

# AT R140: AUTOMOTIVE STEERING AND SUSPENSION

## Originator

kevin\_corse1

## College

Oxnard College

## Discipline (CB01A)

AT - Automotive Technology

## Course Number (CB01B)

R140

## Course Title (CB02)

Automotive Steering and Suspension

## Banner/Short Title

Auto Steering & Suspension

## Credit Type

Credit

## Start Term

Spring 2021

## Formerly

AT R050 - Auto Steering and Suspension

## Catalog Course Description

This course is for the automotive student who wants to understand automotive steering and suspension systems. This course provides the technical skills and preparation required in diagnosis, adjustment, replacement and repair of all types of suspension systems commonly used in the automotive industry. Factory type scan tools will be used for interaction with the vehicle steering and suspension control systems. Skills used for diagnosing body computer systems will be taught as part of the course. Preparation for the ASE certification exam is included. Preparation for the ASE certification exam is included. Same as AT R050.

## Taxonomy of Programs (TOP) Code (CB03)

0948.00 - \*Automotive Technology

## Course Credit Status (CB04)

D (Credit - Degree Applicable)

## Course Transfer Status (CB05) (select one only)

B (Transferable to CSU only)

## Course Basic Skills Status (CB08)

N - The Course is Not a Basic Skills Course

## SAM Priority Code (CB09)

C - Clearly Occupational

## Course Cooperative Work Experience Education Status (CB10)

N - Is Not Part of a Cooperative Work Experience Education Program

## Course Classification Status (CB11)

Y - Credit Course

## Educational Assistance Class Instruction (Approved Special Class) (CB13)

N - The Course is Not an Approved Special Class

**Course Prior to Transfer Level (CB21)**

Y - Not Applicable

**Course Noncredit Category (CB22)**

Y - Credit Course

**Funding Agency Category (CB23)**

Y - Not Applicable (Funding Not Used)

**Course Program Status (CB24)**

1 - Program Applicable

**General Education Status (CB25)**

Y - Not Applicable

**Support Course Status (CB26)**

N - Course is not a support course

**Field trips**

May be required

**Grading method**

Letter Graded

**Alternate grading methods**

Credit by exam, license, etc.

**Does this course require an instructional materials fee?**

No

**Repeatable for Credit**

No

**Is this course part of a family?**

No

**Units and Hours**

**Carnegie Unit Override**

No

**In-Class**

**Lecture**

**Minimum Contact/In-Class Lecture Hours**

87.5

**Maximum Contact/In-Class Lecture Hours**

87.5

**Activity**

**Laboratory**

**Minimum Contact/In-Class Laboratory Hours**

52.5

**Maximum Contact/In-Class Laboratory Hours**

52.5

**Total in-Class**

**Total in-Class**

**Total Minimum Contact/In-Class Hours**

140

**Total Maximum Contact/In-Class Hours**

140

**Outside-of-Class**

**Internship/Cooperative Work Experience**

**Paid**

**Unpaid**

**Total Outside-of-Class**

**Total Outside-of-Class**

**Minimum Outside-of-Class Hours**

175

**Maximum Outside-of-Class Hours**

175

**Total Student Learning**

**Total Student Learning**

**Total Minimum Student Learning Hours**

315

**Total Maximum Student Learning Hours**

315

**Minimum Units (CB07)**

6

**Maximum Units (CB06)**

6

**Advisories on Recommended Preparation**

AT R110 and AT R115

**Student Learning Outcomes (CSLOs)**

**Upon satisfactory completion of the course, students will be able to:**

- |   |                                                                                                                                                                                                                                                                                     |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Students will be able to achieve an entry level ability to correctly set up and align a modern automobile on various standard equipment.                                                                                                                                            |
| 2 | Students will read industry standard measuring tools, such as a micrometer and dial caliper, to determine acceptable tolerances for common automotive components, steering and suspension.                                                                                          |
| 3 | Students identify and comprehend environmental, safety rules, and regulations in the following in areas common to the automotive repair industry such as shop safety; personal safety; hazardous material handling; air bag safety; power tools and other typical equipment safety. |

