

*Virtual*



**Automotive software  
& Electronics  
Fundamentals  
VIRTUAL Boot Camp**

[futuretechauto.com/virtualfundamentals](http://futuretechauto.com/virtualfundamentals)



The Automotive Software & Electronics Fundamentals Boot Camp provides the right tools for creative solutions in advanced automotive diagnostics and repair.

With Vehicle Electrification and ADAS (Advanced Driver Assistance Systems) now in the mainstream automotive market, the diagnostic lines have been blurred between microcontrollers (MC), electronics devices, and network systems. Highly complex software (S/W), firmware (F/W), and hardware (H/W) interface systems in modern automotive architectures are compelling automotive industry service and diagnostic professionals to cultivate new knowledge and skills to more fully understand, analyze, and diagnose modern vehicle systems.

FutureTech's Fundamentals (and also the Intermediate and Advanced) Automotive Software & Electronics Boot Camp is designed to give technicians and educators a fully immersive environment for learning how to work with advanced automotive systems. Whether it be a Tesla Model S, Chevrolet Volt, or Toyota Prius, all electrified vehicles have complex software, electronics, and network systems that will affect how they perform and thus, how a technician will diagnose and repair them. In these boot camps, participants will look beyond parts (high voltage batteries, for example) and into the software and electronics that drive them.

# Joining a Boot Camp in Virtual Format

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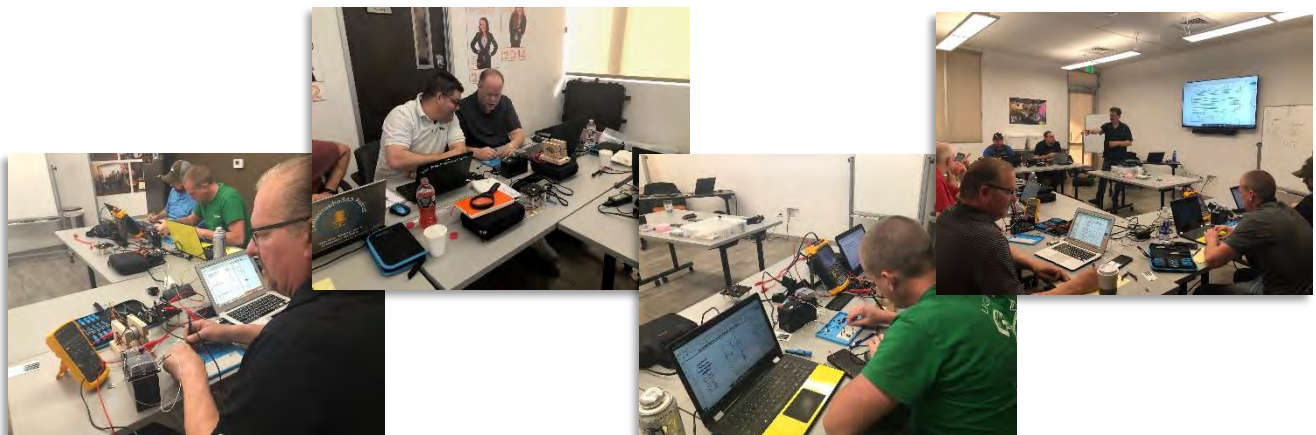
The award-winning boot camps from FutureTech, which are traditionally held as an immersive 5-day hands-on event, have been adapted as a virtual format for participants of the Fundamentals course. Participants can expect the same rigor as completing the original boot camp, as well as the same one-on-one attention with course developer and instructor Dr. Mark Quarto.

Participants will learn the same skills and perform the course projects as the hands-on boot camp, but instead will use carefully curated component and tool kits at home (provided by FutureTech) and interface with Dr. Quarto in group and individual settings using a specially adapted webcam.

