Basic Course Information

Semester:	**Spring 2016**	Instructor Name:	**David R. Martinez**
Course Title & #:	**Suspension and Wheel Alignment 155**	Email:	**David.martinez@imperial.edu**
CRN #:	**20850**	Webpage (optional):	**N/A**
Classroom:	**1101-1102**	Office #:	**Part Time/ No office**
Class Dates:	**Feb. 16th – June 10th 2016**	Office Hours:	**N/A**
Class Days:	**T-TH and Wed.**	Office Phone #:	**N/A**
Class Times:	11:20-12:45, 8:00-11:10	Emergency Contact:	**760 404-9533**
Units:	4		

Course Description

This course covers the principles and construction of passengers vehicle and light truck steering, chassis, and suspension system. Emphasis is placed on 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 of alignment using either two or four wheel sensors. Upon successful completion of this course, students are prepared to take the Automotive Service Excellence (ASE) certification examination is steering wheel suspension.

Student Learning Outcomes

Upon course completion, with a grade of C or better, a successful student will have acquired new skills, knowledge, and or attitudes as demonstrated by being ale to:

1. List the four functions of a front suspension system. ILO1, ILO2, ILO3.
2. List and briefly describe the three types of independent rear suspensions. ILO1, ILO2, ILO3.
3. List the five angles involved in wheel alignment, and identify which angles are adjustable. ILO1, ILO2, ILO3.
4. Explain the concept of four-wheel alignment. ILO1, ILO2, ILO3.
5. Explain the relationship between the suspension and steering systems. ILO1, ILO2, ILO3.
6. Explain the operating principles of rack and pinion steering system. ILO1, ILO2, ILO3.
7. List the components of a power assisted steering system and briefly describe their inner relationship. ILO1, ILO2, ILO3.

IVC as an institution has adopted five Student Learning Outcomes (SLO's). They are interconnected with each other. They will be inherent through the course:

1. Communication Skills
2. Critical Thinking Skills

3. Personal Responsibility
4. Information Literacy
5. Global Awareness

Course Objectives

-Explain the function of the various front and rear suspension components.

- Name the three basic types of front and rear suspension systems.

- Tell how a typical "Automatic Level Control System" works.

- Describe the make up of manual rack-and-pinion and recirculating ball types of steering systems.

- State the operating principles of power rack-and-pinion steering gear assembly and the integral power steering gear assembly.

- Identify some typical suspension and steering system troubles and give possible causes.

- Compare basic tire types and tire sidewall markings.

- Describe excessive and uneven thread wear patterns and possible causes.

- Outline steps for checking wheel and tire radial and lateral run out.

- Demonstrate proper techniques for using a power operator tire changer to demount and mount tires on wheels.

- State several methods for making satisfactory permanent tire repairs.

- Tell why four-wheel alignment is necessary.

- Explain how various elements have an influence on tire-to-road contact.

- List preliminary steps required before wheel alignment angles are set.

- Identify and describe the angles involved in front wheel alignment.

- Define the six front wheel alignment angles and list the order in which they should be checked.

- List preliminary checks that are necessary before making measurements of caster, camber, and toe-in.

- Give examples of typical front wheel caster and camber adjustment methods on both rear-wheel and front-wheel drive cars.

- Describe how various front-wheel-toe-in adjustments are made.

- Explain the importance of rear wheel tracking.

- Give examples of typical rear wheel camber and toe-in checks and adjustments.

Textbooks & Other Resources or Links

1. Modern Automotive Technology, James E. Duffy 8th Edition (Textbook). ISBN # 978-1-61960-370-7
2. Modern Automotive Technology, James E. Duffy 8th Edition (Workbook). ISBN # 978-1-61960-375-2

Course Requirements and Instructional Methods

Lectures, textbook/workbook, assignments, worksheets, videos, internet information, live demonstrations, quizzes, mid-term, and final tests.

Out of Class Assignments: The Department of Education policy states that one (1) credit hour is the amount of student work that reasonably approximates not less than one hour of class time and two (2) hours of out-of-class time per week over the span of a semester. WASC has adopted a similar requirement.

Course Grading Based on Course Objectives

There will be a Mid-term and a Final exam. Each will be worth 25% of your grade. Quizzes will make up 25% of your grade. The last 25 % of your grade will be based on completion of projects assigned as part of the lab section of the class.

Percentage	*Scores*	*Letter Grade*
25% Completed Assignments	*100-90%*	*A*
25% Quizzes	*89-80%*	*B*
25% Mid-term Exam	*79-70%*	*C*
25% Final Exam	*69-60%*	*D*
	59-50%	*F*

Attendance

- 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.

