

# Automotive Technology

## Overview

The automotive technology program is a combination of classroom and hands-on shop experiences that prepare students for careers in all phases of automotive service and repair on all types of cars. Students are trained on the use of workshop manuals in traditional and computerized formats, hand held meters and scanners, and special shop tools including power and hand tools.

Highlights include:

- NATEF certified in: brakes, electrical/electronic systems, engine performance, suspension and steering, automatic transmission/transaxle, engine repair, heating and air conditioning, manual drive trains and axles.
- ASE certified instructors and programs.
- Students may begin 5-week courses 3 times during the semester.
- 5-week courses allow completion of some certificate programs in one semester.
- Small class size ensures individual attention and access to specialized equipment.
- Preparation for ASE and State Smog Certification (Emissions Control) exams.

## Roadmaps

Road maps lay out all of the courses you need to take for a given degree or certificate.

[Get a Road map! Explore Ways to Complete These Programs \(/academics/arc-program-road-maps\)](#)

Division Dean [Gary Aguilar \(/about-us/contact-us/faculty-and-staff-directory/gary-aguilar\)](#)  
 Department Chair [Ben French \(/about-us/contact-us/faculty-and-staff-directory/ben-french\)](#)  
 HomeBase [Manufacturing, Construction and Transportation \(/academics/homebases/manufacturing-construction-and-transportation\)](#)  
 Division [Technical Education Division Office \(/academics/technical-education-division-office\)](#)  
 Phone (916) 484-8354

## Associate Degrees

### A.S. in Automotive Analysis

This program prepares students for entry-level employment as smog and driveability service technicians. It also prepares students for Automotive Service Excellence (ASE) certification in Engine Repair A1, Automatic Transmissions/Transaxles A2, Electrical A6, Engine Performance A8, and Advanced Engine Performance L1. This program also fulfills the Bureau of Automotive Repair (BAR) requirements for California State Smog Check Inspector and California State Smog Check Repair Technician test candidates.

Catalog Date: January 1, 2021

### Degree Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 105	Mathematics for Automotive Technology	3
AT 180	Automotive Data Acquisition	3
AT 181	Snap-On Multimeter Basics	1
AT 186	Snap-On MODIS – Automotive Diagnostic Use and Operation	2
AT 188	Snap-On SOLUS– Automotive Diagnostic Use and Operation	1
AT 189	Snap-On VERUS – Automotive Diagnostic Use and Operation	2
AT 330	Automotive Electrical Systems	6
AT 331	Advanced Automotive Electrical Systems	6
AT 332	Engine Performance & Electronic Engine Controls	6
AT 333	California State Smog Check Inspector Training	6
A minimum of 1 unit from the following:		1
AT 298	Work Experience in Automotive Technology (1 - 4)	
or AT 140	Advanced Automotive Skill and Speed Development (3)	
Total Units:		40

*The Automotive Analysis Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.*

### Student Learning Outcomes

Upon completion of this program, the student will be able to:

- identify and implement safety procedures involved in the diagnosis, service, and repair of all major automobile and light truck systems.
- describe the function, operation, and characteristics of all major components in the following automotive systems: engines, automatic transmissions, electrical, air conditioning, emission control and computerized engine controls.
- identify and follow manufacturer's standards for proper automobile diagnosis and repair.

- operate hand and power tools necessary for automobile and light truck repair.
- operate diagnostic equipment and interpret test results.
- analyze, diagnose, and repair automotive engines, automatic transmissions, electrical systems, fuel delivery systems, ignition systems, emissions control systems, and computerized engine controls.
- operate a variety of aftermarket and factory scan tools.

## Career Information

Automotive Technician Smog Check Technician

# A.S. in Automotive Component Service Technician

This degree prepares the student for employment repairing of various automobile components including those requiring computer technology.

Catalog Date: January 1, 2021

## Degree Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 105	Mathematics for Automotive Technology	3
AT 110	Automotive Brakes	3
AT 130	Manual Drive Trains and Axles	3
AT 140	Advanced Automotive Skill and Speed Development	3
AT 180	Automotive Data Acquisition	3
AT 310	Heating and Air-Conditioning Systems	3
AT 311	Suspension and Steering Systems	3
AT 313	Automatic Transmission and Transaxles	3
AT 314	Automotive Engine Repair	3
AT 330	Automotive Electrical Systems	6
A minimum of 1 unit from the following:		1
AT 298	Work Experience in Automotive Technology (1 - 4)	
Total Units:		37

The Automotive Component Service Technician Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- diagnose and repair major automotive components.
- describe the relationships between automotive components.
- complete service and repair work to industry time and quality standards.
- follow federal EPA guidelines for handling and use of hazardous material found in an automotive shop.
- demonstrate safe work practices in the auto shop.

## Career Information

Employment as a technician, shop foreman, service manager for new car dealers, automotive repair shops, and fleet operators.

# A.S. in Automotive Technology

This program prepares students for entry-level positions in the automotive industry with emphasis on engine management systems, emission controls, and complete automotive systems diagnosis and repair. It prepares students for all nine Automotive Service Excellence (ASE) certifications including Advanced Engine Performance (L-1). This program also fulfills the Bureau of Automotive Repair (BAR) requirements for California State Smog Check Inspector and California State Smog Check Repair Technician test candidates.

Catalog Date: January 1, 2021

## Degree Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 105	Mathematics for Automotive Technology	3
AT 110	Automotive Brakes	3
AT 130	Manual Drive Trains and Axles	3
AT 180	Automotive Data Acquisition	3
AT 310	Heating and Air-Conditioning Systems	3
AT 311	Suspension and Steering Systems	3
AT 313	Automatic Transmission and Transaxles	3
AT 314	Automotive Engine Repair	3
AT 330	Automotive Electrical Systems	6
AT 331	Advanced Automotive Electrical Systems	6
AT 332	Engine Performance & Electronic Engine Controls	6
AT 333	California State Smog Check Inspector Training	6
A minimum of 1 unit from the following:		1

COURSE CODE	COURSE TITLE	UNITS
AT 298	Work Experience in Automotive Technology (1 - 4)	
or AT 140	Advanced Automotive Skill and Speed Development (3)	
Total Units:		52

The Automotive Technology Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply algebraic and mathematical concepts essential to advancement in the automotive industry.
- operate equipment and tools safely.
- evaluate, adjust, test, and diagnose components/system malfunctions.
- diagnose, assess, and repair manual and automatic transmissions and transaxles.
- locate, download, and analyze technical manuals from the Internet, digital, and text sources.
- analyze, diagnose, and repair automotive electrical and electronic systems to ASE performance level.
- diagnose, troubleshoot, and repair basic air conditioning (AC) systems.
- diagnose, disassemble, inspect, clean, and reassemble components of the steering and suspension system.
- analyze, diagnose, and repair engines to ASE performance levels.
- analyze and repair fuel injection systems to ASE standards.
- diagnose engine emission control systems to ASE standards.
- prepare for the State Smog Check Inspector and California State Smog Check Repair Technician tests.

## Certificates of Achievement

### Air Conditioning Service Certificate

This certificate program prepares the student for an entry level position in the automotive industry. This program also prepares the student for Automotive Service Excellence (ASE) certification in Air Conditioning A-7.

Catalog Date: January 1, 2021

### Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 105	Mathematics for Automotive Technology	3
AT 180	Automotive Data Acquisition	3
AT 310	Heating and Air-Conditioning Systems	3
AT 330	Automotive Electrical Systems	6
Total Units:		18

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- Identify and implement safety procedures involved in the service and repair of Automotive Heating, Ventilation, Air Conditioning (HVAC) systems.
- Describe the function, operation and characteristics of each component in automotive HVAC systems.
- Operate diagnostic equipment and interpret results from the equipment.
- Diagnose automotive HVAC systems including manual, semi-automatic, and automatic.
- Repair automotive HVAC systems including manual, semi-automatic, and automatic.
- Diagnose engine cooling systems.
- Repair engine cooling systems.
- Follow Federal EPA guidelines for the handling and use of refrigerants.

### Alternative Fuels and Green Vehicle Technology Certificate

This certificate covers the various technologies used in the alternative fuels vehicles of today. Topics include biodiesel production, hybrid electric vehicles, and fuel cell technology.

Catalog Date: January 1, 2021

### Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 309	Introduction to Hybrid and Electric Vehicle Technology	4
AT 330	Automotive Electrical Systems	6
AT 331	Advanced Automotive Electrical Systems	6
AT 316	Alternative Fuels and Advanced Technology Vehicles	4
Total Units:		23

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- perform basic automotive services on alternative fuels vehicles.
- describe different alternative fuels vehicle designs.
- describe the process of making biodiesel.
- analyze electrical and electronic components and identify failures.
- use automotive test equipment such as digital multimeters and scan tools.
- perform high voltage system disable procedures on hybrid electric vehicles.

