

# WE ARE THE ENGINE CONTROLS TRAINING EXPERTS

## BRIDGING THE GAP BETWEEN EDUCATION AND EXPERIENCE

### WE'RE FUELING AN INDUSTRY BY STARTING CAREERS

LHPU's mission is to increase the worldwide supply of highly qualified embedded controls engineers. Our Fundamentals of Control Systems courses are industry-leading, hands-on controls training courses that include time in either a diesel or a gasoline engine test cell – and with instructors who have more than 100 years of combined experience in the automotive industry.



### AND WE'RE SHIFTING THOSE CAREERS INTO HIGH GEAR

The majority of LHPU graduates hold master's degrees in various engineering disciplines (EE/ME/CE/SE). We build on their substantial educational backgrounds by giving them real-world experience, allowing them to contribute as controls engineers their first day on the job. Our candidates are prepared for interviews so they make the best impression possible with hiring managers.

ALMOST ALL OF OUR  
**350 GRADUATES**  
ARE ON PROJECTS...

### ...IN HIGH-DEMAND ENGINEERING POSITIONS LIKE THESE...

SYSTEMS  
CONTROLS  
EMBEDDED  
EMBEDDED CONTROLS  
ELECTRONIC CONTROLS  
DYNO  
CALIBRATIONS TEST  
VEHICLE SYSTEMS  
VEHICLE INTEGRATION  
DIAGNOSTICS

### ...WITH COMPANIES LIKE THESE...

BOSCH  
CATERPILLAR  
CHRYSLER  
CNH  
CUMMINS  
DELPHI  
FORD  
GENERAL ELECTRIC  
GENERAL MOTORS  
HARLEY-DAVIDSON  
HILL-ROM  
KPIT  
UNITED TECHNOLOGIES



LHPU IS THE ONLY PLACE ENGINEERS CAN EARN A  
**CERTIFICATE OF MASTERY IN CONTROL SYSTEMS**  
(DIESEL OR GASOLINE) FROM SAE INTERNATIONAL



**Lhpu**  
training  
solutions *control your future.*

LHPU@LHPES.com

# CURRICULUM FOR FUNDAMENTALS OF CONTROL SYSTEMS

## **BUSINESS SOFT SKILLS**

Introduction to General Business Etiquette  
Leadership  
Stress Test  
Team Building

## **ENGINEERING PROCESS**

Agile SCRUM

## **CAN (J1939) COMMUNICATIONS**

### **CODE GENERATION**

Code generation interface to Simulink and RTW  
Basics of Simulink and Rapid Prototyping Tools  
ECU Hardware and I/O  
Description of System Block Diagram  
Throttle Project Description  
Build and Flash Test Model  
Basics of Tuning and Calibration Tools  
RTI Triggers and Multi-Rate Subsystems  
ADC Sampling  
Analog I/O  
Calibration, Probe, and Overrides Blocks  
Feedback Controllers  
Throttle Position Controller  
Fault Management  
System Protection Using Faults  
Add Fault Management to Throttle Project  
Anatomy of a CAN Message  
CAN Communications with Throttle Project  
Encoder Blocks and TPU  
TPU Interface to Fuel Injector Drivers  
Add Fuel Injection to Throttle Project  
Crank/Cam Inputs  
Encoder Blocks and TPU  
TPU Interface to Fuel Injector Drivers  
Spark and Fuel Injection Control  
Multi-pulse Fuel Control  
Add Fuel Injection to Throttle Project

## **CONTROLS THEORY AND APPLICATION**

## **ENGINE & CONTROLS (DIESEL)**

### **INTRODUCTION**

4-Stroke Engines / Basic Engine Components / Diesel History / What Makes a Diesel / Diesel Combustion Video / Injector Technology / Turbo Technology / EGR Technology / What Has Driven Diesel Engine Development / Advantages/ Disadvantages of Diesel Engines / Overview of Diesel Emissions / Multipulse Injector Control / High Pressure Fuel Pump Control

### **DIESEL SPEED GOVERNING**

Adaptive Feedforward, Feedback Control / MinGov Control / Model Based Control / Manifold Airflow Estimation / Throttled Flow Estimation / Dynamometer versus Vehicle Strategies

### **DIESEL CONTROLS MODEL**

Base Fuel Control / MaxGov Controller / Torque-Based Control / Fault Management / Finalize Diesel Engine Controller

### **SYSTEM DIAGRAMS, WIRING, AND CAN**

Walk Through Diesel Engine In Lab / Build System Diagram for Diesel Engine / Begin Wiring Harness / Review CAN Messages / Implement Messages Into Engine Model

## **ENGINE & CONTROLS (GASOLINE)**

### **INTRODUCTION TO LIFECYCLE SOFTWARE DEVELOPMENT FOR E-MODEL CONTROLS**

Analysis of regulatory requirements / Designing a system and generating proper design documents / Implementation of the system / Model-In-Loop (MIL) testing / Writing a DVP test procedure and executing it on the platform

### **GASOLINE ENGINE CONTROL, TORQUE, & COMBUSTION**

Controls theory/combustion theory / Introduction of the problem / Developing requirements documentation/ implementation / Model-In-Loop (MIL) testing / Engine Calibration and Validation / DVP and test procedure / Execution of the test procedure / Using MATLAB to solve an optimization problem

### **TECHNIQUES FOR CALIBRATION OPTIMIZATION**

Use of Analytical methods for data processing and analysis / Focus on MATLAB tools / Designing a method for optimizing the combustion control of gasoline engines / Testing