

San Jose State University
Department of Mechanical Engineering
ME 230, Advanced Mechanical Engineering Analysis, Fall 2016

Instructor:	Younes Shabany
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Office Hours:	Tuesdays 4:00 – 5:30 PM
Class Days/Time:	Tuesdays and Thursdays 7:30 – 8:45 PM
Classroom:	Clark 202
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 and Warren S. Wright, 5th Edition, Jones and Bartlett Publishers, 2014

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/. 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.
- Homework sets may be submitted with a maximum of one week delay, but with 10% penalty.
- Homework shall be professional, neat and easy to follow.

Grading Policy

Homework:	20%
Midterm 1 (Thursday, October 6, Class Time):	20%
Midterm 2 (Thursday, November 10, Class Time):	25%
Final Exam (Thursday, December 15, 7:45 – 10:00 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 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 25	Introduction Differential Equations as Mathematical Models Definitions and Terminology Initial-Value Problems	1.3 1.1 1.2
2	August 30 September 1	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	September 6 September 8	Higher Order Ordinary Differential Equations Initial-Value, Boundary-Value, Homogeneous and Nonhomogeneous Equations Reduction of Order Homogeneous Linear Equations with Constant Coefficients	3.1 3.2 3.3 3.4
4	September 13 September 15	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	3.5 3.6 3.7 3.8 3.9 3.11
5	September 20 September 22	Laplace Transform Definition of Laplace Transform The Inverse Transfer and the Transform of Derivative	4.1 4.2
6	September 27 September 29	Translation Theorems Derivative of Transform, Transform of Integrals and Periodic Functions The Dirac Delta Function	4.3 4.4 4.5
7	October 4 October 6	Series Solutions of Linear Differential Equations Solutions about Ordinary Points Midterm 1	5.1
8	October 11 October 13	Series Solutions of Linear Differential Equations Solutions about Ordinary Points Solutions about Singular Points Bessel and Legendre Functions	5.1 5.2 5.3
9	October 18 October 20	Orthogonal Functions and Fourier Series Orthogonal Function Fourier Series Fourier Cosine and Sine Series	12.1 12.2 12.3
10	October 25 October 27	Orthogonal Functions and Fourier Series Complex Fourier Series Sturm-Liouville Problem Fourier-Bessel and Fourier-Legendre Series	12.4 12.5 12.6

11	November 1 November 3	Boundary-Value Problems in Rectangular Coordinates The Method of Separation of Variables Classical Partial Differential Equations and Bounday-Value Problems Heat Equation Wave Equation Laplace's Equation Nonhomogeneous Boundary-Value Problems Orthogonal Series Expansions	13.1 13.2 13.3 13.4 13.5 13.6 13.7
12	November 8 November 10	Review Midterm 2	
13	November 15 November 17	Boundary-Value Problems in Other Coordinate Systems Polar Coordinates Cylindrical Coordinates Spherical Coordinates	14.1 14.2 14.3
14	November 22 November 24	Laplace Transform and Solving Partial Differential Equations Error Function Application of Laplace Transform in Solving PDEs No Class – Thanksgiving Holiday	15.1 15.2
15	November 29 December 1	Fourier Transform and Solving Partial Differential Equations Fourier Integral Fourier Transform Fast Fourier Transform	15.3 15.4 15.5
16	December 6 December 8	Review	
	December 15	Final Exam	