Classroom Etiquette

- Electronic Devices: Cell phones and electronic devices must be turned off and put away during class, unless otherwise directed by the instructor.
- Food and Drink are prohibited in all classrooms. Water bottles with lids/caps are the only exception. Additional restrictions will apply in labs. Please comply as directed by the instructor.
- Disruptive Students: Students who disrupt or interfere with a class may be sent out of the room and told to meet with the Campus Disciplinary Officer before returning to continue with coursework. Disciplinary procedures will be followed as outlined in the General Catalog.

- Children in the classroom: Due to college rules and state laws, no one who is not enrolled in the class may attend, including children.

  - No music allowed in the auto shop
  - No parking in front of the gate.
  - No work should be done without instructor's permission.
  - No parking inside the shop during lecture time.
  - Each student should clean the work area.
  - Break must be 10 min. per class hr.
  - Students may not leave early without instructor's permission.
  - No helpers or visitors during lab activities.
  - Safety glasses are required.

Online Netiquette

- 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 (!!!!)].

Academic Honesty

Academic honesty in the advancement of knowledge requires that all students and instructors respect the integrity of one another's work and recognize the important of acknowledging and safeguarding intellectual property.

There are many different forms of academic dishonesty. The following kinds of honesty violations and their definitions are not meant to be exhaustive. Rather, they are intended to serve as examples of unacceptable academic conduct.

- Plagiarism is taking and presenting as one's own the writings or ideas of others, without citing the source. You should understand the concept of plagiarism and keep it in mind when taking exams and preparing written materials. If you do not understand how to "cite a source" correctly, you must ask for help.
- Cheating is defined as fraud, deceit, or dishonesty in an academic assignment, or using or attempting to use materials, or assisting others in using materials that are prohibited or inappropriate in the context of the academic assignment in question.

Anyone caught cheating or plagiarizing will receive a zero (0) on the exam or assignment, and the instructor may report the incident to the Campus Disciplinary Officer, who may place related documentation in a file. Repeated acts of cheating may result in an F in the course and/or disciplinary action. Please refer to the General Catalog for more information on academic dishonesty or other misconduct. Acts of cheating include, but are not limited to, the following: (a) plagiarism; (b) copying or

attempting to copy from others during an examination or on an assignment; (c) communicating test information with another person during an examination; (d) allowing others to do an assignment or portion of an assignment; (e) using a commercial term paper service.

Additional Student Services

Imperial Valley College offers various services in support of student success. The following are some of the services available for students. Please speak to your instructor about additional services which may be available.

- **Blackboard Support Site.** The Blackboard Support Site provides a variety of support channels available to students 24 hours per day.
- **Learning Services.** There are several learning labs on campus to assist students through the use of computers and tutors. Please consult your Campus Map for the Math Lab; Reading, Writing & Language Labs; and the Study Skills Center.
- **Library Services**. There is more to our library than just books. You have access to tutors in the Study Skills Center, study rooms for small groups, and online access to a wealth of resources.

Disabled Student Programs and Services (DSPS)

Any student with a documented disability who may need educational accommodations should notify the instructor or the Disabled Student Programs and Services (DSP&S) office as soon as possible. The DSP&S office is located in Building 2100, telephone 760-355-6313. Please contact them if you feel you need to be evaluated for educational accommodations.

Student Counseling and Health Services

Students have counseling and health services available, provided by the pre-paid Student Health Fee.

- **Student Health Center**. A Student Health Nurse is available on campus. In addition, Pioneers Memorial Healthcare District provide basic health services for students, such as first aid and care for minor illnesses. Contact the IVC Student Health Center at 760-355-6128 in Room 1536 for more information.
- **Mental Health Counseling Services**. Short-term individual, couples, family, and group therapy are provided to currently enrolled students. Contact the IVC Mental Health Counseling Services at 760-355-6196 in Room 2109 for more information.

Student Rights and Responsibilities

Students have the right to experience a positive learning environment and to due process of law. For more information regarding student rights and responsibilities, please refer to the IVC General Catalog.

Information Literacy

Imperial Valley College is dedicated to helping students skillfully discover, evaluate, and use information from all sources. The IVC Library Department provides numerous Information Literacy Tutorials to assist students in this endeavor.

Anticipated Class Schedule/Calendar

Spring 2016 Important dates:

- Late registration	***Feb. 16-27***
- Deadline to drop full-term classes without owning fees	***Feb. 27***
- Ticketing for parking violation starts	***Feb. 29***
- Deadline to make up for incomplete grade	***Mar. 25***
- Financial aid return to title IV drop deadline	***April 28***
- Deadline to drop full-term classes	***May 14***
- Holiday/Spring recess	***Mar. 28-April 2***
- Last week of classes including final examinations	***June 6-10***