## Career Information

Alternative fuels is an emerging career field that is rapidly growing. This certificate prepares automotive technology students for entrance into this field, from servicing alternative fuels vehicles to developing alternative fuels technology. Additional career opportunities are likely as the industry continues to grow.

## Automotive Analysis Certificate

This program prepares students for entry-level employment as smog and driveability service technicians. It also prepares students for Automotive Service Excellence (ASE) certification in Engine Repair A1, Automatic Transmissions/Transaxles A2, Electrical A6, Engine Performance A8, and Advanced Engine Performance L1. This program also fulfills the Bureau of Automotive Repair (BAR) requirements for California State Smog Check Inspector and California State Smog Check Repair Technician test candidates.

Catalog Date: January 1, 2021

## Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 105	Mathematics for Automotive Technology	3
AT 180	Automotive Data Acquisition	3
AT 181	Snap-On Multimeter Basics	1
AT 186	Snap-On MODIS – Automotive Diagnostic Use and Operation	2
AT 188	Snap-On SOLUS– Automotive Diagnostic Use and Operation	1
AT 189	Snap-On VERUS – Automotive Diagnostic Use and Operation	2
AT 330	Automotive Electrical Systems	6
AT 331	Advanced Automotive Electrical Systems	6
AT 332	Engine Performance & Electronic Engine Controls	6
AT 333	California State Smog Check Inspector Training	6
A minimum of 1 unit from the following:		1
AT 298	Work Experience in Automotive Technology (1 - 4)	
or AT 140	Advanced Automotive Skill and Speed Development (3)	
Total Units:		40

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- identify and implement safety procedures involved in the diagnosis, service, and repair of all major automobile and light truck systems.
- describe the function, operation, and characteristics of all major components in the following automotive systems: engines, automatic transmissions, electrical, air conditioning, emission control, and computerized engine controls.
- identify and follow manufacturer's standards for proper automobile diagnosis and repair.
- operate hand and power tools necessary for automobile and light truck repair.
- operate diagnostic equipment and interpret test results.
- analyze, diagnose, and repair automotive engines, automatic transmissions, electrical systems, fuel delivery systems, ignition systems, emissions control systems, and computerized engine controls.
- operate a variety of aftermarket and factory scan tools.

## Career Information

Automotive Technician Smog Check Technician

## Automotive Component Service Technician Certificate

This certificate prepares the student for entry level employment in the repairing of various automobile components including those requiring computer technology.

Catalog Date: January 1, 2021

## Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 105	Mathematics for Automotive Technology	3
AT 110	Automotive Brakes	3
AT 130	Manual Drive Trains and Axles	3
AT 140	Advanced Automotive Skill and Speed Development	3
AT 180	Automotive Data Acquisition	3
AT 310	Heating and Air-Conditioning Systems	3
AT 311	Suspension and Steering Systems	3

COURSE CODE	COURSE TITLE	UNITS
AT 313	Automatic Transmission and Transaxles	3
AT 314	Automotive Engine Repair	3
AT 330	Automotive Electrical Systems	6
A minimum of 1 unit from the following:		1
AT 298	Work Experience in Automotive Technology (1 - 4)	
Total Units:		37

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- diagnose and repair automotive major automotive components.
- describe the relationship between automotive components.
- complete service and repair tasks to industry time and quality standards.
- follow federal EPA guidelines for handling and use of hazardous material found in an automotive shop.
- demonstrate safe work practices in the auto shop.

## Career Information

Employment as a technician for new car dealers, automotive repair shops, and fleet operators.

# Automotive Emissions Inspection and Repair Technician Certificate

This certificate prepares students for entry-level positions in the automotive industry as emissions inspectors or emissions repair technicians. It meets the state of California requirements for students seeking to apply for a California state smog inspector and/or repair license(s).

Catalog Date: January 1, 2021

## Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 105	Mathematics for Automotive Technology	3
AT 180	Automotive Data Acquisition	3
AT 314	Automotive Engine Repair	3
AT 330	Automotive Electrical Systems	6
AT 331	Advanced Automotive Electrical Systems	6
AT 332	Engine Performance & Electronic Engine Controls	6
AT 333	California State Smog Check Inspector Training	6
AT 334	BAR Specified Diagnostic and Repair Training	4
Total Units:		40

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- operate emission analyzers and tools safely.
- evaluate, adjust, test, and diagnose components/system malfunctions.
- research, download, and analyze technical manuals from the Internet, digital, and text sources.
- inspect, diagnose, and repair automotive electrical and electronic systems at Automotive Service Excellence (ASE) performance level.
- inspect, diagnose, and repair engines to ASE performance levels.
- inspect, diagnose, and repair fuel injection systems to ASE and BAR standards.
- diagnose engine emission systems to ASE and Bureau of Automotive Repair (BAR) standards.
- prepare for state smog inspector and repair technician certifications.

## Career Information

California State Smog Inspector and California State Smog Repair Technician.

# Automotive Technology Certificate

This program prepares students for entry-level positions in the automotive industry with emphasis on engine management systems, emission controls, and complete automotive systems diagnosis and repair. It prepares students for all nine Automotive Service Excellence (ASE) certifications including Advanced Engine Performance (L-1). This program also fulfills the Bureau of Automotive Repair (BAR) requirements for California State Smog Check Inspector and California State Smog Check Repair Technician test candidates.

Catalog Date: January 1, 2021

## Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 105	Mathematics for Automotive Technology	3
AT 110	Automotive Brakes	3
AT 130	Manual Drive Trains and Axles	3

COURSE CODE	COURSE TITLE	UNITS
AT 180	Automotive Data Acquisition	3
AT 310	Heating and Air-Conditioning Systems	3
AT 311	Suspension and Steering Systems	3
AT 313	Automatic Transmission and Transaxles	3
AT 314	Automotive Engine Repair	3
AT 330	Automotive Electrical Systems	6
AT 331	Advanced Automotive Electrical Systems	6
AT 332	Engine Performance & Electronic Engine Controls	6
AT 333	California State Smog Check Inspector Training	6
A minimum of 1 unit from the following:		1
AT 298	Work Experience in Automotive Technology (1 - 4)	
or AT 140	Advanced Automotive Skill and Speed Development (3)	
Total Units:		52

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply algebraic and mathematical concepts essential to advancement in the automotive industry.
- operate equipment and tools safely.
- evaluate, adjust, test, and diagnose components/system malfunctions.
- diagnose, assess, and repair manual transmissions and transaxles.
- locate, download, and analyze technical manuals from the Internet, digital, and text sources.
- analyze, diagnose, and repair automotive electrical and electronic systems at ASE performance level.
- diagnose and troubleshoot basic air conditioning (AC) systems.
- diagnose, disassemble, inspect, clean, and reassemble all components of the steering and suspension system.
- analyze, diagnose, and repair engines to ASE performance levels.
- analyze and repair fuel injection systems to ASE standards.
- diagnose engine emission systems to ASE standards.
- prepare for the state smog inspector and repair technician certifications.

## Extreme Tuner Certificate

This program covers advanced applications of emissions related principles including fuel control and efficiency management of modern automobiles. Topics include brakes, repair of electrical systems, suspension, steering, and engine repairs.

Catalog Date: January 1, 2021

### Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 110	Automotive Brakes	3
AT 130	Manual Drive Trains and Axles	3
AT 311	Suspension and Steering Systems	3
AT 330	Automotive Electrical Systems	6
AT 314	Automotive Engine Repair	3
AT 316	Alternative Fuels and Advanced Technology Vehicles	4
AT 325	Engine Performance Testing & Tuning	4
AT 327	Introduction to Motorsports	4
Total Units:		33

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- evaluate vehicle horsepower safely and effectively by use of diagnostic equipment.
- analyze and demonstrate safe operating practices both in the shop and track environment with stock and modified vehicles.
- validate and summarize outcomes of fuel, timing and power band modifications through hands-on exposure to live data derived before and after modifications.
- apply performance based principles to construct and operate a vehicle for competition, including classification divisions within a sanctioned racing organization.
- organize maintenance schedules and record keeping in order to keep vehicle competitive throughout a season.
- accurately interpret computer software data to make adjustments and modifications to improve performance and/or economy of a modern vehicle.

## Career Information

The "Tuner" industry is a rapidly growing industry. Professional technicians today are modifying vehicles for both on and off road application. This certificate prepares the students for the following career opportunities: alternative fuels diagnostic technician, off-road performance tuner, and a racing team crew member.

