



### Basic Course Information

Semester:	<b>SPRING 2022</b>	Instructor Name:	<b>Julio Hernandez</b>
Course Title & #:	<b>SUSPENSION &amp; WHEEL ALIGNMENT AUT-155</b>	Email:	<b>julio.hernandez@imperial.edu</b>
CRN #:	<b>20432</b>	Webpage (optional):	<b>N/A</b>
Classroom:	<b>BLDG 1100</b>	Office #:	<b>1100 bldg.</b>
Class Dates:	<b>FEB. 14, 2022 – JUNE 10, 2022</b>	Office Hours:	<b>N/A</b>
Class Days:	<b>MONDAY &amp; WEDNESDAY</b>	Office Phone #:	<b>N/A</b>
Class Times:	<b>6:30 PM - 9:40 PM</b>	Emergency Contact:	<b>Campus Nurse: (760)355-6128 Campus Safety: (760)483-7411</b>
Units:	<b>4.0</b>	Class Format:	

### Course Description

This course covers the principles and construction of passenger vehicle and light truck steering, chassis, and suspension system. Emphasis is placed the skill required in the diagnosis repair and adjustment of wheel alignment including two and four-wheel alignment angles. Complete suspension and overhaul will be done in laboratory activities as well alignment using either two or four wheel sensors. Upon successful completion of this course, the students are prepared to take the Automotive Service Excellence (ASE) Certification Examination in steering wheel suspension.

### Course Prerequisite(s) and/or Corequisite(s)

*None*

### Student Learning Outcomes

1. Identify and interpret suspension and steering system concerns; determine necessary action.
2. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action.
3. Inspect, remove, and replace shock absorbers.
4. Inspect tire condition; identify tire wear patterns; check and adjust air pressure; determine necessary action.

### Course Objectives

1. Comply with 11 safety shop procedures associated with the handling of hazardous materials in accordance with the regulations.
2. Correctly identify the major components of the suspension and steering system and how they relate to each other to control the vehicle.
3. Have a basic understanding of how a tire and wheel is constructed.
4. Learn different styles of automotive front and rear suspension.
5. Understand the purpose for shock an absorber and stabilizer bars.
6. Understand the operation of both major styles of steering gears.
7. Understand the purpose for the various front and rear wheel alignment angles.
8. Diagnose Mac-Phersons strut and short/long arm suspension system for wears, noise, cracks, uneven, riding height or other related problem. Remove, Inspect and replace upper and lower control arm bushings, or other related components. Remove and replace coil spring, insulator, torsion bars, bushings and links. Remove, Inspect and replace

strut cartridge, coil spring, and bearing mount. Diagnose and repair shock absorber, wheel bearing and electronically controlled components.

9. Disable air bag system in accordance with manufacture's procedures. Diagnose steering column, looseness, and binding problems. Diagnose power non-rack and pinion steering gear bushing, uneven turning effort, looseness, hard steering and fluid leakage problems. Adjust steering gear box system for pinion preload and sector lash. Inspect and replace steering gear rod ends and components. Remove, inspect and replace power steering accessories as needed perform power steering system pressure test and adjust or replace components of electronically controlled steering system.

10. Diagnose wheel alignment problems. Measure vehicle front/rear height suspension. Check and adjust front/rear wheel alignment angles. Check steering axis inclination, rear wheel-thrust angle, and front wheel setback.

11. Diagnose tire vibration, shimmy, or other related symptoms. Rotate tires according to manufacturer's recommendation. Measure wheel/tire and hub run out and adjust or replace according to specifications. Balance wheel and tire assembly (static and dynamic) dismount, inspect, repair and remount tire on wheel and torque lug nuts.

12. Be familiar with automotive services excellence (ASE) examination requirements, and prepare to successfully pass the exam.

### Textbooks & Other Resources or Links

Textbook: Modern Automotive Technology ISBN: 978-1-63563-424-2 or Canvas Common Cartridge Access Key Code

### Course Requirements and Instructional Methods

#### Method of Instruction:

Methods of instructions may include, but are not limited to, the following: lectures, textbook worksheets, hands-on worksheets, internet readings, large and small group discussions, audiovisual aids, and demonstrations.

#### Out of class:

Obtain information from a flat rate manual and a parts catalog and prepare a repair order for replacement and diagnosis of a suspension + steering system of a vehicle of your choice. Check the information for the amount of labor involved. Then, consult the parts catalog for the cost of the parts. Add up the cost plus state tax ( figure labor cost at \$85/hour)

#### Reading and Writing:

Using sketches and principles you have learned about suspension + steering, prepare a presentation showing the differences between conventional steering box and steering gear (rack + pinion) systems.

