



## SYLLABUS

### Your Course Learning Plan

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# Engine Control Systems

## A. General Course Information

- Course description:** The Engine Control Systems students of UAW-LETC will satisfactorily complete a series of activities that will meet the needs of Automotive Dealerships and the aftermarket while following guide lines of the National Automotive Training and Education Foundation (NATEF). These activities will consist of, but not limited to; diagnostics, repair and/or replacement, and adjustment to factory specifications. These activities will take place in the classroom and shop, consisting of written and hands-on exercises. Each phase will have its guidelines and time period. We will cover some areas with more detail than other's depending on the demand for that area.
- Prerequisites:** Technical Introduction to Dealerships Module4 Engine and Components, Module 6 Fuel Systems, Module 12 Electrical Systems, Electrical Fundamentals, and Electrical Systems Diagnostics.
- Organization:** This is a lecture / shop course in which topics are presented by the instructor, shop assignments are explained and assigned projects are completed by students both during class and shop time. Objective quizzes are given at the end of each section and there is a comprehensive final exam. When students have completed this course they generally have the same level of expertise as those who have had previous training or experience. Initial emphases are on the use of equipment and basic procedures.
- Course objectives:**
1. Demonstrate the skill to diagnose and repair computerized vehicle systems used for power train control using current state-of-the-art diagnostic tools
  2. Demonstrate the skill to diagnose and repair electrical problems relating to the computerized systems
  3. Demonstrate the skill to diagnose and repair Starting and charging systems
  4. Demonstrate the skill to diagnose and repair Emissions problems to aid in compliance with local I/M standards
- Textbooks / Software:**
1. Toyota Engine Control Systems I, Course 852 Handbook
  2. Toyota Engine Control Systems II, Course 874 Handbook
  3. Toyota Advanced Emissions & Drivability Diagnosis, Course 972 Materials
  4. Materials Downloaded From the Internet Site: Toyota Information System (as required to complete worksheets and exercises.
  5. Toyota Repair Manuals and Electrical Wiring Diagrams
  6. Lexus Body Electrical Diagnosis, Course L652 Handbook

## B. Course Content and Outcomes

- Course content:**
1. Introduction to Toyota Educational Programs and Engine Control Systems
  2. PCV System Operation and Position/Mode Sensors
  3. Ignition Systems
  4. Fuel Systems
  5. Emission Systems
  6. Idle Air Control Systems
  7. Electronic Throttle Control Systems
  8. Variable Valve Timing & Acoustic Control Induction Systems
  9. Engine Control Systems Processes & Diagnostic Tools
  10. On-Board Diagnostic Systems
  11. Comprehensive Component Monitor Diagnosis
  12. Engine Misfire Diagnosis
  13. Evaporative Systems Diagnosis
  14. Fuel System Diagnosis
  15. O<sub>2</sub> & A/F Sensor Diagnosis
  16. Catalytic Converter Diagnosis
  17. Exhaust Gas Recirculation (EGR) System Diagnosis and Thermostat Monitor
  18. ECM Diagnosis And Using a 4 or 5 Gas Analyzer
  19. General Development of Multiplexing and Hybrid Vehicle Service Precautions
  20. ASE Test Preparation

**Learning outcomes:** To Be Determined Using Task Completion Analysis, Quizzes, Toyota Assessment Tests, and a Final Examination

**Grading (credit) criteria:** Course will be weighted as follows. Task Worksheets 30%, Quizzes 20%, Toyota open book assessment tests 20%, final exam 30%.

Task worksheets will be assigned almost every day. Worksheets will be due at the end of each day. Grading will be based on a performance rating of "2" (Proficient) and "3" (Proficient, able to teach others) with a minimum rating of "2" being required for passing. (Extra credit will be given for a performance rating of "3").

There will be many objective quizzes given relating to current topics. Grading will be based on percentage of correctly answered questions. A grade of 80% is required for passing.

There are two open book Toyota assessment tests given as each section of the course is completed. An 80% score is required for passing.

The final exam will be comprehensive relating to all topics covered in the course. Questions are written with heavy emphasis on critical thinking and diagnostic skills. A grade of 80% is required for passing.

## C. Class/Shop Policies

- Student Expectations:**
1. Be on time for the start of class and return to class for final roll call.
  2. Wear safety glasses in the shop at all times. Steel toes required in the UAW building "at all times".
  3. Appropriate working attire shall be worn.
  4. Access to shop vehicles only as authorized by the instructor.
  5. No cell phones or other electronic devices allowed in the building.
  6. Participate in classroom discussions.
  7. Observe classroom etiquette.
  8. Participate in shop clean up.
  9. Attendance to shop activities in assigned area.
  10. Approval by instructor required prior to being absent from assigned area.
  11. Clean all tools prior to returning them to the tool crib.
  12. Follow all safety rules; be concerned with your safety and the safety of others.
  13. Report all injuries regardless of the nature or severity to the instructor.

