San Jose State University  
Department of Mechanical Engineering  
ME 130, Applied Engineering Analysis, Fall 2022, Section 03

Instructor: Younes Shabany  
Office Location: ENG 348  
Telephone: (408) 313-8391  
Email: younes.shabany@sjsu.edu  
Office Hours: Fridays 4:00 – 5:45 PM  
Class Days/Time: Wednesdays and Fridays 6:00 – 7:15 PM  
Classroom: Clark 222  
Prerequisites: Math 133A, ME101 with a C- or better  
Corequisite: ME113

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

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 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

Mandatory Textbook


Classroom Protocol

- Class attendance and arriving on time are encouraged.
- Participation in class discussions is encouraged and rewarded.
- Cell phone use in class is prohibited unless it is required for class activities.

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 or MATLAB.

- Homework shall be professional, neat and easy to follow.

### Grading Policy

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<thead>
<tr>
<th>Grade</th>
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<tbody>
<tr>
<td>A</td>
<td>93.0 – 100</td>
<td>A-</td>
<td>90.0 – 92.9</td>
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<tr>
<td>B+</td>
<td>87.0 – 89.9</td>
<td>B</td>
<td>84.0 – 86.9</td>
</tr>
<tr>
<td>C+</td>
<td>77.0 – 79.9</td>
<td>C</td>
<td>74.0 – 76.9</td>
</tr>
<tr>
<td>D</td>
<td>60.0 – 69.9</td>
<td>C-</td>
<td>70.0 – 73.9</td>
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Homework: 20%
Projects: 15%

**Midterm 1 (Friday, September 30, Class Time):** 15%
**Midterm 2 (Friday, November 4, Class Time):** 20%
**Final Exam (Friday, December 9, 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 cannot 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 alternate 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 (DRC)](http://www.drc.sjsu.edu/) at http://www.drc.sjsu.edu/ to establish a record of their disability.
## Tentative Topics and Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Textbook Reading</th>
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</table>
| 1    | August 19     | Introduction to MATLAB  
Textbook Reading: Engineering Computations; An Introduction Using  
MATLAB and EXCEL  
**Mandatory Online Course: MATLAB Onramp** | - |
|      | August 24     | Review of Calculus (See Review of Fundamentals of Calculus) | - |
|      | August 26     | Mathematical Modeling of Engineering Problems  
Differential Equations as Mathematical Models  
Definitions and Terminology  
Initial-Value Problems  
Modeling with Systems of Differential Equations | 1.3  
1.1  
1.2  
2.9 |
| 2    | September 7   | First Order Ordinary Differential Equations  
Separable Equations  
Linear Equations | 2.2  
2.3 |
|      | September 9   | Exact Equations  
Solution by Substitution | 2.4  
2.5 |
| 3    | September 14  | Review  
Midterm 1 | |
| 4    | September 21  | Second Order Ordinary Differential Equations  
Initial-Value, Boundary-Value, Homogeneous and Nonhomogeneous  
Equations  
Reduction of Order  
Homogeneous Linear Equations with Constant Coefficients  
Method of Undetermined Coefficients | 3.1  
3.2  
3.3  
3.4 |
|      | September 23  | Method of Variation of Parameters  
Cauchy-Euler Equation  
Linear Models; Initial-Value Problems  
Linear Models; Boundary-Value Problems | 3.5  
3.6  
3.8  
3.9 |
| 5    | October 5     | Laplace Transform  
Definition of Laplace Transform  
The Inverse Transfer and the Transform of Derivative | 4.1  
4.2 |
|      | October 7     | Translation Theorems  
Derivative of Transform, Transform of Integrals and Periodic Functions  
The Dirac Delta Function | 4.3  
4.4  
4.5 |
| 6    | October 12    | Review  
Midterm 2 | |
|      | October 14    | |
| 7    | September 28  | Review  
Midterm 1 | |
| 8    | October 5     | Second Order Ordinary Differential Equations  
Initial-Value, Boundary-Value, Homogeneous and Nonhomogeneous  
Equations  
Reduction of Order  
Homogeneous Linear Equations with Constant Coefficients  
Method of Undetermined Coefficients | 3.1  
3.2  
3.3  
3.4 |
|      | October 14    | Method of Variation of Parameters  
Cauchy-Euler Equation  
Linear Models; Initial-Value Problems  
Linear Models; Boundary-Value Problems | 3.5  
3.6  
3.8  
3.9 |
| 9    | October 19    | Laplace Transform  
Definition of Laplace Transform  
The Inverse Transfer and the Transform of Derivative | 4.1  
4.2 |
|      | October 21    | Translation Theorems  
Derivative of Transform, Transform of Integrals and Periodic Functions  
The Dirac Delta Function | 4.3  
4.4  
4.5 |
| 10   | October 26    | Review  
Midterm 2 | |
| 11   | October 28    | |
| 12   | November 2    | |
|      | November 4    | |

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<tr>
<th>Week</th>
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<th>Topic</th>
<th>Sections</th>
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| 13   | November 9 | Numerical Solution of Ordinary Differential Equations  
Euler Methods and Error Analysis  
Runge-Kutta Methods  
Higher-Order Equations and Systems  
Second-Order Boundary-Value Problems | 6.1, 6.2, 6.4, 6.5 |
|      | November 11| Veteran’s Day, Campus Closed               |          |
| 14   | November 16| Vectors, Vector Algebra, Vector Calculus    | 7.1 – 7.4, 9.1 – 9.5, 9.7 |
|      | November 18|                                            |          |
| 15   | November 23| Thanksgiving Holiday                       |          |
|      | November 25|                                            |          |
| 16   | November 30| Matrices and Matrix Algebra                | 8.1, 8.4 – 8.6, 8.8 |
|      | December 2 |                                            |          |
| 17   | December 9 | Final Exam                                 |          |