

San José State University
Department of Mechanical Engineering
ME 230 – Advanced Mechanical Engineering Analysis, Section 01,
Fall 2022

Course and Contact Information

Instructor:	Dr. Feruza Amirkulova
Office Location	Engineering Building, Room 310J
Lecture:	Monday, Wednesday 4:30pm – 5:45pm (PT)
Classroom:	E303
Telephone:	(408) 924-2045
Email:	feruza.amirkulova@sjsu.edu
Office Hours:	Monday, Wednesday 3 pm to 4 pm (PT)

Prerequisite: (BSME or BSAE) OR (ME 130 or equivalent) OR (Instructor's Consent)

Proof of Prerequisites

As part of the requirements, you must submit proof of prerequisites to your instructor before the second day of the class in order to remain enrolled. A survey on Canvas is designated to this part where you upload an unofficial copy of your transcripts with prerequisite courses highlighted. If your courses are being transferred or evaluated, please attach a course description to your unofficial transcripts.

Course Materials

Copies of the course materials including the syllabus, homework solutions, slides, and MATLAB codes will be available on course webpage at Canvas

Course Description

- Designed to supplement and enrich students with advanced mathematical methods in treating problems selected from various areas of mechanical engineering. Application to engineering problems including numerical solutions. Several Computer Projects will be assigned including Final Project.
- 3 units.

Course Goal(s)

The goal of this course is to educate students on advanced techniques which are used to solve mathematical equations that describe engineering problems.

Learning Objectives:

1. To learn different analytical and numerical techniques used to solve ordinary and partial differential equations that arise in modeling engineering problems
2. To be able to create mathematical models for engineering problems using differential equations and appropriate boundary conditions.

Course Format and Classroom Protocol

The course format will be in-person however due to developing conditions in response to COVID-19 some modifications may apply that will be discussed in class. The course relies on lecture materials presented in class. Class participation and attendance are strongly encouraged. Students should attend all classes and take class notes

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to support their reading assignments. Use of cell-phones is not allowed except during taking quizzes using iClicker (see <https://www.iclicker.com/students> for instructions). Laptop computers and tablet are allowed for taking lecture notes on the front row only.

Textbooks:

There is no requirement for purchasing a textbook for this course. The content of this class, however, is inspired by the following item:

- Zill, Dennis G.. “Advanced Engineering Mathematics”, 7th edition, Jones & Bartlett Learning, 2020.

Other Reference Books:

- “Advanced Engineering Mathematics.” Michael D. Greenberg. Pearson. Second Edition. 1998.

Library Liaison

Engineering library liaison: Jane Dodge, jane.dodge@sjsu.edu, Phone number: 408-808-2087

See also Mechanical Engineering LibGuide at: <https://libguides.sjsu.edu/me>

Technology requirements and Software

- In this course, students will study how to use MATLAB to simulate different mechanical phenomena that arise in engineering applications. They will also explore how to use various MATLAB embedded functions and solvers to tackle different engineering problems. MATLAB is installed in COE computer labs, and may have access to it via VPN on their computers.
- San Jose State University provides MATLAB, Simulink and add-on toolboxes free to students for coursework and academic research. Campus-wide license allows installation of MATLAB on personal computers of SJSU students and faculty. Go to: San Jose State University’s MATLAB Portal [here](#) to download the software to your personal computer. Training and Help resources can also be found on the MATLAB Portal: <http://www.mathworks.com/academia/tah-portal/san-jose-state-university-31511582>

Assignments and Grading Policy

Course grade will be based on homework assignments, exams, final computer project and class participation. Homework assignments consist of regular written assignments and a couple of computer projects with MATLAB coding.

Homework and Computer Projects: 20%

Exam-1: 25%

Exam-2: 25%

Final Project: 25% (5% - Presentation (video and slides), 5% - Codes & Simulation Model, 15% - Report)

Class participation: 5% (Class discussions, participation, group solving problems, iClicker quizzes)

Homework will be assigned weekly on each Monday and is due on next Monday. Homework will be graded and returned the following week.

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of forty-five hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation, studying or course related activities including but not limited to internships, labs, clinical practical. Other course structures will have equivalent workload expectations as described in the syllabus.

Examinations

Two 75-minute exams and one final computer project.

Class Protocol

Class participation and attendance are strongly encouraged. Use of cell-phones is not allowed except during taking quizzes using iClicker (see <https://www.iclicker.com/students> for instructions).

University Policies

Academic integrity

Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The [University's Academic Integrity policy](http://www.sjsu.edu/senate/S07-2.htm), located at <http://www.sjsu.edu/senate/S07-2.htm>, requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The [Student Conduct and Ethical Development](http://www.sa.sjsu.edu/judicial_affairs/index.html) website is available at http://www.sa.sjsu.edu/judicial_affairs/index.html.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU's Academic Policy S07-2 requires approval of instructors.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with the [Disability Resource Center \(DRC\)](http://www.drc.sjsu.edu/) at <http://www.drc.sjsu.edu/> to establish a record of their disability.

