

ATL 111 Course Outline as of Fall 2024**CATALOG INFORMATION**

Dept and Nbr: ATL 111 Title: EV HYBRID POWERTRAIN

Full Title: Electric and Hybrid Vehicle Powertrain Systems

Last Reviewed: 1/22/2024

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	2.50	17.5	Lecture Scheduled	43.75
Minimum	3.00	Lab Scheduled	1.50	6	Lab Scheduled	26.25
		Contact DHR	0		Contact DHR	0
		Contact Total	4.00		Contact Total	70.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 87.50

Total Student Learning Hours: 157.50

Title 5 Category: AA Degree Applicable

Grading: Grade or P/NP

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly:

Catalog Description:

Students will explore the use of hybrid and electric battery power for vehicle transportation. Topics include safety when using high voltage, maintenance, drivability, inverter, DC/DC power transfer, and battery technology. Physics of battery storage, hybrid generation systems, electric vehicle applications and their integrated systems will be discussed. Hybrid and high-voltage service and maintenance procedures will be covered. This course serves as preparation for the student to successfully complete the Automotive Service Excellence (ASE) L3 Light Duty Hybrid/Electric Vehicle Specialist certification test.

Prerequisites/Corequisites:

Course Completion of ATL 163

Recommended Preparation:**Limits on Enrollment:****Schedule of Classes Information:**

Description: Students will explore the use of hybrid and electric battery power for vehicle transportation. Topics include safety when using high voltage, maintenance, drivability, inverter,

DC/DC power transfer, and battery technology. Physics of battery storage, hybrid generation systems, electric vehicle applications and their integrated systems will be discussed. Hybrid and high-voltage service and maintenance procedures will be covered. This course serves as preparation for the student to successfully complete the Automotive Service Excellence (ASE) L3 Light Duty Hybrid/Electric Vehicle Specialist certification test. (Grade or P/NP)

Prerequisites/Corequisites: Course Completion of ATL 163

Recommended:

Limits on Enrollment:

Transfer Credit:

Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	Area	Effective:	Inactive:
CSU GE:	Transfer Area	Effective:	Inactive:
IGETC:	Transfer Area	Effective:	Inactive:
CSU Transfer:		Effective:	Inactive:
UC Transfer:		Effective:	Inactive:

CID:

Certificate/Major Applicable:

Both Certificate and Major Applicable

COURSE CONTENT

Student Learning Outcomes:

At the conclusion of this course, the student should be able to:

1. Demonstrate the precautions (personal and shop safety procedures) needed to safely work with high voltage systems.
2. Demonstrate acquired knowledge related to the components used of modern hybrid/electronic vehicles.
3. Demonstrate familiarity with reference materials such as schematics, flow charts, logic trees, and workshop manuals to aid in battery system troubleshooting.
4. Demonstrate how to perform basic maintenance related to hybrid and electric vehicles.
5. Demonstrate how to diagnose a basic hybrid or electric vehicle fault using standard diagnostic equipment.

Objectives:

At the conclusion of this course, the student should be able to:

1. Demonstrate knowledge of introductory principles, motor and generator basics, and battery basics.
2. Perform routine hybrid vehicle repairs and maintenance using manufacturer specified procedures.
3. Demonstrate safety procedures and describe their critical importance.
4. Describe and demonstrate knowledge of system-specific repairs and maintenance.
5. Use test equipment appropriately to diagnose hybrid system-related problems.

Topics and Scope:

Lecture-Related Topics and Scope:

- I. Working Safety with High-Voltage, National Fire Protection Association (NFPA) And Society of Automotive Engineers (SAE) High-Voltage Standards
- II. Main Service Plug Disconnects Drive Systems
- III. Hybrid/EV Drive Systems – Design, Operation Regenerative Braking (Electrical Energy Recovery)
- IV. Battery Storage
- V. Power Management Systems
- VI. System Monitoring Sensors
- VII. Wiring
- VIII. Cables and Harness
- IX. Hybrid Controllers and Inverters
- X. High-Voltage Air Conditioning Compressors

Laboratory-Related Topics and Scope:

- I. High-Voltage Safety Demonstration
- II. Properly Power Down System and Verify with Meter
- III. Service Procedures Associated with Hybrid/High-Voltage Technology
- IV. Connect and Observe Hybrid/Electric Vehicle Scan Tool Data
- V. Inverter Operation
- VI. DC/DC Operation
- VII. AC to DC Charging Conversions
- VIII. Electric Power Steering, Electric Braking and Regenerative Energy Collection

Assignment:

Lecture-Related Assignments:

1. Weekly reading (10-25 pages)
2. Written report analyzing one of the current hybrid auto systems (3-5 pages)
3. Evaluate accuracy and utility of online resources
4. Quizzes (13-16), midterm exam and final exam

Lab-Related Assignments:

1. Conduct routine diagnostics on an electric or hybrid vehicle
2. Conduct routine maintenance on an electric or hybrid vehicle
3. Oral presentation of group diagnostic results

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Written report

Writing 10 - 15%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Evaluation of online resources; conduct routine diagnostics on an electric or hybrid vehicle

Problem solving
30 - 40%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Conduct routine maintenance on an electric or hybrid vehicle

Skill Demonstrations
10 - 25%

Exams: All forms of formal testing, other than skill performance exams.

Quizzes, midterm exam, and final exam

Exams
30 - 40%

Other: Includes any assessment tools that do not logically fit into the above categories.

Oral presentation

Other Category
5 - 10%

Representative Textbooks and Materials:

Light Duty Hybrid and Electric Vehicles. Quarto, Mark. Nicholas Goodnight. 2023
Instructor prepared materials