

AUTO 194 Course Outline as of Spring 2011**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: DET 194

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

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

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

Outcomes and Objectives:

Upon completion of the course, students will 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 specifications.
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:

- A. Introductory Principles
 1. Hybrid and electric vehicle vocabulary
 2. Hybrid and electric vehicles in production
 3. Types of hybrid systems
 - a. Series
 - b. Parallel
 - c. Series/parallel
 - d. Mild and assist hybrids
 - e. Plug-in hybrids
 4. Electrical theory basics and safety implications
- B. Motor and Generator Basics
 1. Basic motor operations
 - a. Series
 - b. Parallel
 2. Generators
 3. Motor generators

4. Controllers
- C. Battery Basics
 1. Lead-Acid (Pb-A)
 2. AGM (Absorbed Gas Mat) Battery (12 volt system)
 3. High-Voltage (HV) System Batteries
 - a. NiMH (Nickel Metal Hydride)
 - b. Lithium-Ion (Li-Ion) and other new battery technologies
 - c. Importance of HV state-of-charge
- D. Hybrid System Components and Operation
 1. System components
 - a. Internal combustion engine (ICE) and motor generator (MG)
 - b. Battery pack
 - c. Rectifiers, inverters, converters
 - d. Cables, switches
 2. Battery charging
 3. Regenerative braking
 4. Driving
- E. Safety
 1. Personal safety
 2. Electrical safety gloves
 3. Tools and equipment
 - a. Mega-ohm meter
 - b. Scanners (eg, Toyota Technical Information System (TIS))
 - c. Using appropriate fluids
 4. Safety procedures (shop)
 - a. Depowering HV system
 - b. Importance of ensuring auto in shutdown mode
 - c. Repowering HV System
 5. Safety procedures (test driving)
- F. Honda and/or GM (Mild Hybrid) Systems
 1. Routine maintenance (unique to this type of hybrid system)
 - a. System-specific fluids
 - b. Other system-specific requirements (e.g., brakes)
 2. Diagnostics (for Hybrid-system related problems)
 - a. Types and use of test equipment
 - b. Reading data codes
 - c. Assuring proper use of fluids
- G. Toyota and/or Nissan and/or Ford (Full Hybrid) Systems
 1. Routine maintenance (unique to this type of hybrid system)
 - a. System-specific fluids
 - b. Other system-specific requirements (e.g., brakes)
 2. Diagnostics (for Hybrid-system related problems)
 - a. Types and use of test equipment
 - b. Reading data codes
 - c. Assuring proper use of fluids
- H. Plug-in Hybrids
 1. Battery pack
 2. Installation
 3. Interface to car
 4. Charger
 5. Troubleshooting

Assignment:

1. Conduct routine diagnostics and maintenance on a college vehicle (or vehicles)
2. Written paper analyzing one of the current (Toyota, Honda, Nissan or GM) Hybrid auto systems (3-5 pages)
3. Orally summarize findings of group diagnostic results and present to class
4. Evaluations of on-line resources
5. Textbook and hand-out reading assignments (approximately 10-25 pages per week)
6. Chapter quizzes (5-7), midterm exam and final exam

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.

Written exams and final

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, Electric & Fuel Cell Vehicles. Erjavec, Jack & Jeff Arias. Delmar Cengage Learning, 2006.

Rosebro, Jack. Basic Hybrid Powertrains. Perfect Sky, 2008.

Instructor prepared materials