### What if I need to borrow technology or access to WIFI?

1. To request a loaner laptop, MYFI device, or other electronic device, please submit your request here: <https://imperial.edu/students/student-equity-and-achievement/>
2. If you'd like access the WIFI at the IVC campus, you can park in parking lots "I & J". Students must log into the IVC student WIFI by using their IVC email and password. The parking lots will be open Monday through Friday from 8:00 a.m. to 7:00 p.m.

#### Guidelines for using parking WIFI:

- Park in every other space (empty space BETWEEN vehicles)
- Must have facemask available
- For best reception park near buildings
- Only park at marked student spaces
- Only owners of a valid disabled placard may use disabled parking spaces
- Only members of the same household in each vehicle

- Occupants **MUST** remain in vehicles
- Restrooms and other on-campus services not available
- College campus safety will monitor the parking lot
- Student code of conduct and all other parking guidelines are in effect
- Please do not leave any trash behind
- **No parking permit required** If you have any questions about using parking WIFI, please call Student Affairs at 760- 355-6457

## Course Grading Based on Course Objectives

### Grading Criteria:

#### 1. Grading System:

- A=90%-100% of points= Excellent
- B=80%-89% of points= Good
- C=70%-79% of points= Satisfactory
- D= 60%-69% of points= Pass, less than satisfactory
- F= Less than 60% of points= Failing

#### 2. Very important:

- **Midterm Exam** will be given on April 11, 2022.
- **Final Exam** will be given on June 6, 2022.
- There are no make-up exams unless you have a very good reason and make arrangements with the instructor before the exam.
- Final grades can be raised or lowered based on your preparation and participation in class. It benefits you to be engaged and participative.

### Grades:

	Points
Quizzes	140
Lab activities, hands-on worksheets	240
Midterm Exam	60
Final Exam	60
Total points	500

### Course Grade:

The course grade is based on total points accumulated during the semester. There is a total of 500 points available. Grades are determined by dividing the total points you earn by the total points available to get your percentage. (Total points may vary if I change the assignments in a particular week).

### Grading of Hands-on Assignments:

The most common problem students experience is not being detailed enough in their answers and not spending the right amount of time in the repair procedures. Always be as specific as you can and use examples from your readings. Make sure to answer all parts of the questions. Points will be deducted for inadequate responses. Feedback will be given after each assignment and, hopefully, you will improve as you proceed with the course. The following grading rubric is used when grading assignments.

	Grading Rubric for Hands-on Assignment	Points
A	Focused and clearly organized. Contains critical thinking and content analysis. Convincing evidence is provided to support conclusions. Ideas are clearly communicated. Clearly meets or exceeds assignments requirements.	18-20
B	Generally focused and contains some development of ideas, may be simplistic or repetitive. Evidence is provided which supports conclusions. Meets assignments requirements.	16-17
C	May be somewhat unfocused, underdeveloped, or rumbling. But does have some coherence. Some evidence is provided which support conclusions. Meets minimum assignment requirements.	14-15
D	Unfocused, underdeveloped. Minimal evidence is used to support conclusion. Does not respond appropriately to the assignment.	12-13
F	Minimal effort by the student. Unfocused, underdeveloped. Evidence is not used to support conclusion. Block overall understanding. Does not meet assignment requirements.	0-11

### Course Policies

- A student who fails to attend the first meeting of a class or does not complete the first mandatory activity of an online class will be dropped by the instructor as of the first official meeting of that class. Should readmission be desired, the student's status will be the same as that of any other student who desires to add a class. It is the student's responsibility to drop or officially withdraw from the class. See General Catalog for details.
- Regular attendance in all classes is expected of all students. A student whose continuous, unexcused absences exceed the number of hours the class is scheduled to meet per week may be dropped. For online courses, students who fail to complete required activities for two consecutive weeks may be considered to have excessive absences and may be dropped.
- Absences attributed to the representation of the college at officially approved events (conferences, contests, and field trips) will be counted as 'excused' absences.
- What is netiquette? Netiquette is internet manners, online etiquette, and digital etiquette all rolled into one word. Basically, netiquette is a set of rules for behaving properly online.

Students are to comply with the following rules of netiquette: (1) identify yourself, (2) include a subject line, (3) avoid sarcasm, (4) respect others' opinions and privacy, (5) acknowledge and return messages promptly, (6) copy with caution, (7) do not spam or junk mail, (8) be concise, (9) use appropriate language, (10) use appropriate emoticons (emotional icons) to help convey meaning, and (11) use appropriate intensifiers to help convey meaning [do not use ALL CAPS or multiple exclamation marks (!!!!)].

### What does it mean to "attend" an online class?

Attendance is critical to student success and for IVC to use federal aid funds. Acceptable indications of attendance are:

- Student submission of an academic assignment
- Student submission of an exam
- Student participation in an instructor-led Zoom conference
- Documented student interaction with class postings, such as an interactive tutorial or computer-assisted instruction via modules
- A posting by the student showing the student's participation in an assignment created by the instructor
- A posting by the student in a discussion forum showing the student's participation in an online discussion about academic matters
- An email from the student or other documentation showing that the student has initiated contact with a faculty member to ask a question about an academic subject studied in the course.