**Course Objectives**

**Upon satisfactory completion of the course, students will be able to:**

- |   |                                                                      |
|---|----------------------------------------------------------------------|
| 1 | Identify safety hazards in the automotive shop                       |
| 2 | Explain the theory of front and rear suspension systems on a vehicle |
| 3 | Set up and calibrate alignment equipment                             |
| 4 | Explain the frame construction of a vehicle                          |
| 5 | Explain the effects of wheel bearing wear from suspension components |

- 6 Identify rear axle offset in relation to the thrust angle of the vehicle
- 7 Explain the tire pressure monitor systems in modern vehicles
- 8 Explain how vehicle stability control systems work in modern vehicles
- 9 Demonstrate scan tool use to review sensor information from the body control computer
- 10 Evaluate suspension related sensors
- 11 Identify and demonstrate use of common and specialty tools use for automotive steering and suspension.
- 12 Explain related terms and conventions
- 13 Explain related electrical systems
- 14 Demonstrate understanding and safe interaction with design, function and relationship of Supplemental Restraint systems to the suspension & steering system

## Course Content

### Lecture/Course Content

1. Shop operation and Safety
  - a. Personal safety
  - b. Safety equipment
  - c. Equipment safety
  - d. Fire extinguisher use
  - e. Hazardous materials
2. Suspension components and service
  - a. Purpose and definition
  - b. Conventional steering linkage systems
  - c. Rack and pinion steering systems
  - d. Solid front axle suspension
  - e. Front independent suspension
  - f. Rear independent suspension
  - g. MacPherson strut suspension
  - h. Strut and shock service
  - i. Coil spring service
  - j. Major component overhaul
3. Front wheel drive (transaxle and constant velocity Joints)
  - a. Fundamentals of front wheel drive
  - b. Constant velocity joint application and service
4. Power steering systems
  - a. Steering angle fundamentals
  - b. Manual steering systems
  - c. Hydraulic assist power steering systems
  - d. Electrical assist power steering systems
  - e. Diagnosis of the system
5. Frames and axles
  - a. Unitized body design
  - b. Solid frame design
  - c. Vehicle directional stability
  - d. Axle construction
6. Computer control and diagnosis
  - a. Tire inflation monitor systems
  - b. Body control computer systems
  - c. Supplemental restraint systems
  - d. Sensors
    - i. Wheel speed
    - ii. Yaw
    - iii. Steering angle
    - iv. Thrust
    - v. Height

1. Stability control computer systems
2. Collision avoidance systems
3. Supplemental restraint systems
7. Fault codes related to steering and suspension systems
  - a. Obtaining fault codes
  - b. Logical diagnostic procedures
8. Internet resources
  - a. Locating information related to mechanical steering and suspension systems
  - b. Locating information related to electrical/computer steering and suspension systems

### Laboratory or Activity Content

1. Demonstrate Shop operation and safety
  - a. Personal safety
  - b. Safety equipment
  - c. Equipment safety
  - d. Fire extinguisher use
  - e. Hazardous materials
2. Demonstrate Suspension components and service
  - a. Purpose and definition
  - b. Conventional steering linkage systems
  - c. Rack and pinion steering systems
  - d. Solid front axle suspension
  - e. Front independent suspension
  - f. Rear independent suspension
  - g. MacPherson strut suspension
  - h. Strut and shock service
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  - a. Steering angle fundamentals
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  - d. Electrical assist power steering systems
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  - a. Unitized body design
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  - c. Vehicle directional stability
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6. Demonstrate Computer control and diagnosis
  - a. Tire inflation monitor systems
  - b. Body control computer systems
  - c. Supplemental restraint systems
  - d. Sensors
    - i. Wheel speed
    - ii. Yaw
    - iii. Steering angle
    - iv. Thrust
    - v. Supplemental restraint systems
    - vi. Height
      1. Stability control computer systems
      2. Collision avoidance systems
7. Demonstrate Fault codes related to steering and suspension systems
  - a. Obtaining fault codes
  - b. Logical diagnostic procedures
8. Internet resources