## Parts and Service Certificate

This certificate provides training for automotive parts and service advisors. Topics include parts knowledge, integrated computer management software, scheduling, inventory control, hazardous materials and warranty documentation requirements.

Catalog Date: January 1, 2021

## Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 105	Mathematics for Automotive Technology	3
AT 107	Employability Skills for Technical Careers	2
AT 143	Automotive Parts	3
AT 146	Automotive Service Consultant	3
AT 180	Automotive Data Acquisition	3
A minimum of 1 unit from the following:		1
AT 298	Work Experience in Automotive Technology (1 - 4)	
Total Units:		18

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- Apply established procedures in the automotive industry.
- Ensure the satisfactory resolution of service-related customer issues.
- Create a service work including dispatching and invoicing.

## Career Information

Various entry level positions in the automotive parts and service industry, such as service writers and parts specialists.

## Small Engines Certificate

This certificate prepares students for employment in the automotive industry, specializing in small engines.

Catalog Date: January 1, 2021

## Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 180	Automotive Data Acquisition	3
AT 181	Snap-On Multimeter Basics	1
AT 301	Small Gas Engines, Outdoor Power Equipment (4)	4
or HORT 330	Small Gas Engines, Outdoor Power Equipment (4)	
A minimum of 1 unit from the following:		1
AT 298	Work Experience in Automotive Technology (1 - 4)	
or AT 140	Advanced Automotive Skill and Speed Development (3)	
Total Units:		12

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- demonstrate accepted safety and work procedures, including Occupational Safety and Health Administration (OSHA) and proper hazardous materials disposal.
- service and repair the starter systems of 2-cycle and 4-cycle small engines.
- identify the external and internal parts of 2-cycle and 4-cycle small engines.
- determine the proper lubrication and fuel requirements for 2-cycle and 4-cycle small engines using factory maintenance data.
- service and repair the cooling and oil systems of 2-cycle and 4-cycle small engines.
- remove, rebuild, install, adjust, and tune 2-cycle and 4-cycle small engine fuel delivery and ignition system components.

## Career Information

The automotive small engines industry is growing and in need of technicians. This certificate prepares students for employment in many different areas, including horticulture, off road vehicles, marine applications, and many others.

## Snap-On™ Certification Certificate

This certificate prepares students for entry-level positions in the automotive industry. It provides the knowledge and skills needed for certification using current Snap-On™ diagnostic tools.

Catalog Date: January 1, 2021

## Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 107	Employability Skills for Technical Careers	2
AT 180	Automotive Data Acquisition	3
AT 181	Snap-On Multimeter Basics	1
AT 188	Snap-On SOLUS– Automotive Diagnostic Use and Operation	1

COURSE CODE	COURSE TITLE	UNITS
AT 189	Snap-On VERUS – Automotive Diagnostic Use and Operation	2
A minimum of 1 unit from the following:		1
AT 140	Advanced Automotive Skill and Speed Development (3)	
or AT 298	Work Experience in Automotive Technology (1 - 4)	
Total Units:		13

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- demonstrate safe, accurate use of tools and equipment.
- apply accurate measurement techniques.
- explain screen orientation and how to navigate through different functions of the VERUS scanner.
- perform the proper procedure to do an oil change on a vehicle.
- locate and analyze technical manuals from online computerized databases.
- apply retrieved data to specific vehicle conditions.

## Career Information

The automotive industry is growing and in need of technicians. Snap-On™ certifications are in high demand.

## Transmission Service Certificate

This certificate program prepares the student for an entry-level position in the automotive industry. This program includes Automotive Service Excellence (ASE) certification in A-2 automatic transmission and A-3 manual drive-train.

Catalog Date: January 1, 2021

## Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 105	Mathematics for Automotive Technology	3
AT 130	Manual Drive Trains and Axles	3
AT 140	Advanced Automotive Skill and Speed Development	3
AT 180	Automotive Data Acquisition	3
AT 317	Advanced Drivetrain	3
AT 330	Automotive Electrical Systems	6
AT 313	Automatic Transmission and Transaxles	3
Total Units:		27

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- analyze an automotive transmission, applying elements of drive-train theory.
- investigate an automotive electrical malfunction by locating, testing and identifying the failure in order to make the necessary repairs.
- research on-line and computer based automotive data sources in order to identify the correct repair procedure, and locate safety campaigns and bulletins.
- describe the operation of drive-train components in order to report and justify a recommended repair procedure.
- apply gear theory to drive-train malfunction.
- evaluate and recognize the drive-train malfunction.

## Career Information

Entry-level positions in automatic transmission, clutch, and drive-train repair.

## Undercar Service Certificate

The Undercar Service certificate provides entry-level training in performing repairs to automotive suspension, brake, and exhaust systems.

Catalog Date: January 1, 2021

## Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 106	Automotive Shop Operations	2
AT 110	Automotive Brakes	3
AT 145	Automotive Exhaust System	3
AT 180	Automotive Data Acquisition	3
AT 311	Suspension and Steering Systems	3
A minimum of 1 unit from the following:		1
AT 140	Advanced Automotive Skill and Speed Development (3)	
or AT 298	Work Experience in Automotive Technology (1 - 4)	



COURSE CODE	COURSE TITLE	UNITS
Total Units:		18

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- develop a resume and cover letter to plan for future career opportunities.
- perform run-out and parallelism evaluations on brake rotors and machine to manufacturer's specifications.
- measure and analyze suspension angles of a modern automobile and make adjustments necessary to bring the angle within manufacturer's specifications.
- identify modern exhaust system components and demonstrate how they relate to California emission control laws.
- research and synthesize brake, suspension, and exhaust system information on electronic service manuals to provide information on repairs to meet industry standards.

## Career Information

This certificate provides students with knowledge for entry-level careers in the automotive suspension, brake, and exhaust repair facilities.

## Certificates

### Automotive Brakes Certificate

This certificate prepares students for employment in the automotive industry, specializing in brakes.

Catalog Date: January 1, 2021

### Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 110	Automotive Brakes	3
AT 180	Automotive Data Acquisition	3
AT 181	Snap-On Multimeter Basics	1
A minimum of 1 unit from the following:		1
AT 140	Advanced Automotive Skill and Speed Development (3)	
or AT 298	Work Experience in Automotive Technology (1 - 4)	
Total Units:		11

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- describe shop orientation and safety issues.
- discuss the basics of vehicle service including oil, lubrication, inspection, and replacement of fluids.
- demonstrate proper handling, use, and disposal of hazardous materials in the automotive shop environment, combined with safety test.
- practice safety precautions and procedures when inspecting and repairing braking systems.
- analyze the various brake components used on automobiles and describe the functions of each.
- evaluate and diagnose brake components/system malfunctions.
- reassemble and adjust all components of the brake system following service manual procedures.
- arrange, clean, inspect, and measure all components of brake systems following established service manual procedures.

## Career Information

The automotive brakes industry is growing and in need of technicians.

### Automotive Suspension and Steering Certificate

This certificate prepares students for employment in the automotive industry, specializing in suspension and steering.

Catalog Date: January 1, 2021

### Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
AT 100	Technical Basics for the Automotive Professional	3
AT 180	Automotive Data Acquisition	3
AT 181	Snap-On Multimeter Basics	1
AT 311	Suspension and Steering Systems	3
A minimum of 1 unit from the following:		1
AT 298	Work Experience in Automotive Technology (1 - 4)	
or AT 140	Advanced Automotive Skill and Speed Development (3)	
Total Units:		11

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- analyze, describe, and avoid unsafe working conditions and unsafe acts, as well as observe safety regulations in an auto repair facility.
- identify the various components used on automotive steering and suspension systems and describe the function of each.
- perform geometric centerline and thrustline alignments.
- disassemble, inspect, clean, and reassemble all components of the steering and suspension systems in accordance to service manual procedures.
- determine the need for and perform four-wheel alignments.
- diagnose any malfunction of the steering suspension components used on automobiles.

## Career Information

The automotive suspension and steering industry is growing and in need of technicians.

# Automotive Technology (AT) Courses

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## AT 100 Technical Basics for the Automotive Professional

Units:	3
Hours:	26 hours LEC; 84 hours LAB
Prerequisite:	None.
Catalog Date:	January 1, 2021

This course presents theoretical and practical training for entry-level automotive technicians. It presents basic automotive diagnosis and service procedures used in automotive shops. Projects performed in an automotive shop environment provide hands-on experience with industry shop tools. Shop service operations which meet Automotive Service Excellence (ASE) standards including safety, electrical, and other general automotive procedures are covered.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate safe, accurate use of tools and equipment.
- incorporate the proper use of a tap and die to repair threads.
- apply accurate measurement techniques.
- perform the proper procedure to do an oil change on a vehicle.

