. If you are considering a withdrawal, please review the following ASU policies: Withdrawal from Classes, Withdrawing as a Financial Aid Recipient, Medical/Compassionate Withdrawal, and a Grade of Incomplete.

Grade Appeals:

Students must first speak with the instructor of the class to discuss any disputed grades. If, after review, a resolution is not achieved, students may proceed with the appeal process. Student grade appeals must be processed in the regular semester immediately following the issuance of the grade in dispute (by commencement for fall or spring), regardless whether the student is enrolled at the university. Complete details are available in the CISA Grade Appeals policy.

Harassment Prohibited:

ASU policy prohibits harassment on the basis of race, sex, gender identity, age, religion, national origin, disability, sexual orientation, Vietnam era veteran status, and other protected veteran status. Violations of this policy may result in disciplinary action, including termination of employees or expulsion of students. Students are encouraged to report harassment to instructors and the Dean of Students Office.

Student Conduct and Academic Integrity:

ASU and the College of Integrative Sciences and Arts expects and requires its students to act with honesty, integrity, and respect. Required behavior standards are listed in the Student Code of Conduct and Student Disciplinary Procedures, Computer, Internet, and Electronic Communications policy, ASU Student Academic Integrity Policy, and outlined by the Office of Student Rights & Responsibilities. Anyone in violation of these policies is subject to sanctions. Students are entitled to receive instruction free from interference by other members of the class. An instructor may withdraw a student from the course when the student's behavior disrupts the educational process per Instructor Withdrawal of a Student for Disruptive Classroom Behavior. The Office of Student Rights and Responsibilities accepts incident reports from students, faculty, staff, or other persons who believe that a student or a student organization may have violated the Student Code of Conduct.

Students must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.

Academic honesty is expected of all students in all examinations, papers, laboratory work, academic transactions and records. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification and dismissal. For more information, see provost.asu.edu/academicintegrity.

If you fail to meet the standards of academic integrity in any of the criteria listed on the university policy website, sanctions will be imposed by the instructor, college, and/or dean. Academic dishonesty includes, but is not limited to, cheating on an academic evaluation or assignment, plagiarizing, academic deceit (such as fabricating data or information), or falsifying academic records. Turning in an assignment (all or in part) that you completed for a previous class is considered self-plagiarism and falls under these guidelines. Any infractions of self-plagiarism are subject to the same penalties as copying someone else's work without proper citations. Students who have taken this class previously and would like to use the work from previous assignments should contact the instructor for permission to do so.

If you have any questions about your work and the academic integrity policy, please discuss your assignment or concerns with your instructor, teaching assistant, or your college Academic Integrity Officer in advance of submitting an assignment. Student resources on Sun Devil Integrity and strategies for completing your work with integrity and avoiding plagiarism are available here: ASU Student Resources for Academic Integrity or provost.asu.edu/academicintegrity for more information.

Title IX:

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish to discuss any concerns confidentially and privately. ASU online students may access 360 Life Services, https://goto.asuonline.asu.edu/success/online-resources.html.

Student Accessibility and Inclusive Learning Services (SAILS):

Qualified students with disabilities who will require disability accommodations in this class are encouraged to make their requests to me at the beginning of the semester either during office hours or by appointment. Note: Prior to receiving disability accommodations, verification of eligibility from the **Student Accessibility and Inclusive Learning Services** is required. Disability information is confidential.

Website: eoss.asu.edu/drc; **Email:** DRC@asu.edu; **Phone:** 480-965-1234; **FAX:** 480-965-0441

Statement on Inclusion:

Arizona State University is deeply committed to positioning itself as one of the great new universities by seeking to build excellence, enhance access and have an impact on our community, state, nation and the world. To do that requires our faculty and staff to reflect the intellectual, ethnic and cultural diversity of our nation and world so that our students learn from the broadest perspectives, and we engage in the advancement of knowledge with the most inclusive understanding possible of the issues we are addressing

through our scholarly activities. We recognize that race and gender historically have been markers of diversity in institutions of higher education. However, at ASU, we believe that diversity includes additional categories such as socioeconomic background, religion, sexual orientation, gender identity, age, disability, veteran status, nationality and intellectual perspective.