Resources

If you need special accommodations throughout the course please contact me personally. Also, you can find support and useful information in [Accessible Education Center \(AEC\)](https://www.sjsu.edu/aec/index.php)'s page at <https://www.sjsu.edu/aec/index.php>

- The Learning Assistance Resource Center (LARC) is located at Room 600 in the Student Services Center. It is designed to assist students in the development of their full academic potential and to motivate them to become self-directed learners. The center provides support services, such as skills assessment, individual or group tutorials, subject advising, learning assistance, summer academic preparation, and basic skills development. The LARC web-site is <https://peerconnections.sjsu.edu/>. Additional tutoring may be available through the engineering honor societies.
- In case you need help with purchasing the textbook or obtaining the required technologies that are essential for being successful in this class, please visit [Affordable Learning Solutions](https://library.sjsu.edu/affordable-learning-solutions/affordable-learning-solutions) available at <https://library.sjsu.edu/affordable-learning-solutions/affordable-learning-solutions>.
- If you need assistance with basic equipment needs please visit the [Learn Anywhere's Technology](https://www.sjsu.edu/learnanywhere/equipment/index.php) page at <https://www.sjsu.edu/learnanywhere/equipment/index.php>

Canvas, Communication, and Connect

- Copies of the course materials such as the syllabus, assignments, exam review materials, eclectic presentations, and etc. may be found on the Canvas site for the class. Canvas, also, shows you your grades and allows for discussion forums within the class. This feature may be helpful if you or your group need assistance on understanding a concept, a homework problem, or a project.
- To log in, go to the [Canvas URL](https://www.canvas.net) at <https://www.canvas.net>. Log in with your 9-digit SJSU ID and Password. For questions on how to use Canvas, please visit http://www.sjsu.edu/at/ec/canvas/student_resources/index.html
- You are responsible for regularly checking with the messaging system through Canvas. You can set up your account to forward all emails sent to your Canvas account to any other email address you regularly use.

Classroom Protocols

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University Policies

Students are responsible for understanding the policies and procedures about academic integrity, accommodations,

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc.

Refer to the current semester's [Catalog Policies](http://info.sjsu.edu/static/catalog/policies.html) section at <http://info.sjsu.edu/static/catalog/policies.html>.

Add/drop deadlines can be found on the [current academic calendar](http://www.sjsu.edu/academic_programs/calendars/academic_calendar/) web page located at

http://www.sjsu.edu/academic_programs/calendars/academic_calendar/. The [Late Drop Policy](http://www.sjsu.edu/aars/policies/latedrops/policy/) is available at

<http://www.sjsu.edu/aars/policies/latedrops/policy/>. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the [Advising Hub](http://www.sjsu.edu/advising/) at <http://www.sjsu.edu/advising/>.

Last Day to Drop Class: August 31 2022

Last Day to Add Class: September 8 2022

Holidays: November 1 2022, *Veteran's Day* (Observed) - Campus Closed

November 24 2022, *Thanksgiving Holiday* (Observed) - Campus Closed

Last Day of Instructions: December 06 2022

General Attendance Policies

You should attend every class session. However, extenuating circumstances may arise that can affect your schedule. In case, you cannot attend a session, please let me know in advance.

- Please do not use cell-phones during sessions except Clicker quiz sessions
- Discussion forums/boards and chat sections are designed for enriching the course content and enhancing your learning experience. Please follow the Netiquette expectations available on Canvas and avoid out of the course context material.

The Instructional Team Code of Conduct

The instructional team affirms and commits to the following and encourages you to,

- Promote the diversity of opinions, ideas, and backgrounds which are crucial for academic pursuits
- Practice personal and academic integrity
- Respect the dignity and work of others
- Promote a culture of respect within and outside of the class and through discussion forums and/or other online platforms
- Respect the privacy, property, and freedom of others
- Reject bigotry, discrimination, and violence or intimidation of any kind

Clicker Technology:

In this course, we will be using clicker technology to collect student responses to questions posted in class. Points will be awarded based on participation. Please do not purchase any clicker technologies, as they are free to SJSU students from iClicker.

Students are responsible for creating a free student account at www.iClicker.com, and adding this course to their account. Detailed instructions are available on the [SJSU eCampus website](http://www.sjsu.edu/eCampus). Please contact [eCampus](http://www.sjsu.edu/eCampus) with any questions or issues with the iClicker technology.

iClicker Cloud

I will be using iClicker Cloud this semester to conduct polls, quizzes, and/or attendance in class. This will help me understand what you know and give everyone a chance to participate in class. This will also give you feedback on how well you are comprehending course concepts, help you master the challenging material in this class, and allow you to review material after class.