- a. Locating information related to mechanical steering and suspension systems
- b. Locating information related to electrical/computer steering and suspension systems

## Methods of Evaluation

**Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):**

Problem solving exercises  
Skills demonstrations  
Written expression

**Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):**

Essay exams  
Individual projects  
Laboratory activities  
Objective exams  
Oral presentations  
Projects  
Problem-Solving Assignments  
Skills demonstrations  
Skill tests

## Instructional Methodology

**Specify the methods of instruction that may be employed in this course**

Audio-visual presentations  
Collaborative group work  
Class activities  
Class discussions  
Case studies  
Distance Education  
Field trips  
Group discussions  
Guest speakers  
Instructor-guided interpretation and analysis  
Instructor-guided use of technology  
Laboratory activities  
Lecture

**Describe specific examples of the methods the instructor will use:**

Textbook quizzes and presentations

Students will have a daily quiz to identify important tools and equipment. The quiz will either have a picture of a special tool or an actual tool in hand. Students will look up the information and submit a written description of tool and describe its use.

Instructor will demonstrate a lab activity and students must complete the activity in much the same way in an acceptable time and scope.

Instructor will provide parts of a vehicle for discussion and students will provide feedback about each component and discuss the parts function, repair and replacement when faulty.

## Representative Course Assignments

### Writing Assignments

1. Students will be required to answer questions at the end of each textbook chapter; all tests may include essay questions.
2. Students will be required to complete written reports about an inspection of a suspension system.

### Reading Assignments

1. Students will be required to do outside reading in professional journals such as Motor Age Magazine and Motor Service Journal in addition to the textbook assignments.
2. Students will be required to do outside reading on the internet at websites such as: IATN.net (International Automotive Technicians Network) and IDENTIFIX.com.

**Skills Demonstrations**

1. Students will be required to perform hands on lab activities and instructor must observe and respond to the activity. A few examples are:
  - a. Wheel alignment
  - b. Tire balancing
  - c. Tire replacement
  - d. Steering component replacement
  - e. Suspension repairs

**Other assignments (if applicable)**

1. Students will be required to do research from automotive industry websites such as Ford and Toyota, regarding the latest suspension repair techniques used in today's vehicles
2. Students will be required to do research from automotive tool company websites regarding the latest tools for communication with the vehicle body computer.

**Outside Assignments****Representative Outside Assignments**

Students will be required to complete several online courses and earn certificates after completing the initial contact.

Students will research Steering and suspension completing online training through Gates Corporation, Timken Bearings, SP2. org

**District General Education**

**A. Natural Sciences**

**B. Social and Behavioral Sciences**

**C. Humanities**

**D. Language and Rationality**

**E. Health and Physical Education/Kinesiology**

**F. Ethnic Studies/Gender Studies**

**CSU GE-Breadth**

**Area A: English Language Communication and Critical Thinking**

**Area B: Scientific Inquiry and Quantitative Reasoning**

**Area C: Arts and Humanities**

**Area D: Social Sciences**

**Area E: Lifelong Learning and Self-Development**

**CSU Graduation Requirement in U.S. History, Constitution and American Ideals:**

**IGETC**

**Area 1: English Communication**

**Area 2A: Mathematical Concepts & Quantitative Reasoning**

**Area 3: Arts and Humanities**

**Area 4: Social and Behavioral Sciences**

**Area 5: Physical and Biological Sciences**

**Area 6: Languages Other than English (LOTE)**

**Textbooks and Lab Manuals**

**Resource Type**

Textbook

**Description**

Halderman (2017). *Automotive Chassis Systems* (7th). Prentice Hall. 0134064453

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**Resource Type**

Textbook

**Description**

Halderman, James D. (2017). *Automotive Chassis Systems Corrolated Task Sheets* (7th). Prentice Hall. 0134072375