*****Tentative, subject to change without prior notice*****

Week	Automotive Suspension and Wheel Alignment	Homework/ Exam	Workbook Activities	Quiz	Lab Activity
Ist	-Course introduction, orientation, safety shop procedures -Tools/Equipment -Videos and shop demonstrations	Purchase textbooks		Safety shop exam	
2nd	Chapter 3 -Basic hand-tools -Identify common hand-tools -Safety rules for hand-tools	Texbook Homework Chapter 3 Review ASE questions on page 56	Open activity workbook Basic Tools Chapter 3 Pages 23-28		Demonstration Basic Tools
Part 2	Chapter 4 -Power Tools/Equipment -Types of Power Tools	Textbook Homework Chapter 4 Review ASE Questions Pages 71-72	Open activity workbook Power Tools and equipment Pages 29-33	Quiz Basic Tools	Demonstration Basic Tools and Equipment
3rd Part 1	Chapter 74 Tire, wheel, and wheel bearing fundamentals -Identify the parts of a tire and wheel -Tire and wheel sizes -Tire rating -Hub and wheel bearing assemblies	Textbook Chapter 74 Review ASE questions pages 1497-1499	Open activity workbook Answer pages 489-497		Demonstration Tires, wheel hubs, and wheel bearing assembly
Part 2	Chapter 75	Textbook	Open activity		Demonstration

	-Tire, wheel and wheel bearing diagnosis, service, and repair. -Tire inflation and rotation procedures -Static dynamic wheel balance -Service procedures for wheel bearings - Safe-practices while servicing tires/wheels	Chapter 75 Review ASE questions Pages 1519-1521	workbook Answer pages 499-505		Tire/wheel run out Wheel/tire balance and tire machine
Week 4th	Chapter 76 Suspension System Technology -Major parts of a suspension -Function of each part -Operation of the four common types of springs -Various types of suspension -Automatic suspension leveling systems	Textbook Chapter 76 Homework Review question Pages 1543-1545	Workbook Answer page 507-515		Suspension Parts
Week 5th	Chapter 77 Suspension System Diagnosis and Repair -Diagnosis problems -Replace shock absorbers -The removal and replacement of springs -Service a strut assembly -Replace control arm bushings	Chapter 77 Review ASE questions pages 1565-1567	Open activity Workbook Answer for pages 517-522		Demonstration and worksheets -Diagnosis Dry test -Shock absorbers -Coil springs -Struts -Control arm bushings -Wheel bearings
Week 6th	Chapter 78 Steering System technology -Major parts of a steering system -Operation principles of steering system -Difference between linkage steering and a rock-and-pinion steering system -Describe the operation of hydraulic and electric assist power steering system	Mid-Term Exam Chapter 78 Textbook Review ASE questions pages 1590-1592	Workbook Pages 523-530		Demonstration and worksheets -Steering -Linkages -Rack-and-pinion -Power-steering -Tools

Week 7th & 8th	Chapter 79 Steering system Diagnosis and repair -Describe common steering system problems -Inspect and determine the condition of a steering system -Basic steering column repair -Describe service and repair procedures for a rock-and-pinion steering gear -Service power steering belts, hoses and fluids	Textbook Chapter 79 Review ASE questions Pages 1609-1611	Workbook Open activity Answers for pages 531-537		Demonstration Worksheets -Inspection Steering -Rock-and-pinion -Power steering pump service
Week 9th & 10th	Chapter 80 -Wheel alignment -Principles of wheel alignment -List the purpose of each wheel alignment setting -Pre-alignment inspection -Describe caster, camber, and toe adjustment -Explain toe-out on turns, steering access inclination and tracking -Describe the use of different types of wheel alignment equipment	Textbook Chapter 80 Review ASE questions Pages 1634-1636	Workbook Chapter 80 Open activity Provide answers for pages 539-544		Demonstration and worksheets -Pre-alignment inspection -Wheel dynamic balance -Wheel bearing -Suspension system inspection -Steering system inspection -Measuring camber, caster, toe-in (four wheel alignment)
Week 11th	Chapter 73 Transaxle and Front Drive axle diagnosis and repair -Diagnose common transaxle and drive axle problems -Remove and install a transaxle assembly -Replace CV-Joints on front drive axels	Textbook Chapter 73 Review ASE questions Pages 1474-1475	Workbook Open activity Answer pages 483-488		Demonstration worksheets -Remove drive shaft -Universal joint service -CV-Joint service
Week 12th	Computer-Controlled suspensions (Support textbook) -The difference between an active and passive suspension system. -Relationship between vehicle operation and				

	electronic control of the suspension. -Variable shock damping, electronic level control, and air spring suspension.				
Week 13th	Computer controlled steering -Conventional and electronically controlled systems -Relationship between vehicle speed and electronic control of the steering system-VAPS,EVO, power steering, and four wheel steering systems.				
Week 14th & 15th	Preparation of Automotive Service ASE exams Consists of: Multiple-choice questions. -Most likely type questions -Except type questions -Least-likely-type questions		Activities with ASE booklets: -Suspension -Steering -Power steering		
Week 16th	Final Exam				