Logging onto Canvas alone is NOT adequate to demonstrate academic attendance by the student.

## Other Course Information

### Shop/Lab Area

- Safety test must be passed to work in the shop and complete required lab exercise.
- Safety glasses are required to be worn at all times while in the shop area, safety glasses are the student responsibility (students not wearing safety glasses will be ask to leave the class for that day no exceptions). P.P.E.
- Clean up your area and any other lose debris or trash.
- Wear all required safety protection and comply with posted signs.
- No shorts or open toe foot wear, always be prepared to go into the lab area.
- Comply with tool check out policy and return tools clean.
- Do not perform any work on any vehicle outside the assigned task without permission from your instructor.

### Parking:

No student parking by the building, the only exception is on lab time if your vehicle is a project (instructor approved). Speed limit must be kept at or under 5MPH.

Parking permit is required at all times.

### Projects:

All projects are to be taken with the student's unless otherwise approved by the instructor.

All approved projects must be removed from campus prior to finals.

All projects must have a written work order (R/O).

### Shop Maintenance:

All work will cease 20 minutes prior to end of class.

All work areas must be cleaned.

Tools must be cleaned and returned to the tool room.

Any broken or missing tools must be reported immediately. Tools are student's responsibility.

## IVC Student Resources

IVC wants you to be successful in all aspects of your education. For help, resources, services, and an explanation of policies, visit <http://www.imperial.edu/studentresources> or click the heart icon in Canvas.

### Anticipated Class Schedule/Calendar

<b>Date or Week</b>	<b>Activity, Assignment, and/or Topic</b>	<b>Pages/ Due Dates/Tests</b>
Week 1 M: 2/14 W: 2/16	Syllabus. Shop Safety. Automotive Tools. Shop Class: Auto Shop Safety, Tools + Equipment.	Ch.3, Ch.4, Ch.5
Week 2 M: 2/21 W: 2/23	Holiday *NO CLASSES* Shop Class: Work Orders + Vehicle Inspection	
Week 3 M: 2/28 W: 3/2	TIRES + WHEELS + BEARINGS Fundamentals Shop Class: Tire D-mount + mount + balance	Ch.73
Week 4 M: 3/7 W: 3/9	TIRES + WHEELS + BEARINGS Diagnosis & Repair Shop Class: Wheel Bearings Inspection + Service	Ch.74
Week 5 M: 3/14 W: 3/16	SUSPENSION SYSTEMS Technology Shop Class: Front Suspension Identification + Service	Ch.75
Week 6 M: 3/21 W: 3/23	SUSPENSION SYSTEMS Diagnosis & Repair Shop Class: Rear Suspension Identification + Service	Ch.76
Week 7 M: 3/28 W: 3/30	STEERING SYSTEMS Technology Shop Class: Power assisted Rack + Pinion Steering Service	Ch.77
Week 8 M: 4/4 W: 4/6	STEERING SYSTEMS Diagnosis + Repair Shop Class: Power Steering Gear Box System Service	Ch.78
Week 9 M: 4/11 W: 4/13	<MIDTERM EXAM> Shop Class: <MIDTERM EXAM> Hands-on	
Week 10 M: 4/18 W: 4/20	Spring Break *NO CLASSES* Spring Break *NO CLASSES*	
Week 11 M: 4/25 W: 4/27	WHEEL ALIGNMENT Principles + Adjustments Shop Class: Pre-Alignment Inspection + Set-up	CDX Ch.13 + Video
Week 12 M: 5/2 W: 5/4	WHEEL ALIGNMENT Diagnosis + Adjustments Shop Class: 2 Wheel Alignment + 4 Wheel Alignment Procedure	CDX Ch.14
Week 13 M: 5/9 W: 5/11	DRIVE SHAFT + C.V. JOINTS SERVICE Shop Class: Service drive shafts + C.V. Joints	CDX Ch.15
Week 14 M: 5/16 W: 5/18	TIRE PRESSURE MONITOR SYSTEMS (TPMS) Shop Class: Identify TPMS problems + Service TPMS Sensors	CDX Ch.16 + Video



Date or Week	Activity, Assignment, and/or Topic	Pages/ Due Dates/Tests
Week 15 M: 5/23 W: 5/25	ELECTRIC ASSISTED STEERING Components + Operation Shop Class: Practice Alignment Set-up + Adjustments	CDX Ch.11 Video + Handout
Week 16 M: 5/30 W: 6/1	Memorial Day *NO CLASSES* Shop Class: Identify Electric Assisted Steering Components	
Week 17 M: 6/6 W: 6/8	<FINAL EXAM> Shop Class: "Hands On" Final Assignment	

**\*\*\*Subject to change without prior notice\*\*\***