Raspberry Pi Projects Specialization

Invent, Prototype, Create -- with Raspberry Pi. Master multi-discipline theory and practice for creating custom projects and hardware based on the Raspberry Pi. No experience necessary.

Instructor: Drew Wilson

5,236 already enrolled

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4 course series
Get in-depth knowledge of a subject

4.9 ★
(73 reviews)

Beginner level
Recommended experience

16 weeks to complete
at 3 hours a week

Flexible schedule
Learn at your own pace

What you'll learn

This Specialization is crafted to take beginners in this field from start to building functional prototypes, home projects, and new creations with custom peripheral hardware and a Raspberry Pi. If you've never touched a Raspberry Pi, it's ok. Course 1 will get you started, and by Course 4 you'll be designing and fabricating printed circuit boards for your own custom add-on hardware to make your projects come to life and be truly unique.

Applied Learning Project

Learners can work along with all the projects in the Specialization (or on their own project). All software tools used in this Specialization are free and open-source and available for anyone to download and use. You can even run them on your Raspberry Pi. By the end of this course, learners will be designing software, electronics, and 3D hardware in CAD--all custom and designed to perfectly implement your projects.

Read less

Skills you'll gain

Remote Access Systems | Web Applications | Internet Of Things | Electronic Components | Computer-Aided Design | Communication Systems | Schematic Diagrams | Serial Peripheral Interface | Systems Of Measurement | Electronics | Linux | Data Processing | Data Science | 3D Modeling | Digital Communications | Electronic Hardware | Mechanical Design | Electrical Engineering | Electronic Systems | Hardware Design | View less skills

Details to know

Shareable certificate
Add to your LinkedIn profile

Taught in English
21 languages available

See how employees at top companies are mastering in-demand skills

Advance your subject-matter expertise

- Learn in-demand skills from university and industry experts
- Master a subject or tool with hands-on projects
- Develop a deep understanding of key concepts
- Earn a career certificate from Johns Hopkins University

Specialization - 4 course series

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Beginning Custom Projects with Raspberry Pi

Course 1 • 13 hours

Course details

What you'll learn

In this course you will use a Raspberry Pi 4 to build a complete network-connected project with sensors and motors and access it from your smartphone. We'll explore all the parts which make this work, so you can use this experience as a foundation for your own projects. We'll use the Raspberry Pi as an "embedded system" (as opposed to a desktop computer) so you're ready to build a Raspberry Pi into your projects as the brains that make it all work. Want to build your own Internet of Things (IoT) device? Home automation? Robotics? This is the class to learn how it all works, to get you building on your own. No experience in embedded systems, programming, or electronics is assumed, and optional bonus sections are provided for those who want a fast start in Python programming, Linux essentials, and basic electronics. The course is divided into four modules to explore each focus area with demontrations and extras along the way: 1) installing and configuring a Raspberry Pi, 2) accessing the Raspberry Pi over the network, 3) programmatically controlling external sensors and motors, and 4) accessing the embedded device through a web interface. After these four modules you'll get started building your own projects right away, and the three follow-on courses in this Coursera specialization dive into each area to really boost your skills and the complexity of your projects. I hope you enjoy all the courses and I hope you take your builds to the next level.

Read more

Skills you'll gain

Electronic Hardware | Application Programming Interface (API) | Embedded Systems | Linux Commands | Python Programming | Remote Access Systems

Hardware Design | Electronics | System Configuration | Web Applications | Application Security | Software Installation | Control Systems | Linux | Internet Of Things

Communications and High-Speed Signals with Raspberry Pi

Course 2 • 12 hours

Course details

What you'll learn

Course two of this specialization is all about hardware physical layer and communication between elements of your project, how to troubleshoot high-speed signals when they don't work, and how to design your projects so they do work.

We start with a review of common signal protocols available . Then, to build a deep and intuitive understanding of how circuits send and receive these signals, Module 2 explores the physics of high-frequency signals in an easy-to-follow way.

