

San José State University
School of Engineering/Department of Mechanical Engineering
ME-186, Introduction to Automotive Engineering, Section 1, Fall 2021

Course: ME 186 – Automotive Engineering

Course Code: 40918-01

Semester: Fall 2021

Prerequisites: ME 114, ME 130, ME 154 (proof needs to be submitted- please see CANVAS announcement)

Credit Units: 3

Instructor: Syed S.H. Zaidi

Class Hours: Monday/Wednesday, 9:00-10:15 am

Course Delivery: Online/Zoom ***(Students are required to turn the video option during the lecture)***

Office Hours: Wednesday 5:00 to 6:00: By appointment via Zoom

Cell/text: (609) 558 1227

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SJUS Student Support Link for Online Resources:

<https://www.sjsu.edu/engineering/research-support/instructional-design/student-resources.php>

Course Description:

1. Overview of automotive engineering fundamentals including powerplant, structures, suspension, steering, brakes, tires, and drive train.
2. Application of engineering principles in automotive design and analysis. Introduction to alternative vehicle technologies.
3. Use of mechanical engineering principles for automobile performance analysis.

Course Goals:

1. Learn automotive specific engineering principles
2. Learn basic automobile operational principles
3. Study traditional and advanced vehicle technologies
4. Apply engineering principles to automotive component performance analysis
5. Apply engineering principles to analyze automobile stability and handling Student Learning

Objectives:

1. The ability to identify various components of automotive vehicles
2. The ability to describe various automotive operational principles
3. The ability to calculate basic automotive performance parameters
4. The ability to describe automotive systems in terms of engineering models
5. The ability to apply mechanical engineering concepts in the automotive design processes

Course Learning Outcomes: Upon successful completion of this course, students will be able to:

1. Describe and compute the basic thermodynamics of internal combustion engines
2. Compute vehicle dynamic behaviors such as cornering, braking and acceleration
3. Describe the operation and compute the behavior of automotive components such as gear trains, flexible couplings, clutches and brakes
4. Compute cornering forces at the tire and vehicle levels

Required Text/readings:

- Fundamentals of Vehicle Dynamics, by Thomas D. Gellespie. ISBN 1.56091-199-9
- Automotive Engineering Fundamentals, by Stone & Ball. SAE press ISBN 0-7680-0987-1
- PDF materials provided by instructor

Course Requirements and Assignments:

Success in this course is based on the expectations that the student will attempt and submit all homework assignments. Homework assignments are intended to support learning of automotive system fundamentals, and are also intended to prepare the student for the examinations. The student is expected to complete the term project, and submit original work. The student is expected to sit the midterm and final examinations. If problems are not assigned from the texts, homework assignment will be emailed to the class in pdf format. Due date will be no less than 7 days from distribution or assignment in class.

The term project is defined as follows: Select a topic related to automotive engineering that interests you. For example: Design and/or analysis for a component for the Formula SAE or Baja vehicles. Study of the handling characteristics of E-bikes. Dynamics and power usage of an electric scooter.... Submit your topic and proposal of final report content. The proposal shall identify the topic, state the purpose of effort, specify the steps required to produce the desired results and expected content of final report. Here is a simplistic example: I plan to design a new rear spoiler for the formula SAE vehicle. I will size the wing to achieve 200 pounds of downforce. I will provide CFD analysis of the pressure distributions and FEA of the wing and support structure. Work on your project over the semester. Meet with the instructor if you need guidance or advice to complete the task. A formal engineering report summarizing your efforts is due the last day of class.

Grading Information:

- Homework 20%
- Project 20%
- Midterm exams 30%
- Final exam 30%

Homework must be submitted online/CANVAS on the due date. Late homework will be accepted up to one week late with a penalty of 50% maximum credit. No exceptions. Homework solutions will be reviewed in class on the due date.

The term project score will be evaluated on the following criteria:

- Title, purpose and deliverables 10%
- Problem definition and preparation for analysis 20%
- Analysis 40%
- Summary and conclusions 30%

Grades will be assigned per the following university recommended criteria based on a cumulative total of 100 points.

Final semester grades will be assigned on the following percentage basis.

A plus = 100 to 97 %	A = 96.9 to 94 %	A minus = 93.9 to 90 %
B plus = 89.9 to 87 %	B = 86.9 to 84 %	B minus = 83.9 to 80 %
C plus = 79.9 to 77 %	C = 76.9 to 74 %	C minus = 73.9 to 70 %
D plus = 69.9 to 67 %	D = 66.9 to 64 %	D minus = 63.9 to 60 %
F = 59.9 % or lower		

Tentative Course Topics and Schedule:

Week	Topics and Activities
1	Introduction and course overview. Thermodynamic Cycles
2	Engine fundamentals – SI and Diesel Engines HW #1 due week 3 Wed by 6:00 pm Term Project Proposal, due week 3 Wed by 6:00 pm
3	Engine Testing: Measurement of parameters (Torque, Power, Speed, etc)
4	Ancillaries (Lubrication system, Bearing) HW #2 due week 5 Wed by 6:00 pm
5	Ancillaries (Cooling system and Drive Belts)
6	Transmission and Driveline HW# 3 due week 7 Wed by 6:00 pm
7	Sensor design consideration for autonomous vehicles
8	Midterm Exam based on content of weeks 1-6 and HW 1-3
9	Air Condition system
10	Ride and suspension. HW #5 due week 11 Wed by 6:00 pm
11	Steering system
12	Random vibrations and related topics HW #6 due week 13 Wed by 6:00 pm
13	Pneumatic tires and Brakes
14	Cornering and handling performance parameters. HW #7 due week 15 Wed by 6:00 pm
15	Thanksgiving week. Campus closed Wednesday evening
16	Vehicle stability (Aerodynamic Performance) Term project submission
17	Final Exam – Date will be announced in the class

Classroom Protocol

Regular attendance and active participation are encouraged. Please attend to non-classroom related discussion and activity outside of the classroom. 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 calendar web page located at http://www.sjsu.edu/academic_programs/calendars/academic_calendar/. 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/>.

University Policies on 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, 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 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) at <http://www.drc.sjsu.edu/> to establish a record of their disability. "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 practice. Other course structures will have equivalent workload expectations as described in the syllabus.