## **Key differences in how the course is delivered are:**

- Participants will complete the course over a 3-month period from home instead of a 5-day in-person training event
- Component and tool kits (with webcam) can be kept by the participants after the training has been completed
- The course will have self-paced components hosted by FutureTech's Access OnDemand training platform, as well as independent projects, and sessions with the live instructor

**The rigor and content of the learning objectives, projects, and final capstone are identical to that of the original hands-on training.**



# Virtual Training Delivery

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## **Group and One-on-One Interaction with the Instructor**

Each participant will have the opportunity to spend approximately 32 hours with the instructor over the course of **14 pre-scheduled live sessions**. Participants will interact with the instructor via webcam (provided by FutureTech), in which the instructor will provide feedback and instruction on current projects and learning objectives.

## **Independent Learning and Project Completion**

Participants are required to complete guided independent lessons in between each of the live sessions with the instructor. These lessons will be hosted by FutureTech's online training platform Access OnDemand, and in them each participant will be provided:



- **Homework Assignments** - A total of 27 activities, with the time required being dependent upon the participant's pace.
- **Self-Study Assignments** - Hours vary by participant's level of engagement.
- **Quizzes** – a total of twelve 10-minute quizzes will be administered within the training platform during the live sessions.
- **Capstone** – A final project in which participants write software and select proper hardware components. Successful completion will grant the participant a separate (additional) certificate.



## **Tool and Component Kit**

Each participant will be shipped a tool and component kit upon paid registration for the virtual boot camp. This kit will be used to complete portions of self-study assignments, the course Capstone, and virtual sessions with the instructor. This kit is meant to be kept by the participants upon completion of the boot camp for future learning, whether it be independent projects or for participation in future Virtual Automotive Software & Electronics Boot Camps.

# 2021 Schedule of Virtual Boot Camps (Tracks)

The 2021 Virtual Automotive Software & Electronics Fundamentals Boot Camp will be scheduled as “tracks”. A track is a pre-scheduled timeline for completing milestones and attending live sessions with the instructor.

Each participant will choose one of the three available tracks below upon paid registration into the Virtual Boot Camp:

TRACK 1 YR 2021 BOOTCAMP L1			
Session #	Date	Start Time	Time Zone
1	May 4, 2021	3:00 P.M.	Pacific
2	May 6, 2021	3:00 P.M.	Pacific
3	May 18, 2021	3:00 P.M.	Pacific
4	May 20, 2021	3:00 P.M.	Pacific
5	June 1, 2021	3:00 P.M.	Pacific
6	June 3, 2021	3:00 P.M.	Pacific
7	June 15, 2021	3:00 P.M.	Pacific
8	June 17, 2021	3:00 P.M.	Pacific
9	June 29, 2021	3:00 P.M.	Pacific
10	July 1, 2021	3:00 P.M.	Pacific
11	July 13, 2021	3:00 P.M.	Pacific
12	July 15, 2021	3:00 P.M.	Pacific
13	August 3, 2021	3:00 P.M.	Pacific
14	August 5, 2021	3:00 P.M.	Pacific

TRACK 2 YR 2021 BOOTCAMP L1			
Session #	Date	Start Time	Time Zone
1	May 4, 2021	6:30 P.M.	Pacific
2	May 6, 2021	6:30 P.M.	Pacific
3	May 18, 2021	6:30 P.M.	Pacific
4	May 20, 2021	6:30 P.M.	Pacific
5	June 1, 2021	6:30 P.M.	Pacific
6	June 3, 2021	6:30 P.M.	Pacific
7	June 15, 2021	6:30 P.M.	Pacific
8	June 17, 2021	6:30 P.M.	Pacific
9	June 29, 2021	6:30 P.M.	Pacific
10	July 1, 2021	6:30 P.M.	Pacific
11	July 13, 2021	6:30 P.M.	Pacific
12	July 15, 2021	6:30 P.M.	Pacific
13	August 3, 2021	6:30 P.M.	Pacific
14	August 5, 2021	6:30 P.M.	Pacific