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## Distance Education Addendum

### Definitions

#### Distance Education Modalities

Hybrid (51%–99% online)  
 Hybrid (1%–50% online)

### Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

### Regular Effective/Substantive Contact

#### Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Regular use of asynchronous discussion boards encourages various types of interaction and critical thinking skills among all course participants. Questions and topics posed will allow students to discuss, compare and contrast, identify, and analyze elements of the course outcomes. Other discussion boards may be used for Q&A and general class discussion by students and instructor to facilitate student success and strengthen student learning outcomes.
E-mail	E-mail, class announcements and various learning management system tools such as “Message Students Who” and “Assignment Comments”, will be used to regularly communicate with all students on matters such as clarification of class content, reminders of upcoming assignments and/or course responsibilities, to provide prompt feedback to students on coursework to facilitate student learning outcomes, or to increase the role of an individual educator in the academic lives of a student. Students will be given multiple ways to email instructor through both the learning management system inbox and faculty provided email accounts.
Face to Face (by student request; cannot be required)	Students will have direct face-to-face contact with instructor during weekly class meetings. This time will provide the opportunity for students to discuss and ask questions about the material to facilitate student learning objectives and course outcomes. The instructor will also hold weekly, scheduled office hours for students to be able to meet and discuss course materials or individual progress. Students can request additional in-person or web conferencing meetings with faculty member as needed. Faculty may encourage online students to form “study groups” in person or online. Note: For hybrid classes, face-to-face class time will provide opportunities for students to discuss amongst themselves (in groups or pairs) and ask questions about the material to facilitate SLOs and course outcomes.
Other DE (e.g., recorded lectures)	Faculty may use a variety of ADA compliant tools and media integrated within the learning management system to help students reach SLO competency. Tools may include: o Recorded Lectures, Narrated Slides, Screencasts o Instructor created content o OC Online Library Resources o Canvas Peer Review Tool o Canvas Student Groups (Assignments, Discussions) o 3rd Party (Publisher) Tools (MyOpenMath) o Websites and Blogs o Multimedia (YouTube, Films on Demand, 3CMedia, Khan Academy, etc.)

Synchronous Dialog (e.g., online chat)	Instructor may provide a set time each week where they will be available for synchronous chat and be available in the discussion board and can answer questions in live time.
<b>Hybrid (51%–99% online) Modality:</b>	
<b>Method of Instruction</b>	<b>Document typical activities or assignments for each method of instruction</b>
Asynchronous Dialog (e.g., discussion board)	Regular use of asynchronous discussion boards encourages various types of interaction and critical thinking skills among all course participants. Questions and topics posed will allow students to discuss, compare and contrast, identify, and analyze elements of the course outcomes. Other discussion boards may be used for Q&A and general class discussion by students and instructor to facilitate student success and strengthen student learning outcomes.
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Synchronous Dialog (e.g., online chat)	Instructor may provide a set time each week where they will be available for synchronous chat and be available in the discussion board and can answer questions in live time.
Video Conferencing	Video tools such as ConferZoom can be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Video Conferences will be used to facilitate SLOs and student-to-student group meetings will also be encouraged.

## Examinations

### Hybrid (1%–50% online) Modality

Online  
On campus

### Hybrid (51%–99% online) Modality

Online  
On campus

**Primary Minimum Qualification**

AUTOMOTIVE TECHNOLOGY

**Additional local certifications required**

MLR, A4, &amp; A6

**Review and Approval Dates****Department Chair**

12/02/2020

**Dean**

12/02/2020

**Technical Review**

12/09/2020

**Curriculum Committee**

12/09/2020

**DTRW-I**

MM/DD/YYYY

**Curriculum Committee**

12/09/2020

**Board**

MM/DD/YYYY

**CCCCO**

MM/DD/YYYY

**Control Number**

CCC000593787

**DOE/accreditation approval date**

MM/DD/YYYY