AUTO 194 Course Outline as of Spring 2021

CATALOG INFORMATION

Dept and Nbr: AUTO 194 Title: INTRO HYBRID VEHICLE
Full Title: Introduction to Hybrid Vehicle Maintenance and Repair
Last Reviewed: 11/27/2017

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	4.00	Lecture Scheduled	3.50	17.5	Lecture Scheduled	61.25
Minimum	4.00	Lab Scheduled	1.50	6	Lab Scheduled	26.25
		Contact DHR	0		Contact DHR	0
		Contact Total	5.00		Contact Total	87.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 122.50 Total Student Learning Hours: 210.00

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:
Principles and functions of hybrid automobiles and procedures for their maintenance, problem diagnosis and repair. Function of individual system components examined. Critical importance of safety and hybrid-unique equipment and procedures, maintenance procedures and diagnostic and repair processes for at least one type of hybrid (Parallel or Series-Parallel) taught in detail.

Prerequisites/Corequisites:

Recommended Preparation:
Eligibility for ENGL 100 or ESL 100; and Course Completion of AUTO 80 and AUTO 156 and IED 190

Limits on Enrollment:

Schedule of Classes Information:
Description: Principles and functions of hybrid automobiles and procedures for their maintenance, problem diagnosis and repair. Function of individual system components examined. Critical importance of safety and hybrid-unique equipment and procedures, maintenance procedures and diagnostic and repair processes for at least one type of hybrid

(Parallel or Series-Parallel) taught in detail. (Grade or P/NP)
Prerequisites/Corequisites:
Recommended: Eligibility for ENGL 100 or ESL 100; and Course Completion of AUTO 80 and AUTO 156 and IED 190
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. Present a written diagnosis and repair plan to correct a mechanical/electrical problem on a hybrid vehicle.
2. Identify on a vehicle the various hybrid system components.
3. Demonstrate knowledge and appropriate use of test 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:

I. Introductory Principles
   A. Hybrid and electric vehicle vocabulary
   B. Hybrid and electric vehicles in production
   C. Types of hybrid systems
      1. Series
      2. Parallel

3. Series/parallel
4. Mild and assist hybrids
5. Plug-in hybrids

D. Electrical theory basics and safety implications

II. Motor and Generator Basics

A. Basic motor operations
1. Series
2. Parallel

B. Generators

C. Motor generators

D. Controllers

III. Battery Basics

A. Lead-Acid (Pb-A)

B. AGM (Absorbed Gas Mat) Battery (12 volt system)

C. High-Voltage (HV) System Batteries
1. NiMH (Nickel Metal Hydride)
2. Lithium-Ion (Li-Ion) and other new battery technologies
3. Importance of HV state-of-charge

IV. Hybrid System Components and Operation

A. System components
1. Internal combustion engine (ICE) and motor generator (MG)
2. Battery pack
3. Rectifiers, inverters, converters
4. Cables, switches

B. Battery charging

C. Regenerative braking

D. Driving

V. Safety

A. Personal safety

B. Electrical safety gloves

C. Tools and equipment
1. Mega-ohm meter
2. Scanners (eg, Toyota Technical Information System (TIS))
3. Using appropriate fluids

D. Safety procedures (shop)
1. Depowering HV system
2. Importance of ensuring auto in shutdown mode
3. Repowering HV System

E. Safety procedures (test driving)

VI. Honda and/or GM (Mild Hybrid) Systems

A. Routine maintenance (unique to this type of hybrid system)
1. System-specific fluids
2. Other system-specific requirements (e.g., brakes)

B. Diagnostics (for Hybrid-system related problems)
1. Types and use of test equipment
2. Reading data codes
3. Assuring proper use of fluids

VII. Toyota and/or Nissan and/or Ford (Full Hybrid) Systems

A. Routine maintenance (unique to this type of hybrid system)
1. System-specific fluids
2. Other system-specific requirements (e.g., brakes)

B. Diagnostics (for Hybrid-system related problems)

1. Types and use of test equipment
2. Reading data codes
3. Assuring proper use of fluids

VIII. Plug-in Hybrids
A. Battery pack
B. Installation
C. Interface to car
D. Charger
E. Troubleshooting

IX. Personal Standards Expected in the Workplace (NATEF Standard 7.9, tasks 1 - 5)
A. Appropriate dress, language use and manners suitable to the workplace
B. Reporting to work on time
C. Proper personal hygiene
D. Meets and maintains employment eligibility criteria i.e., drug/alcohol free status, maintains a clean driving record, etc
E. Demonstrates honesty, integrit, and reliability,

X. Implementing Good Work Habits and Ethics (NATEF Standard 7.10, tasks 1 - 10)
A. Using scientific, technical, engineering and mathematics principles and reasoning
B. Addressing the needs of customers, and providing helpful, courteous service
C. Implementation of a productive plan of work
D. Knowing, understanding, and complying with workplace policies and laws
E. Resolving problems that arise during the course of a workday
F. Working successfully as a member of a work team
G. Assisting others as requested in the workplace
H. Working well with customers and other employees
I. Negotiating solutions to interpersonal and workplace conflicts
J. Interpreting workplace documents
K. Contributing ideas and demonstrating initiative in the workplace
L. Communication (both verbally and in writing) with customers and coworkers
M. Following instructions successfully

All topics are covered in both lecture and lab parts of the course

Assignment:

Lecture-Related Assignments:
1. Written paper analyzing one of the current Hybrid auto systems (3-5 pages)
2. Evaluations of on-line resources
3. Textbook and hand-out reading assignments (approximately 10-25 pages per week)
4. Chapter quizzes (5-7), midterm exam and final exam

Lab-Related Assignments:
1. Conduct routine diagnostics and maintenance on a college vehicle (or vehicles)
2. Orally summarize findings of group diagnostic results and present to class

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 analyses	Writing 10 - 15%

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

Group routine diagnostics and maintenance; evaluation of online resources	Problem solving 30 - 40%

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

Demonstration of hybrid auto maintenance and diagnostic procedures	Skill Demonstrations 10 - 20%

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

Chapter quizzes, midterm exam and final exam	Exams 30 - 40%

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

Oral summary of findings	Other Category 5 - 10%

Representative Textbooks and Materials:
Hybrid and Alternative Fuel Vehicles. 4th ed. Halderman, James. 2015
Instructor prepared materials