## AT 105 Mathematics for Automotive Technology

Units:	3
Hours:	54 hours LEC
Prerequisite:	None.
Corequisite:	AT 100
General Education:	AA/AS Area II(b)
Catalog Date:	January 1, 2021

This course covers mathematics relative to the automotive trades. Course topics include the metric system, fraction, decimal equivalents, basic equations, ratio and proportion, gear ratio calculations, power, efficiency, and torque. This course is designed for Automotive Technology majors and covers all automotive-related mathematical areas from basic technician calculations to shop money management.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- solve equations that contain addition, subtraction, multiplication, and division.
- use fractions, decimals, and percentages in automotive measurement and finance.
- identify metric and standard units of measurement.
- perform metric to standard unit conversion.
- calculate engine displacement, horsepower, and compression ratios.
- solve problems regarding gear ratios, hydraulics, or electrical systems.
- properly fill out an automotive repair order that includes parts, labor, and sales tax.

## AT 106 Automotive Shop Operations

Units:	2
Hours:	36 hours LEC
Prerequisite:	None.
Catalog Date:	January 1, 2021

This course introduces operations of automotive dealerships, independent shops, and fleet shops. Emphasis is placed on the various influences that affect the technician's position within the operation. Topics include service, sales, parts, and financial operations. Customer Satisfaction Index (CSI) and the Bureau of Automotive Repair (BAR) are discussed. Field trips to local shops may be required.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- identify all of the dealership's departments and their functions
- critique dealership, independent, and fleet shop operation
- analyze how flat rate affects the technician

- analyze and evaluate the advantages and disadvantages of working in dealership, independent, and fleet shops
- evaluate the effectiveness of the Customer Satisfaction Index (CSI) in the service department
- evaluate the Bureau of Automotive Repair (BAR) rules and regulations regarding technician repair responsibilities

## AT 107 Employability Skills for Technical Careers

Same As:	ET 250 and WELD 150
Units:	2
Hours:	36 hours LEC
Prerequisite:	None.
Advisory:	ENGWR 102 or 103, and ENGRD 116 with a grade of "C" or better; OR ESLR 320, ESLL 320, and ESLW 320 with a grade of "C" or better.
General Education:	AA/AS Area III(b)
Catalog Date:	January 1, 2021

This course provides the opportunity to explore technical careers while developing valuable work and life skills. It is an introduction to a variety of technically-related occupations, emphasizing technical careers in the Sacramento area. Activities are designed to enhance personal development, employability skills, and self esteem through leadership, citizenship, and character development. This course is not open to students who have completed ET 250 or WELD 150.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- identify personal interests.
- demonstrate effective communication skills.
- demonstrate personal qualities that are desirable in the workplace.
- create long-term and short-term goals.

## AT 108 Successful Automobile Selling Skills

Units:	1.5
Hours:	27 hours LEC
Prerequisite:	None.
Catalog Date:	January 1, 2021

This course covers successful automobile sales techniques. Topics include the process of selling cars, from greeting the consumer to closing the sale. It also covers understanding today's information age consumer.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- analyze a customer's automobile needs.
- list the steps for selling automobiles.
- create a sales draft.
- describe financing options.
- describe warranty options.

## AT 110 Automotive Brakes

Units:	3
Hours:	26 hours LEC; 84 hours LAB
Prerequisite:	None.
Corequisite:	AT 100 and 180
Advisory:	AT 181 and 188
Catalog Date:	January 1, 2021

This course covers the theory, design, adjustment, and repair or overhaul of brake systems and components. It covers the proper operation of power and hand devices used in the servicing of brake systems and components. This course meets Automotive Service Excellence (ASE) A5 standards.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- practice safety precautions and procedures when inspecting and repairing braking systems.
- analyze the various brake components used on automobiles and describe the functions of each.
- evaluate and diagnose brake components/system malfunctions.
- identify the special tools necessary to properly diagnose and repair brake component/system malfunctions.
- properly use special tools in diagnosing and repairing brake system malfunctions.
- arrange, clean, inspect, and measure all components of brake systems following established service manual procedures.
- refinish brake rotors and/or brake drums following established service manual procedures.
- reassemble and adjust all components of the brake system following service manual procedures.

## AT 130 Manual Drive Trains and Axles

Units:	3
Hours:	26 hours LEC; 84 hours LAB
Prerequisite:	None.
Corequisite:	AT 100 and 180
Advisory:	AT 181 and 188
Catalog Date:	January 1, 2021

This course covers the basic principles of manual transmissions and transaxles and service. Topics include clutches, manual transmissions and transaxles, drive line and shafts, differentials/limited slip differentials, and four-wheel drive/all-wheel drive. This course meets Automotive Service Excellence (ASE) standard A3.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply manual transmission theory to transmission operation.
- analyze and repair clutch problems.
- diagnose, assess, and repair manual transmissions and transaxles.
- diagnose, assess, and repair drive (half) shaft and universal joint/constant velocity joints.
- troubleshoot rear axle ring and pinion gears, differential case assembly, limited slip differential, and axle shafts.
- disassemble and assemble four-wheel drive components.
- determine and apply proper safety and repair procedures.
- diagnose, assess, and repair clutch hydraulic and cable release systems.

## AT 140 Advanced Automotive Skill and Speed Development

Units:	3
Hours:	22.5 hours LEC; 94.5 hours LAB
Prerequisite:	None.
Corequisite:	AT 100
Advisory:	AT 110, 130, 311, and 314
Catalog Date:	January 1, 2021

This course covers automotive component diagnosis and repair, including brakes, suspension, heating and air conditioning, engine, transmissions, and other areas in preparation for competing in the regional, state, and national Skills USA competition. This course may be taken up to four times with different competitions.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- interpret customer's complaints, evaluate vehicle condition, and diagnose proper repair procedures in a competitive environment.
- analyze and replace engine cooling and heater system hoses in a competitive environment.
- perform cooling system tests and determine necessary action in a competitive environment.
- examine, replace, and adjust drive belts, tensioner, and pulleys in a competitive environment.
- solve a spongy brake pedal problem and correct condition in a competitive environment.
- explain the requirements for the Skills USA competition.

## AT 143 Automotive Parts

Units:	3
Hours:	45 hours LEC; 27 hours LAB
Prerequisite:	None.
Corequisite:	AT 100
Catalog Date:	January 1, 2021

This course introduces the key workings of automotive systems and their related parts. It also offers preparation for the Automotive Service Excellence (ASE) P-2 Parts Specialist test. Topics include suspension systems, hazardous waste regulations, and inventory management.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- look up parts using a paper catalog or computer-based system.
- explain the importance of inventory control and perform physical inventory.
- describe key automotive systems and parts application to assist customers in the repair of a vehicle.
- explain hazardous waste regulations as they apply to both transport and disposal, as well as the application of Material Safety Data Sheets (MSDS), in the automotive industry.
- apply the principles of recruiting and hiring, as well as writing of schedules, to ensure proper staffing.
- explain the different types and applications of common chemicals used in the automotive industry.
- utilize customer service skills when working with customers.
- utilize team building, coaching, and one-on-one interaction to facilitate the relationship between a supervisor and employee.

## AT 145 Automotive Exhaust System

Units:	3
Hours:	26 hours LEC; 84 hours LAB
Prerequisite:	AT 100 with a grade of "C" or better
Catalog Date:	January 1, 2021

This course is an introduction to the principles and service of exhaust systems, including pipe bending, cutting, welding, installation, repair, and inspection. It offers preparation to students for the Automotive Service Excellence (ASE) X1 exhaust systems test, which is required for the ASE Under-Car Specialist Certificate. Various welding techniques are covered during the semester.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- perform standard welding operations.
- verify the integrity of a weld.

- determine center and depth of bends, and rotation of pipe.
- perform pipe bending operations.
- determine and perform appropriate exhaust repairs on catalytic converters, mufflers, resonators, pipes, manifolds, and hangers.
- explain state and federal standards for exhaust systems.

## AT 146 Automotive Service Consultant

Units:	3
Hours:	45 hours LEC; 27 hours LAB
Prerequisite:	None.
Corequisite:	AT 180
Advisory:	AT 100
Catalog Date:	January 1, 2021

This course introduces the basic requirements needed to perform the duties of an automotive service consultant. It also offers preparation for the Automotive Service Excellence (ASE) C-1 Service Consultant exam. Topics include utilization of diagnostic flow charts, recruiting techniques, and small business operations.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply Bureau of Automotive Repair (BAR) regulations as an automotive service consultant.
- apply ethical practices to selling of automotive services and repairs.
- explain hazardous waste regulations as they apply to disposal and storage in the automotive repair facility.
- dispatch work in an orderly and efficient process to maximize technician productivity and profitability.
- document all services performed according to Motorist Assurance Program (MAP) standards and BAR regulations.
- utilize recruiting techniques that include print and electronic sources.
- apply proper interview techniques and hire qualified personnel to staff repair facility.
- use diagnostic flow charts to perform repairs on vehicle to reduce comeback repairs.
- describe how a small business operates.

