

**San Jose State University**  
**Department of Mechanical Engineering**  
**ME 230, Advanced Mechanical Engineering Analysis, Fall 2019**

<b>Instructor:</b>	Younes Shabany
<b>Office Location:</b>	ENG 348
<b>Telephone:</b>	(408) 313-8391
<b>Email:</b>	<a href="mailto:yshabany@yahoo.com">yshabany@yahoo.com</a>
<b>Office Hours:</b>	Mondays 4:30 – 5:45 PM
<b>Class Days/Time:</b>	Mondays and Wednesdays 6:00 – 7:15 PM
<b>Classroom:</b>	ENG 339
<b>Prerequisites:</b>	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](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, 6<sup>th</sup> 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](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 year calendars document on the [Academic Calendars webpage](http://www.sjsu.edu/provost/services/academic_calendars/) at [http://www.sjsu.edu/provost/services/academic\\_calendars/](http://www.sjsu.edu/provost/services/academic_calendars/). 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/>.

## Assignments

[Academic Policy S12-3](http://www.sjsu.edu/senate/docs/S12-3.pdf) 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 the student receives on those homework sets.
- Homework shall be professional, neat and easy to follow.

## Grading Policy

Homework:	20%
Midterm 1 (Wednesday, October 2, Class Time):	20%
Midterm 2 (Wednesday, November 6, Class Time):	25%
Final Exam (Wednesday, December 11, 5:15 – 7:30 PM):	35%

- 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](http://www.sjsu.edu/education/Palgiarism.pdf), 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](http://www.sjsu.edu/studentconduct/) 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](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) at [http://www.sjsu.edu/president/docs/directives/PD\\_1997-03.pdf](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](http://www.drc.sjsu.edu/) (DRC) at <http://www.drc.sjsu.edu/> to establish a record of their disability.

## Tentative Topics and Schedule

Week	Date	Topic	Textbook Reading
1	August 21	Introduction Differential Equations as Mathematical Models Definitions and Terminology Initial-Value Problems	1.3 1.1 1.2
2	August 26 August 28	First Order Ordinary Differential Equations Separable Equations Linear Equations Exact Equations Solution by Substitution Linear and Nonlinear Models	2.2 2.3 2.4 2.5 2.7, 2.8
3	<b>September 2</b> September 4	<b>Labor Day, Campus Closed</b> Higher Order Ordinary Differential Equations Initial-Value, Boundary-Value, Homogeneous and Nonhomogeneous Equations Reduction of Order	3.1 3.2
4	September 9 September 11	Homogeneous Linear Equations with Constant Coefficients Method of Undetermined Coefficients Method of Variation of Parameters Cauchy-Euler Equation Nonlinear Equations Linear Models; Initial-Value Problems Linear Models; Boundary-Value Problems Nonlinear Models	3.3 3.4 3.5 3.6 3.7 3.8 3.9 3.11
5	September 16 September 18	Laplace Transform Definition of Laplace Transform The Inverse Transfer and the Transform of Derivative	4.1 4.2
6	September 23 September 25	Translation Theorems Derivative of Transform, Transform of Integrals and Periodic Functions The Dirac Delta Function	4.3 4.4 4.5
7	September 30 <b>October 2</b>	Series Solutions of Linear Differential Equations Solutions about Ordinary Points <b>Midterm 1</b>	5.1
8	October 7 October 9	Series Solutions of Linear Differential Equations Solutions about Singular Points Bessel and Legendre Functions	5.2 5.3
9	October 14 October 16	Orthogonal Functions and Fourier Series Orthogonal Function Fourier Series Fourier Cosine and Sine Series	12.1 12.2 12.3
10	October 21 October 23	Orthogonal Functions and Fourier Series Complex Fourier Series Sturm-Liouville Problem Fourier-Bessel and Fourier-Legendre Series	12.4 12.5 12.6

11	October 28	Boundary-Value Problems in Rectangular Coordinates	
	October 30	The Method of Separation of Variables	13.1
		Classical Partial Differential Equations and Boundary-Value Problems	13.2
		Heat Equation	13.3
		Wave Equation	13.4
		Laplace's Equation	13.5
		Nonhomogeneous Boundary-Value Problems	13.6
		Orthogonal Series Expansions	13.7
12	November 4	Review	
	<b>November 6</b>	<b>Midterm 2</b>	
13	<b>November 11</b>	<b>Veteran's Day, Campus Closed</b>	
	November 13	Boundary-Value Problems in Other Coordinate Systems	
		Polar Coordinates	14.1
		Cylindrical Coordinates	14.2
14	November 18	Laplace Transform and Solving Partial Differential Equations	
		Error Function	15.1
		Application of Laplace Transform in Solving PDEs	15.2
	November 20	Fourier Transform and Solving Partial Differential Equations	15.3
		Fourier Integral	
15	November 25	Fourier Transform and Solving Partial Differential Equations	
		Fourier Integral	15.3
	<b>November 27</b>	<b>No Class – Thanksgiving Holiday</b>	
16	December 2	Fourier Transform and Solving Partial Differential Equations	
	December 4	Fourier Transform	15.4
17	December 9	Review	
	<b>December 11</b>	<b>Final Exam</b>	