TRACK 3 YR 2021 BOOTCAMP L1			
Session #	Date	Start Time	Time Zone
1	November 9, 2021	4:00 P.M.	Pacific
2	November 10, 2021	4:00 P.M.	Pacific
3	November 11, 2021	4:00 P.M.	Pacific
4	November 16, 2021	4:00 P.M.	Pacific
5	November 17, 2021	4:00 P.M.	Pacific
6	November 18, 2021	4:00 P.M.	Pacific
7	November 23, 2021	4:00 P.M.	Pacific
8	November 24, 2021	4:00 P.M.	Pacific
9	November 30, 2021	4:00 P.M.	Pacific
10	December 1, 2021	4:00 P.M.	Pacific
11	December 2, 2021	4:00 P.M.	Pacific
12	December 7, 2021	4:00 P.M.	Pacific
13	December 8, 2021	4:00 P.M.	Pacific
14	December 9, 2021	4:00 P.M.	Pacific

Track 3 is sponsored by:



**Mobile Air Climate Systems Association (MACS)**

# Contents of the Tool and Component Kit

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The tool and component kit that is shipped to each participant will contain all of the elements required for completing course projects. The kit also contains a specially adapted webcam for the purpose of allowing the instructor to view the participants' hardware-based projects properly.

## The contents of the tool and component kit include:

- Master case for holding complete student kit
- Electronic components
  - Component box
  - Compartment labeling
  - Individual project parts
- Electronics tool kit (includes screwdrivers, pliers, cutters)
- Specialty supplies for projects
  - Motor & stand
  - Relay Assembly
  - Frequency Generator and Leads
  - Fuse Holder Assembly
- Streaming webcam – Used to provide the instructor the ability to view projects while you are working during live sessions
- USB Cable
- Participant Materials pre-loaded onto flash drive
  - Programming Software
  - Specification Sheets
  - Project Sheets
  - Course Content PDFs



# Overview – *Fundamentals Virtual Boot Camp*

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With Vehicle Electrification and ADAS now in the mainstream automotive market, the diagnostic lines have been blurred between microcontrollers (MC), electronics devices, and network systems. Highly complex software (S/W), firmware (F/W), and hardware (H/W) interface systems in modern automotive architectures are compelling automotive industry service and diagnostic professionals to cultivate new knowledge and skills to more fully understand, analyze, and diagnose modern vehicle systems.

Automotive Instructors and Technicians are constantly being challenged by changes in electronics systems and control software in advanced automotive systems. This course contains lecture with significant hands-on project content that will make for the perfect learning environment! Using the popular Arduino MC, participants will be introduced to MC and electronics to build new H/W, F/W, & S/W knowledge that can be used directly with automotive systems. This course has the following topics to address these challenges that confront automotive industry service and diagnostic professionals:

- Microcontroller based electronics projects will be built in the independent and live virtual class within a fun and interactive environment
- This course will teach participants how they can inexpensively and quickly create their own testing and diagnostic tools.
- Provide participants sufficient fundamental knowledge and skills that would permit them to develop their own microcontroller-based applications and hardware interface tools that can be used for analyzing and diagnosing most automotive systems
- Learn how external MC systems can be built to be used with a scan tool or on-board vehicle system to manipulate or change systems operation for the purposes of circuit analysis and diagnostics or building vehicle “bugs” for automotive courses

# Course Elements –*Fundamentals Virtual Boot Camp*

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The lecture and significant hands-on project content in this course, using the popular Arduino Microcontroller, will introduce participants to the world of Electronic Devices, MC, Software Writing, and Software Coding.

- **Automotive Instructors** will develop skills to develop MC based classroom simulators, demonstrators, and develop student projects in a fun environment. Simulator and demonstrator systems are significant investments for the modern automotive classroom and this course will teach participants how to inexpensively create their own simulator and demonstration systems.
- **Automotive technicians** will develop skills to develop MC (software) based diagnostic systems that can be used to manipulate or control vehicle systems. Whether the technician wants to monitor control systems, inputs, or outputs this class will instruct them how to quickly make control systems to do it! The technicians will also learn how simple electronic and software circuits can be used with the Scan Tool to develop circuits that can make complex diagnostics easier.
- Information essential for individuals that want to architect vehicle “bugs” for courses or develop circuits and software to focus on specific diagnostic objectives.
- Provide participants enough fundamental knowledge and skills that would permit them to develop microcontroller-based applications and hardware interface tools for most automotive systems.