## AT 156 Light Duty Diesel/Green Diesel Technology

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	None.
Advisory:	AT 314
Catalog Date:	January 1, 2021

This course introduces the diagnosis and repair of light duty diesel vehicles and covers the theory and operation of light duty diesel engines and their fuel delivery systems. Topics include diesel engine characteristics, early mechanical fuel delivery systems, early cylinder head design, and early engine construction. It also covers how to prepare these engines for conversion to green technology, such as low sulfur fuel, biodiesel, and alternative fuels. This course along with AT 157 is applicable for the field technician seeking training for ASE A9 certification and preparation for green technologies.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- describe the basic operation of diesel fueled vehicles.
- explain the differences between diesel and gasoline engine design.
- diagnose basic diesel engine driveability problems.
- perform basic diesel engine mechanical diagnostic procedures.
- evaluate the diesel fuel injection system's compatibility with low sulfur and biodiesel fuels.

## AT 157 Advanced Light Duty Diesel/Green Diesel Technology

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	None.
Advisory:	AT 156 and 330
Catalog Date:	January 1, 2021

This course focuses on late model turbocharged light duty diesel vehicles operating on low sulfur, biodiesel, or alternative fuels. Topics include computer controlled injection, emission control systems, sensors, actuators, computer modules, exhaust gas recirculation (EGR) systems, particulate traps, selective catalytic reduction (SCR) systems, and lean oxides of nitrogen (NOx) traps. Diagnosis and repair of these systems are covered using computer diagnostic equipment to meet state emission compliance. This course along with AT 156 is applicable for the field technician seeking training for ASE A9 certification and preparation for green technologies.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- explain the operation of common rail diesel fuel injection systems.
- explain the differences between late model diesel and older diesel engine design.
- diagnose basic driveability problems on late model diesel vehicles.
- perform basic diesel engine turbo charger diagnostic procedures.
- evaluate high pressure fuel system compatibility with biofuels and biofuel impact on diesel emissions.
- test diesel engine emissions and emission control systems.

## AT 177 Bureau of Automotive Repair (BAR) Emissions Update UT032

Units: 1  
Hours: 18 hours LEC  
Prerequisite: None.  
Advisory: AT 332 with a grade of "C" or better  
Catalog Date: January 1, 2021

This course improves technicians' abilities to diagnose and repair emissions failures on complex computer-controlled vehicles.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- identify the various network topologies used in On-Board Diagnostics (OBD) controlled vehicles.
- identify Controller Area Network (CAN) communication protocols used in OBD equipped vehicles.
- diagnose the cause of CAN communication failures on OBD equipped vehicles.
- use the Air Resources Board's Catalytic Converter database to identify California-legal catalytic converters.
- use an OBD scan tool to retrieve Mode 6 data.
- interpret the meaning of Mode 6 data retrieved from OBD equipped vehicles.

## AT 178 BAR Repair Technician Update UT055

Units: 1  
Hours: 18 hours LEC  
Prerequisite: None.  
Catalog Date: January 1, 2021

This course improves automotive repair technicians' abilities to diagnose and repair emissions failures on complex computer-controlled vehicles that use variable valve lift and valve timing technologies.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- differentiate between fuel system and mechanical failures.
- discuss advanced diagnostic strategies to exclude possible causes of emission failure.
- identify the operation and strategies of variable valve timing and variable valve lift systems.
- explain the use of a diagnostic scan tool to diagnose variable valve timing and variable valve lift systems.

## AT 180 Automotive Data Acquisition

Units: 3  
Hours: 54 hours LEC  
Prerequisite: None.  
Catalog Date: January 1, 2021

This course covers the skills needed to adequately retrieve and apply automotive data, including on-line technical manuals and computerized shop management programs. Computer-based automotive service repair order generation is covered as well as usage and application currently utilized in many automotive repair facilities.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- locate and analyze technical manuals from online computerized databases.
- apply retrieved data to specific vehicle conditions.
- use various computerized shop management programs.

## AT 181 Snap-On Multimeter Basics

Units: 1  
Hours: 18 hours LEC; 9 hours LAB  
Prerequisite: None.  
Catalog Date: January 1, 2021

This course explores the functionality and capability of the digital multimeter to improve technicians' diagnostic expertise when working with electrical related problems and prepares them for the Snap-on certification.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- choose the proper position on the rotary dial for testing.
- interpret the display readings and symbols.
- test for voltage.
- test for resistance.

## AT 182 General Motors Diagnostic Tools

Units: 2  
Hours: 27 hours LEC; 27 hours LAB  
Prerequisite: None.  
Catalog Date: January 1, 2021

This course explores the functionality and capability of General Motors diagnostic tools to improve technicians' expertise when working with On-Board computer-related problems.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- set up the Tech 2 for vehicle malfunction diagnosis.
- set up the MDI for vehicle malfunction diagnosis.
- explain screen orientation and how to navigate through different functions of the Tech 2 scanner.
- explain screen orientation and how to navigate through different functions of the MDI scanner.
- use the Tech 2 to program a control module.
- use the MDI to program a control module.

## AT 184 Toyota Techstream - Automotive Diagnostic Use and Operation

Units: 2  
Hours: 27 hours LEC; 27 hours LAB  
Prerequisite: None.  
Catalog Date: January 1, 2021

This course explores the functionality and capability of Toyota's Techstream to improve technicians' diagnostic expertise when working with On-Board computer-related problems.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- set up the Techstream for vehicle malfunction diagnosis.
- explain screen orientation and how to navigate through different functions of the Techstream.

## AT 186 Snap-On MODIS – Automotive Diagnostic Use and Operation

Units: 2  
Hours: 27 hours LEC; 27 hours LAB  
Prerequisite: None.  
Catalog Date: January 1, 2021

This course explores the functionality and capability of Snap-On's MODIS (Modular Diagnostic Information System) to improve the technician's diagnostic expertise when working with On-Board computer related problems.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- set up the MODIS for vehicle malfunction diagnosis.
- explain screen orientation and how to navigate through different functions of the MODIS scanner.

## AT 188 Snap-On SOLUS– Automotive Diagnostic Use and Operation

Units: 1  
Hours: 18 hours LEC; 9 hours LAB  
Prerequisite: None.  
Catalog Date: January 1, 2021

This course explores the functionality and capability of Snap-On's SOLUS to improve the technician's diagnostic expertise when working with On-Board computer-related problems.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- set up the SOLUS for vehicle malfunction diagnosis.
- explain screen orientation.
- navigate through different functions of the SOLUS scanner.

## AT 189 Snap-On VERUS – Automotive Diagnostic Use and Operation

Units: 2  
Hours: 27 hours LEC; 27 hours LAB  
Prerequisite: None.  
Catalog Date: January 1, 2021

This course explores the functionality and capability of Snap-On's VERUS to improve technicians' diagnostic expertise when working with on-board computer-related problems.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- set up the VERUS for vehicle malfunction diagnosis.
- explain screen orientation and how to navigate through different functions of the VERUS scanner.

# AT 190 Advanced Student Projects

Units:	2
Hours:	108 hours LAB
Prerequisite:	AT 100 with a grade of "C" or better
Catalog Date:	January 1, 2021

This course provides opportunities to pursue advanced laboratory projects in all eight of the Automotive Service Excellence (ASE) educational areas. Projects are selected by the Automotive Department.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply automotive systems specifications and tolerances to modern systems.
- demonstrate skills in repair techniques.
- construct a complete automotive project.
- research automotive information and specifications from written and Internet sources.

# AT 251 Automotive Electronic Accessories and Installation

Units:	3
Hours:	36 hours LEC; 54 hours LAB
Prerequisite:	None.
Corequisite:	AT 330 or ET 302
Catalog Date:	January 1, 2021

This course covers the principles and processes involved in the installation of mobile entertainment, security, positioning, and other electrical and electronic related systems and components. Safety, circuit diagrams, inspection, wiring, installation, and troubleshooting techniques are covered along with the operational characteristics of the various electrical circuits. This course offers preparation to become a qualified Mobile Electronics Certified Professional (MECP) installer. This course is not open to students who have taken ET 251. Field trips are required.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply safety procedures pertaining to the installation and operation of vehicle entertainment/electronic components.
- install, test, and operate the various types of mobile electronic equipment.
- differentiate and analyze the operating characteristics of electronic circuits and installed components under normal and abnormal conditions.
- interpret diagrams, solder and repair wiring, test and inspect installed components.
- troubleshoot installed accessories using electronic test equipment and other measuring devices.
- research mobile electronic circuits and device components using manufacturer's data, library resources, the Internet, and electronic shop manuals.
- master the objectives of the MECP certification test and become a qualified mobile electronics certified installer.