Mental Health:

As a student, like anyone else, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These emotional health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. ASU Counseling Services provides counseling and crisis services for students who are experiencing a mental health concern. Any student may call or walk-in to any ASU counseling center for a same day or future appointment to discuss any personal concern. Here is the Web site: eoss.asu.edu/counseling. After office hours and 24/7 ASU's dedicated crisis line is available for crisis consultation by calling 480-921-1006.

Establishing a Safe Environment:

Learning takes place best when a safe environment is established in the classroom. In accordance with SSM 104-02 of the Student Services Manual, students enrolled in this course have a responsibility to support an environment that nurtures individual and group differences and encourages engaged, honest discussions. The success of the course rests on your ability to create a safe environment where everyone feels comfortable to share and explore ideas. We must also be willing to take risks and ask critical questions. Doing so will effectively contribute to our own and others intellectual and personal growth and development. We welcome disagreements in the spirit of critical academic exchange, but please remember to be respectful of others' viewpoints, whether you agree with them or not.

All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students. If either office determines that the behavior poses or has posed a serious threat to personal safety or to the welfare of the campus, the student will not be permitted to return to campus or reside in any ASU residence hall until an appropriate threat assessment has been completed and, if necessary, conditions for return are imposed. ASU PD, the Office of the Dean of Students, and other appropriate offices will coordinate the assessment in light of the relevant circumstances.

Prohibition of Commercial Notetaking Services:

In accordance with ACD 304-06 Commercial Note Taking Services, written permission must be secured from the official instructor of the class in order to sell the instructor's oral communication in the form of notes. Notes must have the note taker's name as well as the instructor's name, the course number, and the date.

Course Evaluation:

I would really appreciate it if you can complete the course evaluation near the end of the semester. The feedback provides valuable information to me and the college and is used to improve student learning. The results are always anonymous and cannot be reviewed by the instructor/department until after final grades have been posted.

Trigger Warning:

Please note that some course content may be deemed offensive by some students, although it is not my intention to offend anyone. In addition, some materials that we link with online might also be considered offensive, troubling, or difficult to review in terms of language or graphics. I attempt to provide warnings when introducing this kind of material; yet if I forget to do so, or if something else seems offensive, please contact me at Xianping.Li@asu.edu, or the faculty head, Igor Shovkovy, at Igor.Shovkovy@asu.edu.

Academic Affairs Manual:

For a complete guide to ASU course policies, please refer to the Academic Affairs Manual (ACD).

Syllabus Disclaimer:

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. Remember to check your ASU email and the course site often.

Course Topics and Tentative Schedule:

Week #	Topics	Notes
1	School starts on Thursday	No class
2	Introduction and review of properties of Matrices	Syllabus, notes, McQuarrie Ch9
3	Review of Linear Algebra	Notes, McQuarrie Ch9 and Ch10
4	Review of ordinary differential equations, part 1	Notes, McQuarrie Ch10 and Ch11
5	Review of ordinary differential equations, part 2	Notes, McQuarrie Ch11
6	Series solutions of differential equations, special functions	Notes, McQuarrie Ch12
7	General theory of linear ordinary differential equations	Notes, McQuarrie Ch14
8	Review Discussion of **Midterm Exam**	
9	Sturm-Liouville differential equations and associated theory	Notes, McQuarrie Ch14 and Ch15
10	The calculus of common transforms	Notes, McQuarrie Ch15 and Ch17
11	Using the Laplace transform, review of the algebra and differential calculus of vectors	Notes, McQuarrie Ch7, 8 and Ch17
12	The differential and integral calculus of vectors	Notes, McQuarrie Ch7 and Ch8
13	Curvilinear coordinate systems and Introduction to Partial Differential Equations (PDEs)	Notes, McQuarrie Ch7, 8 and Ch16
14	Partial differential equations	Notes, McQuarrie Ch16
15	Partial differential equations Discussion of **Final Exam**	Notes, McQuarrie Ch16
16	Final Exam (comprehensive)	Final Exam

The above topics and schedule may be subject to change based on the course requirement and progress.