You are required to bring a device to participate in my iClicker sessions during class. I will be allowing the use of iClicker Reef on a smartphone, tablet or laptop OR iClicker remotes.

It is your responsibility to properly register your iClicker Reef device and/or iClicker remote in a timely fashion. It is also your responsibility to regularly check your iClicker grades for any discrepancies and bring them to my

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attention quickly.

Registration Instructions:

Regardless of which device you use in class, you must create an iClicker Reef account—or use your existing Reef account if you already have one—to ensure that your grades sync to my iClicker gradebook. You can do this by downloading the mobile app via the App Store or Google Play, or by visiting iclicker.com.

It is your responsibility to make sure your account is in working order, and to regularly check your grades for any discrepancies and bring them to my attention immediately. If you already have a Reef account, simply add my course to it. **Do not create a duplicate account.**

Grading Information

Class attendance/polls will be worth X% of your final grade. You will earn X points for each correct question you answer.

Academic Integrity Information

iClicker activities fall under the provisions of our campus's academic honesty policy. Students must not engage in academic dishonesty while participating in iClicker activities. This includes but is not limited to answering polling questions while not physically in class, looking at other students' devices while answering live questions, or using more than one iClicker remote or account at a time. Any student found to be in violation of these rules will lose polling points for the entire term and may be reported to the Dean of Student Discipline.

Need Help?

You can contact eCampus or check their website for more information. Contact information: Email=ecampus@sjsu.edu Phone= (408)924-2337 Building/Room= IRC206
Website: www.sjsu.edu/ecampus

You may also find the answers to many of your questions by visiting iclicker.com/support.

Tentative Schedule

Please visit the [Spring 2022's academic calendar](https://www.sjsu.edu/registrar/calendar/spring-2022.php) –available at <https://www.sjsu.edu/registrar/calendar/spring-2022.php>– for a detailed schedule of the events, deadlines, and due dates. A tentative schedule of the course is given below.

ME 230 – Advanced Mechanical Engineering Analysis, Fall 2022 Course Schedule/Outline

NOTE: This is not a firm list. There may be additions or deletions during the semester

Week	Date	Lecture Topics	Sections in Text
1	08/22, 08/24	Introduction. Syllabus review Mathematical modeling. Ordinary Differential Equations (ODE) - Review of the 1st-order ODEs - Qualitative behavior of simple ODEs	Chapter 1-2
2	08/29, 08/31	Ordinary Differential Equations (ODE) - Separable equations, linear equations, Exact equations - Solution by substitution - Linear models Review of the high-order ODEs - IVPs, BVPs - Homogeneous and nonhomogeneous equations	Chapter 2-3
3	9/05	No Class, Labor Day Holiday	
3	09/07	Review of the high-order ODEs - Reduction of order - Homogeneous linear equations with constant coefficients	Chapters 3
4	09/12, 09/14	High-order ODEs - Method of undetermined coefficients - Variation of parameters - Cauchy-Euler equations	Chapter 3

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Week	Date	Lecture Topics	Sections in Text
		- Linear IVP and BVP problems	
5	09/19, 09/21 09/26	- System of linear differential equations Laplace transform and applications in solving ODEs.	Chapter 8, 10, 4
	09/28	EXAM-1	
7	10/03, 10/05	Series solution of Linear Differential Equations - Solutions about ordinary points - Solutions about singular points	Chapter 5
8	10/10, 10/12	Series solution of Linear Differential Equations - Bessel and Legendre functions	Chapter 5
9	10/17, 10/20	Orthogonal Functions and Fourier Series - Fourier series, Fourier sine and cosine series - Complex Fourier series - Sturm-Liouville problem	Chapter 12
10	10/24, 10/26	Partial Differential Equations (PDE) Boundary value problems in rectangular coordinates - Separation of variables - Classic PDEs - Heat equation	Chapter 13
11	10/31, 11/02	Boundary value problems in rectangular coordinates - Wave equations - Laplace's equations - Nonhomogeneous BVPs	Chapter 13
12	11/07, 11/09	Boundary value problems in rectangular coordinates - Orthogonal series expansions - Other coordinates	Chapter 13
13	11/14	EXAM-2	
13	11/16	Laplace transform and solving PDEs - Error function - Application of Laplace Transform in solving PDEs	Chapter 15
14	11/21	Fourier Transform and solving PDEs - Fourier Integral	Chapter 15
14	11/23	No Class on campus, due to upcoming Thanksgiving holiday	
15	11/28, 11/30	Fourier Transform and solving PDEs - Fourier Transform Numerical solution of PDEs - Introduction to Finite Difference Method	Chapter 15, 16
16	12/05	Numerical solution of PDEs - Introduction to Finite Difference Method	Chapter 16
	12/14, 2:45-5:00 PM	FINAL SIMULATION PROJECT Presentations	