# AT 294 Topics in Automotive Technology

Units:	0.5 - 3
Hours:	9 - 54 hours LEC; 27 - 162 hours LAB
Prerequisite:	None.
Catalog Date:	January 1, 2021

This course provides opportunity to study current topics in automotive technology that are not included in existing courses.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- develop analytical and critical thinking skills as they apply to automotive technology
- demonstrate an understanding and apply principles of automotive technology
- explain automotive technology as it applies to this topic

# AT 295 Independent Studies in Automotive Technology

Units:	1 - 3
Hours:	54 - 162 hours LAB
Prerequisite:	None.
Catalog Date:	January 1, 2021

Independent Study is an opportunity for the student to extend classroom experience in this subject, while working independently of a formal classroom situation. Independent study is an extension of work offered in a specific class in the college catalog. To be eligible for independent study, students must have completed the basic regular catalog course at American River College. They must also discuss the study with a professor in this subject and secure approval. Only one independent study for each catalog course will be allowed.

# AT 298 Work Experience in Automotive Technology

Units:	1 - 4
Hours:	60 - 300 hours LAB
Prerequisite:	None.
Enrollment Limitation:	Students must be in a paid or unpaid internship, volunteer position, or job related to the automotive industry with a cooperating site supervisor. Students are advised to consult with the Automotive Department faculty to review specific certificate and degree work experience requirements.
Advisory:	AT 100; and eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.
General Education:	AA/AS Area III(b)
Catalog Date:	January 1, 2021



This course provides students with opportunities to develop marketable skills in preparation for employment or advancement within the automotive field. It is designed for students interested in work experience and/or internships in associate degree level or certificate occupational programs. Course content includes understanding the application of education to the workforce, completion of Title 5 required forms which document the student's progress and hours spent at the work site, and developing workplace skills and competencies.

During the semester, the student is required to complete 75 hours of related paid work experience, or 60 hours of related unpaid work experience for one unit. An additional 75 or 60 hours of related work experience is required for each additional unit. All students are required to attend the first class meeting, a mid-semester meeting, and a final meeting. Additionally, students who have not already successfully completed a Work Experience course will be required to attend weekly orientations while returning participants may meet individually with the instructor as needed. Students may take up to 16 units total across all Work Experience course offerings. This course may be taken up to four times when there are new or expanded learning objectives. Only one Work Experience course may be taken per semester.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate mastery of specific job skills in the automotive field related to an associate degree or certificate occupational program level career as written in the minimum three (3) learning objectives created by the student and his/her employer or work site supervisor at the start of the course.
- make effective decisions, use workforce information, and manage his/her personal career plans.
- behave professionally, ethically, and legally at work, consistent with applicable laws, regulations, and organizational norms.
- behave responsibly at work, exhibiting initiative and self-management in situations where it is needed.
- apply effective leadership styles at work, with consideration to group dynamics, team and individual decision making, and workforce diversity.
- communicate in oral, written, and other formats, as needed, in a variety of contexts at work.
- locate, organize, evaluate, and reference information at work.
- demonstrate originality and inventiveness at work by combining ideas or information in new ways, making connections between seemingly unrelated ideas, and reshaping goals in ways that reveal new possibilities using critical and creative thinking skills such as logical reasoning, analytical thinking, and problem-solving.

## AT 299 Experimental Offering in Automotive Technology

Units: 0.5 - 4  
Prerequisite: None.  
Catalog Date: January 1, 2021

## AT 301 Small Gas Engines, Outdoor Power Equipment

Same As: HORT 330  
Units: 4  
Hours: 54 hours LEC; 54 hours LAB  
Prerequisite: None.  
Transferable: CSU  
Catalog Date: January 1, 2021

This course covers the basic operational theory, servicing, adjusting, and maintenance of 2-cycle and 4-cycle small gas engines as they pertain to the automotive and horticulture industries. In addition, the small engine repair skill areas included in the regional, state, and national Skills USA competitions are covered. AT 301 and/or HORT 330 may be taken two times for credit for a maximum of 8 units, using different equipment.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate accepted safety and work procedures, including Occupational Safety and Health Administration (OSHA) and proper hazardous materials disposal.
- identify the external and internal parts of 2-cycle and 4-cycle small engines.
- determine the proper lubrication and fuel requirements for 2-cycle and 4-cycle small engines using factory maintenance data.
- service and repair the cooling and oil systems of 2-cycle and 4-cycle small engines.
- service and repair the starter systems of 2-cycle and 4-cycle small engines.
- remove, rebuild, install, adjust, and tune 2-cycle and 4-cycle small engine fuel delivery and ignition system components.
- disassemble, inspect, repair, and assemble a single cylinder 2-cycle and 4-cycle engine.
- list the Skills USA competition requirements.
- list the Skills USA competition judging criteria.
- prepare to compete in Skills USA competition.

## AT 309 Introduction to Hybrid and Electric Vehicle Technology

Units: 4  
Hours: 54 hours LEC; 54 hours LAB  
Prerequisite: AT 315 with a grade of "C" or better  
Advisory: AT 110, 310, 313, 314, and 322  
Transferable: CSU  
Catalog Date: January 1, 2021

This course covers the theory and operation of hybrid and electric vehicle operation. Each of the major manufacturers' vehicles is discussed along with the safety and service procedures that apply to these vehicles. Hands-on activities include major service procedures and basic diagnostics on the most common hybrid and electric vehicles in the market today. It is recommended that a student take the electrical, brakes, and air conditioning courses or have previous field experience before taking this course.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- analyze and avoid unsafe conditions and unsafe acts in compliance with safety laws and regulations in the auto work place.
- explain basic electric and hybrid vehicle operation.
- identify the different types of hybrid vehicles in use today.
- perform routine services on full electric and hybrid electric vehicles following manufacturer's procedures.
- perform high voltage system disable and enable procedures.
- pull generic and manufacturer specific data trouble codes from hybrid vehicle computer systems.
- interpret basic hybrid electric vehicle scan data to determine battery state of charge and temperature.

# AT 310 Heating and Air-Conditioning Systems

Units:	3
Hours:	26 hours LEC; 84 hours LAB
Prerequisite:	None.
Corequisite:	AT 100
Advisory:	AT 181 and 188
Transferable:	CSU
Catalog Date:	January 1, 2021

This course is an introduction to automotive heating and air conditioning theory. It meets Automotive Service Excellence (ASE) standard A7 and combines performance testing and repair practices as utilized in the industry.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply safety precautions in handling of refrigerant R-12 and R134-a.
- describe the basic operation of each component in the typical automotive air conditioning (A/C) system.
- identify the different types of compressors and controls.
- use the manifold gauge set in discharging, evacuating, and charging automotive A/C systems.
- diagnose and troubleshoot basic A/C systems.
- list basic components of automatic temperature control (ATC) systems.
- identify basic five parts of an A/C system.
- detect and repair leaks using electronic and dye leak detection systems.

# AT 311 Suspension and Steering Systems

Units:	3
Hours:	26 hours LEC; 84 hours LAB
Prerequisite:	None.
Corequisite:	AT 100
Advisory:	AT 181 and 188
Transferable:	CSU
Catalog Date:	January 1, 2021

This course is an introduction to advanced principles and service of suspension and steering systems, including alignment of equipment, alignment procedures, and the diagnosis and repair of suspension components. It meets Automotive Service Excellence (ASE) A4 certification standards.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- analyze, describe, and avoid unsafe working conditions and unsafe acts, as well as observe safety regulations in an auto repair facility.
- use measuring instruments and procedures proficiently.
- identify automotive service tools and equipment.
- identify the various components used on automotive steering and suspension systems and describe the function of each.
- diagnose any malfunction of the steering suspension components used on automobiles.
- analyze tire wear problems and/or vibrations and perform the necessary repairs.
- disassemble, inspect, clean, and reassemble all components of the steering and suspension systems in accordance to service manual procedures.
- analyze alignment angles to determine need for two- or four-wheel alignment.
- determine the need for and perform four-wheel alignments.
- perform geometric center-line and thrust-line alignments.
- perform tire balancing procedures.

