San Jose State University
Department of Mechanical Engineering
ME 230, Advanced Mechanical Engineering Analysis, Spring 2020

Instructor:	Younes Shabany
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Office Hours:	Mondays 4:30 – 5:45 PM and 8:45 PM to 9:30 PM
Class Days/Time:	Mondays and Wednesdays 6:00 – 7:15 PM
Classroom:	Clark 234
Prerequisites:	BSME or BSAE, ME 130 or Equivalent, or Instructor's Consent

Canvas and Course Messaging

Copies of the course materials such as the syllabus, course notes, assignments, homework solutions, etc. will be posted on the Canvas site for the class. I will be using this system for any communication with the class. This system will also allow you to have discussions or chat with others in the class. This feature may be especially helpful if you need assistance on a homework problem.

To log in, go to the Canvas URL http://sjsu.instructure.com. Log in with your 9-digit SJSU ID and password you use for your SJSUOne account. For questions on the use of Canvas, please check out 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 Canvas account to forward all email sent to your Canvas account to any other email address you wish.

Course Description

Designed to supplement and enrich students with advanced mathematical methods in treating problems selected from various areas of mechanical engineering.

Course Goals

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

Student Learning Objectives

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

Required Texts/Readings

Textbook

"Advanced Engineering Mathematics", Dennis G. Zill, 6th Edition, Jones and Bartlett Publishers, 2018

Classroom Protocol

- Class attendance and arriving on time are necessary.
- Participation in class discussions is encouraged.
- No cell phone or computer use is allowed during the lecture.

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 section at http://info.sjsu.edu/static/catalog/policies.html. Add/drop deadlines can be found on the current academic year calendars document on the Academic Calendars webpage at http://www.sjsu.edu/provost/services/academic_calendars/. The Late Drop 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 at http://www.sjsu.edu/advising/.

Assignments

Academic Policy S12-3 at http://www.sjsu.edu/senate/docs/S12-3.pdf has defined expected student workload as follows:

"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 practica. Other course structures will have equivalent workload expectations as described in the syllabus."

Homework assignments will challenge students' problem solving skills and may require using computer tools such as Excel.

- Homework sets have to be turned in before the lecture starts on the date they are due.
- Every student can submit up to 2 homework sets with a maximum of one-week delay, and 10% penalty on the total grade of those homework sets.
- Homework shall be professional, neat and easy to follow.

Grading Policy

Homework:	20%
Projects:	15%
Midterm 1 (Wednesday, March 4, Class Time):	15%
Midterm 2 (Wednesday, April 22, Class Time):	20%
Final Exam (Wednesday, May 13, 5:15 – 7:30 PM):	30%

- The dates for midterm and final exams are final and will not change.
- All students shall plan to take the midterm and final tests on these dates.
- If you can not take either a midterm or the final test on these dates, only due to circumstances beyond your control, please let me know two weeks in advance to make alternative arrangements.

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 S07-2, located at http://www.sjsu.edu/education/Palgiarism.pdf 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 website is available at http://www.sjsu.edu/studentconduct/.

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 Integrity 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 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Disability Resource Center (DRC) at http://www.drc.sjsu.edu/ to establish a record of their disability.

Tentative Topics and Schedule

Week	Date	Topic	Textbook Reading
1	January 27	Introduction	
	January 29	Differential Equations as Mathematical Models	1.3
		Definitions and Terminology	1.1
		Initial-Value Problems	1.2
2	February 3	First Order Ordinary Differential Equations	
	February 5	Separable Equations	2.2
		Linear Equations	2.3
		Exact Equations	2.4
		Solution by Substitution	2.5
		Linear and Nonlinear Models	2.7, 2.8
3	February 10	Higher Order Ordinary Differential Equations	
	February 12	Initial-Value, Boundary-Value, Homogeneous and Nonhomogeneous	3.1
		Equations	3.2
		Reduction of Order	3.3
		Homogeneous Linear Equations with Constant Coefficients	3.4
4	February 17	Method of Undetermined Coefficients	3.5
	February 19	Method of Variation of Parameters	3.6
		Cauchy-Euler Equation	3.7
		Nonlinear Equations	3.8
		Linear Models; Initial-Value Problems	3.9
		Linear Models; Boundary-Value Problems	3.11
		Nonlinear Models	
5	February 24	Laplace Transform	
	February 26	Definition of Laplace Transform	4.1
		The Inverse Transfer and the Transform of Derivative	4.2
6	March 2	Translation Theorems	4.3
		Derivative of Transform, Transform of Integrals and Periodic Functions	4.4
		The Dirac Delta Function	4.5
	March 4	**Midterm 1**	
7	March 9	Series Solutions of Linear Differential Equations	
	March 11	Solutions about Ordinary Points	5.1
		Solutions about Singular Points	5.2
8	March 16	Series Solutions of Linear Differential Equations	
	March 18	Bessel and Legendre Functions	5.3
9	March 23	Orthogonal Functions and Fourier Series	
	March 25	Orthogonal Function	12.1
		Fourier Series	12.2
		Fourier Cosine and Sine Series	12.3
10	**March 30**	**Spring Break**	
	April 1		

11	April 6 April 8	Orthogonal Functions and Fourier Series Complex Fourier Series Sturm-Liouville Problem Fourier-Bessel and Fourier-Legendre Series	 12.4 12.5 12.6
12	April 13 April 15	Boundary-Value Problems in Rectangular Coordinates The Method of Separation of Variables Classical Partial Differential Equations and Bounday-Value Problems Heat Equation	 13.1 13.2 13.3
13	April 20 **April 22**	Boundary-Value Problems in Rectangular Coordinates Wave Equation Laplace's Equation Nonhomogeneous Boundary-Value Problems Orthogonal Series Expansions **Midterm 2**	 13.4 13.5 13.6 13.7
14	April 27 April 29	Boundary-Value Problems in Other Coordinate Systems Polar Coordinates Cylindrical Coordinates Spherical Coordinates	 14.1 14.2 14.3
15	May 4 May 6	Laplace Transform and Solving Partial Differential Equations Error Function Application of Laplace Transform in Solving PDEs	 15.1 15.2
16	May 11 **May 13**	Fourier Transform and Solving Partial Differential Equations Fourier Integral Fourier Transform **Final Exam**	 15.3 15.4