## D. Other resources

Online resources: [Techinfo.Toyota.Com](http://Techinfo.Toyota.Com)

### Tentative Schedule

DAY	TASK	TOPIC/ACTIVITY
1	Worksheets 6-1 Analog and Digital Signals 1-1 Diagnostic Tester Operation Worksheet	<b>Introduction to Toyota Education Programs and Engine Control Systems</b> Toyota program information and requirements Digital and Analog Signals Electronic Engine Control Systems Engine Control System Diagnostic Information History of On-Board Diagnostics OBD Generation 1 OBD Generation 2 Diagnostic Tester Operation
2 thru 5 6	Worksheets EC-F1a Diagnosing PCV System Malfunctions 2-1 Position/Mode Switches and Circuits 2-2 Temperature Sensors 2-3 Position Sensors 2-4 Mass Airflow (MAF) Sensors 2-5 Manifold Absolute Pressure (MAP) Sensor 2-6 Position/Speed Sensors 2-7 Oxygen Sensor 2-8 Air/Fuel Ratio 2-9 Knock Sensor	<b>PCV System Operation and Position/Mode Sensors</b> PCV Valve Operation and Issues Position/Mode Sensors and Switches Temperature Sensors Position Sensors Mass Air Flow Sensors Pressure Sensors Position/Speed Sensors Oxygen Sensors Air/Fuel Ratio Sensors Knock Sensors
7	Worksheet 3-1 Ignition System	<b>Ignition Systems</b> Ignition System Overview Electronic Spark Advance Overview Distributor Ignition Systems Distributorless & Direct Ignition Systems Overview Distributorless Operation Direct Ignition Systems Ignition Advance
8	Worksheets 4-1 Fuel Delivery System 4-2 Fuel Injector Systems	<b>Fuel Systems</b> Fuel Injection System Fuel Delivery System Fuel Pump Controls Pressure Regulators Fuel Delivery Components Fuel Injection Operation
9 & 10	Worksheets EC-F3abc Diagnosing A.I.R. System Malfunctions 5-1 EVAP Systems 5-2 EGR Cutoff Control System 5-3 EGR Constant Vacuum System	<b>Emission Systems</b> A.I.R. Systems Evaporative Emissions Control Systems Exhaust Gas Recirculation System Cutoff Control EGR System Operation Constant Vacuum System Operation

11	Worksheet 6-1 Rotary Solenoid IACV System	<b>Idle Air Control Systems</b> Idle Air Control Systems
12	Worksheet 7-1 ETCS-I System	<b>Electronic Throttle Control Systems</b> Electronic Throttle Control Systems
13		<b>Variable Valve Timing &amp; Acoustic Control Induction Systems</b> Variable Valve Timing & Acoustic Control Induction Systems, Components, Construction, and Operations
14	Worksheets. 1-1 General Diagnostic Tester Procedure 1-2 Diagnostic Tester	<b>Engine Control System Processes &amp; Diagnostic Tools</b> Diagnostic Tools and Resources General OBD II Scan Tool use Procedures
15	Worksheets 2-1 Diagnostic Tester Modes 2-2 Readiness Non-Continuous Test Modes	<b>On-Board Diagnostic Systems</b> OBD 1 OBD 2 Malfunction Indicator Lamp (MIL) Diagnostic trouble Codes (DTCs)
16		<b>Comprehensive Component Monitor Diagnosis</b> Mass Air Flow Sensor Circuit Manifold Absolute Pressure Sensor Circuit Intake Air Temperature Sensor Circuit Engine Coolant Temperature Sensor Circuit Throttle Position Sensor Circuit Knock Sensor Circuit Crankshaft Position Sensor Circuit Camshaft Position Sensor Circuit Vehicle Speed Sensor Circuits Idle Air Control Circuit Acceleration Pedal Position Sensor Circuit Throttle Control Motor Circuit Electromagnetic Clutch Circuit Throttle Control Motor Lock Electronic Throttle Control System
17	Worksheet 4-1 Misfire Detection Monitor	<b>Engine Misfire Diagnosis</b> Misfire Monitor Misfire DTCs Causes of Engine Misfire
18 & 19	Worksheets. 5-1 EVAP Leak Test Confirmation – Intrusive Test 5-2 EVAP System Test – Intrusive Type 5-3 EVAP System Test – Non-Intrusive Type	<b>Evaporative Systems Diagnosis</b> Evaporative Systems Monitoring Early-Type (Non-Intrusive) Pressure Detection HC Leak Detection Later Type (Intrusive) Monitor System VPS Diagnosis EVAP Diagnosis Tools and Procedures
20		<b>Fuel System Diagnosis</b> Fuel System Monitor Fuel Trim DTCs Fuel Injector Drive System

21	Worksheets 7-1 A/F Sensor Tests 7-2 O2 Sensor Test	<b>O2 &amp; A/F Sensor Diagnosis</b> O2 Sensor Monitor O2 Sensor Monitoring Test Results O2 Sensor DTC'S O2 Sensor Monitor Diagnosis A/F Sensor DTCs Planar A/F Sensor Operation
22	Worksheet 8-1 Catalytic Converter Monitor	<b>Catalytic Converter Diagnosis</b> Catalytic Converter Monitor Confirmation Engine Racing Pattern Catalytic Efficiency DTC
23	Worksheet 9-1 EGR Monitor	<b>Exhaust Gas Recirculation (EGR) System Diagnosis and Thermostat Monitor</b> Exhaust Gas Recirculation System Monitors EGR Temperature Detection Method EGR MAP Detection Method EGR Valve Position/Temperature Detection Method Thermostat Monitor
24	Worksheet EC-B14 Diagnosing Emission Systems Using a Gas Analyzer	<b>ECM Diagnosis and Using a 4 or 5 Gas Analyzer</b> Troubleshooting the Diagnostic Circuit Inspection of the OBD II Diagnostic Circuit Power Distribution System ECU Reprogramming Using Exhaust Gas As a Tool In I/M Diagnosis
25	Worksheet EC-C5&9 Diagnosing Multiplexing System Malfunctions EC-F5h Hybrid Vehicle Service Precautions – In Class	<b>General Development of Multiplexing and Hybrid Vehicle Service Precautions</b> Benefits In Several System Uses Diagnostic Trouble Codes Typical Systems Actions Taken by Component ECUs Diagnostic Procedures Precautions When Servicing Hybrid Vehicles
26 & 27		<b>Final Examination Preparation and Examination</b>
28 & 29		<b>ASE Test Preparation</b>
30		<b>Tar Day Activities</b>