# AT 313 Automatic Transmission and Transaxles

Units:	3
Hours:	26 hours LEC; 84 hours LAB
Prerequisite:	None.
Corequisite:	AT 100
Advisory:	AT 181 and 188
Transferable:	CSU
Catalog Date:	January 1, 2021

This course covers the basics of automatic transmission and transaxle principles and service. Topics include hydraulic principles, diagnosis and service, power conversion, and automatic transmission operation. AT 313 and AT 317 together meet Automotive Service Excellence (ASE) standard A2.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply automatic transmission theory to transmission operation.
- remove, disassemble, and assemble gear train, shafts, bushings, oil pump, and case.
- remove, inspect, and replace friction and reaction units.
- diagnose and assess transmission and transaxle mechanical and hydraulic systems.
- troubleshoot and analyze transmission and transaxle electronic systems.
- assess condition of fluids, filters, and gaskets.
- determine and apply proper safety and repair procedures.
- assess and adjust bands as necessary.

# AT 314 Automotive Engine Repair

Units:	3
Hours:	26 hours LEC; 84 hours LAB
Prerequisite:	None.
Corequisite:	AT 100 and 105
Transferable:	CSU
Catalog Date:	January 1, 2021

This course covers the principles, operation, and diagnosis of automotive engines, including basic engine operation and construction, parts identification and location, engine dis-assembly procedures, engine diagnosis, engine repair and rebuilding procedures, and engine reassembly procedures. Completion of AT 314 and AT 332 meet Automotive Service Excellence (ASE) A1 standards.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- troubleshoot internal engine malfunctions.
- analyze engine components for wear and/or tear.
- evaluate repairs by checking them with measurement and test equipment.
- diagnose and repair engines at ASE performance standard levels.

# AT 316 Alternative Fuels and Advanced Technology Vehicles

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	None.
Corequisite:	AT 100
Transferable:	CSU
Catalog Date:	January 1, 2021

This hands-on course provides an overview of both conventional and alternative fuels with their impact on vehicle emissions in both gasoline and diesel engines. In addition, advanced vehicle technologies such as hybrid electric, direct injection, and fuel cells are explored. Topics include gasoline, E85, M85, diesel, biodiesel, CNG, LPG, LNG, RNG, EVs, HEVs, fuel cells, and dynamometer testing. Completion of this course helps students prepare for the Automotive Service Excellence (ASE) F1 Alternative Fuels Certification in addition to the ASE L3 Hybrid/Electric Vehicle Specialist Certification. Field trips may be required.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- describe the basic chemical composition of various fuels.
- analyze the benefits and challenges of various fuels.
- identify the major components on a variety of alternative fuel vehicles (AFVs).
- perform before and after repair emission tests and analyze the results.
- conduct vehicle efficiency tests and describe the test results.

# AT 317 Advanced Drivetrain

Units:	3
Hours:	26 hours LEC; 84 hours LAB
Prerequisite:	AT 313 with a grade of "C" or better
Transferable:	CSU
Catalog Date:	January 1, 2021

This course covers advanced aspects of automatic transmissions, automatic transaxles, manual drivetrains, diagnosis, service, and repair. Topics include mechanical, electrical, and electronic diagnosis, diagnosis and repair of vibration problems, advanced scan tool operation, and dynamometer testing. AT 317 and AT 313 together meet Automotive Service Excellence (ASE) standard A2.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- diagnose electronic failures using electronic test equipment.
- analyze data received from vehicle scan tests.
- test electronic and electrical components and identify failures.
- identify vibration problems using electronic test equipment.
- assess electronic, mechanical, or hydraulic failures.
- increase repair speed and skill.
- diagnose and perform in-vehicle repairs.
- identify hybrid powertrain components.

# AT 325 Engine Performance Testing & Tuning

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	AT 301, 316, and 333 with grades of "C" or better
Advisory:	AT 312 and 322
Transferable:	CSU
Catalog Date:	January 1, 2021

This course explores the performance and efficiency of modern vehicle engine systems through the use of engine dynamometers and flowbench test equipment. Course topics include dynamometer performance testing, high performance engine assembly, engine computer reprogramming, fuel injector flow testing, forced induction systems and how to achieve maximum performance by choosing components that complement each other. Field trips may

be required.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate safe practices as related to the automotive performance industry.
- evaluate engine efficiency and/or performance through the use of test equipment.
- repair serviceable parts to improve vehicle performance and/or efficiency.
- modify engine systems to improve vehicle performance and/or efficiency.
- analyze engine performance enhancements for effectiveness and feasibility.

## AT 327 Introduction to Motorsports

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	AT 110, 130, and 311 with grades of "C" or better
Advisory:	AT 325, 330, and 333
Transferable:	CSU
Catalog Date:	January 1, 2021

This course is an introduction to motorsports through lecture, hands-on activities, and raceway experience. It discusses the operation of a race team, racing events, and race track operation. Course topics include the setup and modification of vehicle safety equipment, suspension, braking, and data acquisition systems. Field trips may be required.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate safe practices related to performance vehicles and racing events.
- perform most vehicle safety and performance modifications required to complete sanctioned racing events.
- describe the components of a technical inspection within a sanctioned racing event.
- participate in team activities at race track promotional events.
- identify career opportunities in motorsports.

## AT 330 Automotive Electrical Systems

Units:	6
Hours:	81 hours LEC; 81 hours LAB
Prerequisite:	None.
Corequisite:	AT 100, 105, and 180
Transferable:	CSU
Catalog Date:	January 1, 2021

This course covers the principles, operation, and diagnosis of automotive electrical systems including fundamentals of electricity (DC), electrical circuits, battery operation, fundamentals of magnetism, charging systems, starting systems, and electrical schematics. Along with completion of AT 331, this course meets Automotive Service Excellence (ASE) certification standards for the A6 Electrical Systems certification.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- identify and avoid unsafe conditions and unsafe acts in compliance with safety laws and regulations in the auto work place.
- calculate electrical mathematical problems with Ohm's Law, fractions, square roots, and power formulas.
- solve basic problems as they apply to electrical system repair.
- analyze electrical components for malfunction.
- read and interpret basic electrical schematics for system diagnosis and repair.
- evaluate repairs by utilizing test equipment such as a Digital Volt Ohm Meter (DVOM) and a Voltage Amperage Tester (VAT-40).
- diagnose and repair simple electrical systems at industry ASE performance standard levels.

## AT 331 Advanced Automotive Electrical Systems

Units:	6
Hours:	81 hours LEC; 81 hours LAB
Prerequisite:	AT 180 and 330 with grades of "C" or better
Advisory:	AT 110 and 310
Transferable:	CSU
Catalog Date:	January 1, 2021

This course covers the principles of advanced electrical diagnostics. Topics include automotive computers, vehicle networks, driver information systems and accessories, supplemental restraint systems, antilock brakes, tire pressure monitoring systems, and climate control. Along with completion of AT 330, this course meets Automotive Service Excellence (ASE) certification standards for the A6 Electrical Systems certification.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- identify and avoid unsafe conditions and unsafe acts in compliance with safety laws and regulations in the auto work place.
- solve advanced problems as they apply to electrical system repair.
- analyze electrical and electronic components for malfunction.
- research and interpret advanced electrical schematics for system diagnostics and repair.
- evaluate repairs using test equipment, such as digital volt-ohm meters (DVOM), digital storage oscilloscopes (DSO), and scan-tools.
- diagnose and repair automotive electronic systems at industry ASE performance standard levels.

# AT 332 Engine Performance & Electronic Engine Controls

Units:	6
Hours:	81 hours LEC; 81 hours LAB
Prerequisite:	AT 331 and AT 333 with grades of "C" or better
Transferable:	CSU
Catalog Date:	January 1, 2021

This course covers the principles, operation, and diagnosis of automotive engine performance systems including engine mechanics, ignition, fuel delivery, and electronic engine controls. It includes extensive troubleshooting, use of diagnostic test equipment, lab oscilloscopes, scantools, and emission analyzers. Along with completion of AT 333, this course meets Automotive Service Excellence (ASE) certification standards for the A8 Engine Performance certification. This course is formerly known as AT 326.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- identify and avoid unsafe conditions and unsafe acts and observe safety laws and regulations.
- determine logical diagnostic tests to run based upon vehicle symptoms.
- evaluate service and repair methods according to industry and ASE approved standards.
- analyze and diagnose engine mechanical, electrical and fuel control problems.
- evaluate information obtained from diagnostic equipment.
- diagnose and correct emission problems effectively.
- evaluate the setup and operation of a digital storage oscilloscope (DSO).
- evaluate information obtained from diagnostic equipment.