# Topics Covered – *Fundamentals Virtual Boot Camp*

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- Vehicle Control and Electronic Systems Architectures
- H/W and S/W Interactions in Control Systems
- Analog and Digital Component Operation: High level operation, usage, and integration with a MC
- Electronic Devices: Resistor, Resistor Network, Rectifier Diodes, and Zener Diodes, and Opto-Isolators
- Analog and Digital Signal Conditioning: The purpose of Signal Conditioning is to ensure that external signals can safely connect the MC to the outside world of motors, relay drivers, sensors, other controllers, networks, and more: This course will cover Why and What is needed, and How to build Analog Digital Signal Conditioning circuits that will interface with the MC. As part of learning and interfacing Signal Conditioning with the MC, it is necessary that participants understand the operation and application of electronic devices. The focus will be how to use these devices for building Signal Conditioning and Control Systems, and how to use these devices with a MC.
- Electronic Devices Signal Conditioning, Pulse Counting, and Level Sensing: Counter-Divider Circuits, Operational Amplifiers, and Voltage Level Shifters, Schmitt Trigger Circuits
- Power Electronics Switching and Amplification Devices: BiPolar Transistor Circuits, MOSFET Transistor Circuits
- Electronic Components: Logic Sensing, Magnetic Field Sensing, and Signal Conditioning: Buffers, Logic Gates, and Hall Effect Sensors
- Example circuits that illustrate how Electronic Devices interface with the MC, and how the MC would interface with the vehicle controller circuits
- MC Specifications and Pin Assignments
- MC General Purpose Inputs-Outputs (GPIO) Pin Voltage and Current Functions
- Preparing to Develop a Project Software Solution – and should answer the following questions: 1) What does it need to do?, 2) When does it need to do it?, and 3) How does it need to be done?
- The Microcontroller: Software Language, Compilers, and the MC

## Order of Topics Covered – *Fundamentals Virtual Boot Camp (cont.)*

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- Pseudo-Code: How to write Pseudo-Code to ensure that all aspects of the software solution purpose are comprehended and documented in a “readable” format before the first line of software code developed
- How to write high level operating and function statements for S/W functionality
- Coding your First Program: How to build simple circuits and building circuits that will function with software controls
- Practicing coding, utilizing electronic circuit with the MC, and signal conditioning circuit building using course projects
  - Writing & Coding Software and Building Electronics Projects: Blending the MC and Electronic components to build projects that focus on automotive systems power, analysis, and diagnostic applications
  - Exercises will include diagnostic sensing circuits, simple transmission control, and cooling fan control
- Writing & Coding Software and Building Electronics Projects: Use a MC and Electronic components to build projects that have automotive systems power, analysis, and diagnostic applications
- Electronic projects will include diagnostic circuits and sensing for motor control, relay control, transmission control, and cooling fan control. Also included are reading and writing analog voltages, using vehicle TPS, MAP or MAF inputs to control PWM output – and more
- Writing large programs vs. Modular Software Code for re-usability and ease of Code modification
- Ideas for Building Projects and using the MC and Electronic Devices for the Automotive Classroom or on the job
- Capstone – Participants will completely write the software and select the proper hardware components to complete a Capstone. The project will be disclosed on the final day of the course. Successful completion of the Capstone will be given a second course certificate that signifies their successful completion of the final project.

# Registering for a Virtual Fundamentals Boot Camp

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**Price:** \$2,195.00

**Dates:** Refer to 2021 Tracks on Page 5

**Instructor:** Dr. Mark Quarto

**Registration Link:** <https://www.futuretechauto.com/virtualfundamentals>

**Submit a PO:** <https://www.futuretechauto.com/purchaseorquote.html>

**Have Questions? Contact us:**

[info@futuretechauto.com](mailto:info@futuretechauto.com)

**OR**

<https://www.futuretechauto.com/inquiries.html>

This Virtual Training program is one of many products available from FutureTech Auto in support of Automotive and Transportation Service Professionals and Educators.

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