# AT 333 California State Smog Check Inspector Training

Units:	6
Hours:	81 hours LEC; 81 hours LAB
Prerequisite:	AT 314 with a grade of "C" or better
Transferable:	CSU
Catalog Date:	January 1, 2021

This course covers the Bureau of Automotive Repair (BAR) certified Level 1 and Level 2 smog inspector training. Topics include smog check laws, rules and regulations; standards of practice; engine theory, design, and operation; emission control theory, design, identification, operation, and testing; smog inspection visual and functional testing procedures; and loaded mode emission testing. It is required for first-time licensed inspection technicians. Along with completion of AT 332, this course meets Automotive Service Excellence (ASE) certification standards for the A8 Engine Performance certification. This course is formerly known as AT 323.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- identify and avoid unsafe conditions and unsafe acts and observe safety laws and regulations.
- identify a vehicle by year, make, model, and certification status.
- verify emission control equipment needed.
- evaluate the condition of emission control equipment, and correctly report the condition.
- describe the laws, regulations, and procedures associated with the smog check program.
- test vehicles using appropriate emission testing procedures while observing visual, functional, and tailpipe emission testing procedures.
- explain why inspections are necessary, as well as why vehicles are equipped with emission controls.
- evaluate information obtained from diagnostic equipment.

# AT 334 BAR Specified Diagnostic and Repair Training

Units:	4
Hours:	72 hours LEC
Prerequisite:	None.
Transferable:	CSU
Catalog Date:	January 1, 2021

State law currently requires that applicants for a Smog Check Repair license possesses Automotive Service Excellence (ASE) certifications in the following areas: A6 – Automotive Electrical/Electronic systems; A8 – Automotive Engine Performance; L1 – Advanced Engine Performance.

This course is an intensive review of automotive electrical/electronic systems, engine mechanical systems, emission control systems, and computer control systems as they relate to automotive emissions controls. It satisfies the ASE certification requirement when applying for a Smog Check technician license and may be used by the applicant in lieu of the ASE certifications.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- define and test electrical circuits and locate electrical faults.
- explain the proper use of electrical test equipment.
- interpret electrical wiring diagrams and their role in troubleshooting electrical systems.
- solve problems related to circuit resistance.
- apply organized troubleshooting techniques.
- define electrical terms of watts, voltage, current, and resistance.
- test ignition systems and computer components systems with an oscilloscope.
- explain the theory of the four stroke engine.
- diagnose engine mechanical faults.
- explain the use and operation of five-gas exhaust analyzers as required for emissions diagnosis.
- explain diagnostic principles of advanced engine performance.

- analyze and diagnose computerized engine control systems.
- analyze engine control failures.
- analyze and troubleshoot internal engine failures and their effect on exhaust emissions.

## AT 495 Independent Studies in Automotive Technology

Units: 1 - 3  
 Hours: 54 - 162 hours LAB  
 Prerequisite: None.  
 Transferable: CSU  
 Catalog Date: January 1, 2021

Independent Study is an opportunity for the student to extend classroom experience in this subject, while working independently of a formal classroom situation. Independent study is an extension of work offered in a specific class in the college catalog. To be eligible for independent study, students must have completed the basic regular catalog course at American River College. They must also discuss the study with a professor in this subject and secure approval. Only one independent study for each catalog course will be allowed.

## AT 499 Experimental Offering in Automotive Technology

Units: 0.5 - 4  
 Prerequisite: None.  
 Transferable: CSU  
 Catalog Date: January 1, 2021

## Faculty

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### [Jennifer Andronas \(/about-us/contact-us/faculty-and-staff-directory/jennifer-andronas\)](/about-us/contact-us/faculty-and-staff-directory/jennifer-andronas)

Professor

**Office:** Mather Center, Technical Education, 16  
**Email:** [AndronJ@arc.losrios.edu \(mailto:AndronJ@arc.losrios.edu\)](mailto:AndronJ@arc.losrios.edu)  
**Phone:** (916) 484-8877

### [Christopher Carleton \(/about-us/contact-us/faculty-and-staff-directory/christopher-carleton\)](/about-us/contact-us/faculty-and-staff-directory/christopher-carleton)

Adjunct Professor

**Office:** ARC Main  
**Email:** [CarletC@arc.losrios.edu \(mailto:CarletC@arc.losrios.edu\)](mailto:CarletC@arc.losrios.edu)  
**Phone:** (916) 484-8354

### [Dorin Clinci \(/about-us/contact-us/faculty-and-staff-directory/dorin-clinci\)](/about-us/contact-us/faculty-and-staff-directory/dorin-clinci)

Adjunct Professor

**Office:** ARC Main  
**Email:** [ClinciD@arc.losrios.edu \(mailto:ClinciD@arc.losrios.edu\)](mailto:ClinciD@arc.losrios.edu)  
**Phone:** (916) 484-8354

### [Ben French \(/about-us/contact-us/faculty-and-staff-directory/ben-french\)](/about-us/contact-us/faculty-and-staff-directory/ben-french)

Professor and Co-Coordinator PATC

**Office:** ARC Main, Technical Education, 3  
**Email:** [FrenchB@arc.losrios.edu \(mailto:FrenchB@arc.losrios.edu\)](mailto:FrenchB@arc.losrios.edu)  
**Phone:** (916) 484-8671

### [Marty Gunn \(/about-us/contact-us/faculty-and-staff-directory/marty-gunn\)](/about-us/contact-us/faculty-and-staff-directory/marty-gunn)

Adjunct Professor

**Office:** ARC Main  
**Email:** [GunnM@arc.losrios.edu \(mailto:GunnM@arc.losrios.edu\)](mailto:GunnM@arc.losrios.edu)  
**Phone:** (916) 484-8354

### [Leo Gutierrez \(/about-us/contact-us/faculty-and-staff-directory/leo-gutierrez\)](/about-us/contact-us/faculty-and-staff-directory/leo-gutierrez)

Adjunct Professor

**Office:** ARC Main  
**Email:** [GutierJ@arc.losrios.edu \(mailto:GutierJ@arc.losrios.edu\)](mailto:GutierJ@arc.losrios.edu)  
**Phone:** (916) 484-8354

### [Eric Harper \(/about-us/contact-us/faculty-and-staff-directory/eric-harper\)](/about-us/contact-us/faculty-and-staff-directory/eric-harper)

Professor

**Office:** Technical Education, 23  
**Email:** [HarperE2@arc.losrios.edu \(mailto:HarperE2@arc.losrios.edu\)](mailto:HarperE2@arc.losrios.edu)  
**Phone:** (916) 484-8046

### [Larry Hawe \(/about-us/contact-us/faculty-and-staff-directory/larry-hawe\)](/about-us/contact-us/faculty-and-staff-directory/larry-hawe)

Adjunct Professor

**Office:** ARC Main  
**Email:** [hawel@arc.losrios.edu \(mailto:hawel@arc.losrios.edu\)](mailto:hawel@arc.losrios.edu)  
**Phone:** (916) 484-8354

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[Nicole McCormack \(/about-us/contact-us/faculty-and-staff-directory/nicole-mccormack\)](/about-us/contact-us/faculty-and-staff-directory/nicole-mccormack)

Adjunct Professor

**Office:** ARC Main

**Email:** [McCormN@arc.losrios.edu](mailto:McCormN@arc.losrios.edu) (<mailto:McCormN@arc.losrios.edu>)

**Phone:** (916) 484-8354

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[Christopher Moore \(/about-us/contact-us/faculty-and-staff-directory/christopher-moore\)](/about-us/contact-us/faculty-and-staff-directory/christopher-moore)

Professor

**Office:** Mather Center, Technical Education, 26

**Email:** [MooreC@arc.losrios.edu](mailto:MooreC@arc.losrios.edu) (<mailto:MooreC@arc.losrios.edu>)

**Phone:** (916) 484-8356

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[Cheryl Tsushima \(/about-us/contact-us/faculty-and-staff-directory/cheryl-tsushima\)](/about-us/contact-us/faculty-and-staff-directory/cheryl-tsushima)

Adjunct Professor

**Office:** ARC Main

**Email:** [TsushiC@arc.losrios.edu](mailto:TsushiC@arc.losrios.edu) (<mailto:TsushiC@arc.losrios.edu>)

**Phone:** (916) 484-8354

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[James Wakeley \(/about-us/contact-us/faculty-and-staff-directory/james-wakeley\)](/about-us/contact-us/faculty-and-staff-directory/james-wakeley)

Adjunct Faculty

**Office:** ARC Main

**Email:** [WakeleJ@arc.losrios.edu](mailto:WakeleJ@arc.losrios.edu) (<mailto:WakeleJ@arc.losrios.edu>)

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## Automotive Technology at Mather Center

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