Module 3 flips your thinking from the time-domain to the frequency-domain to examine the frequency components of signals and understand how unintended filtering in your circuits distorts your digital waveforms. These are "signal integrity" concepts, distilled to what you need for your Raspberry Pi projects.

Now, with our knowledge of signals, Module 4 develops five rules of thumb for designing your circuits so that your high-speed signals work the first time. These five rules of thumb, combined with the experience from earlier modules, help you estimate spectral bandwidth of signals, rise time, and gain insights whether you're troubleshooting a broken design or designing something new.

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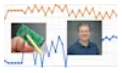
Skills you'll gain

Digital Communications | Serial Peripheral Interface | Engineering Analysis | Telecommunications | Electronics | Basic Electrical Systems | Electronic Systems | Simulation and Simulation Software | Failure Analysis | Electronic Components | Hardware Design | Network Analysis | Electrical Engineering | Communication Systems



Using Sensors With Your Raspberry Pi

Course 3 • 8 hours

Course details

What you'll learn

This course on integrating sensors with your Raspberry Pi is course 3 of a Coursera Specialization and can be taken separately or as part of the specialization. Although some material and explanations from the prior two courses are used, this course largely assumes no prior experience with sensors or data processing other than ideas about your own projects and an interest in building projects with sensors.

This course focuses on core concepts and techniques in designing and integrating any sensor, rather than overly specific examples to copy. This method allows you to use these concepts in your projects to build highly customized sensors for your applications.

Some of the ideas covered include calibrating sensors and the trade-offs between different mathematical methods of storing and applying calibration curves to your sensors. We also discuss accuracy, precision, and how to understand uncertainty in your measurements. We study methods of interfacing analog sensors with your Raspberry Pi (or other platform) with amplifiers and the theory and technique involved in reducing noise with spectral filters. Lastly, we borrow from the fields of data science, statistics, and digital signal processing, to post-process our data in Python.

Read more

Skills you'll gain

Systems Of Measurement | Data Processing | Statistical Methods | Regression Analysis | Electronic Components | Data Science | NumPy | Analytical Skills | Mathematical Modeling | Data Analysis Software | Electronics | Real Time Data | Data Cleansing

Designing Hardware for Raspberry Pi Projects

Course 4 • 10 hours

Course details

What you'll learn

This is course 4 of this specialization (although it can be taken out of order) and focuses on applying experience and knowledge gained in the first three courses to build physical electronics hardware. Specifically, this course focuses on four areas: circuit simulation, schematic entry, PCB layout, and 3D CAD modeling. There are many excellent commercial applications available in these areas, however to give everyone access we'll be using all free and open-source software.

By the end of this course you should feel comfortable using free and open-source software to design your own printed circuit board and any bracketry or case to hold it, customized for your application.

Module 1 covers circuit simulation using several open-source projects and simulation methods for simulating transient response of circuits as well as frequency-domain response of filters. Additionally, we'll use open-source filter synthesis tools to help you quickly design and simulation filters.

Module 2 is all about creating professional looking electrical schematics. This is both an art and a skill and we'll cover the technical elements of using schematic entry software as well as broad concepts that are portable to any commercial application.

Module 3 takes our schematic and turns it into a physical PCB design. Understanding this process of how the schematic and the PCB layout work together is critical. We'll be demonstrating this with open-source software, but again, the concepts apply to any commercial software you may have access to.

Module 4 demonstrates the powerful idea of co-designing your electrical and mechanical systems together. We'll create a 3D model of our electrical PCB and bring it into 3D CAD software to design mechanical parts around it. Tying together these two applications opens another dimension in customizing your projects.

Read less

Skills you'll gain

Schematic Diagrams | Computer-Aided Design | Design Specifications | 3D Modeling | Hardware Design | Electronic Hardware | Technical Design | Open Source Technology | Electronic Components | Mechanical Design | Electronics | Electrical Engineering | Simulation and Simulation Software

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Instructor

Drew Wilson
Johns Hopkins University
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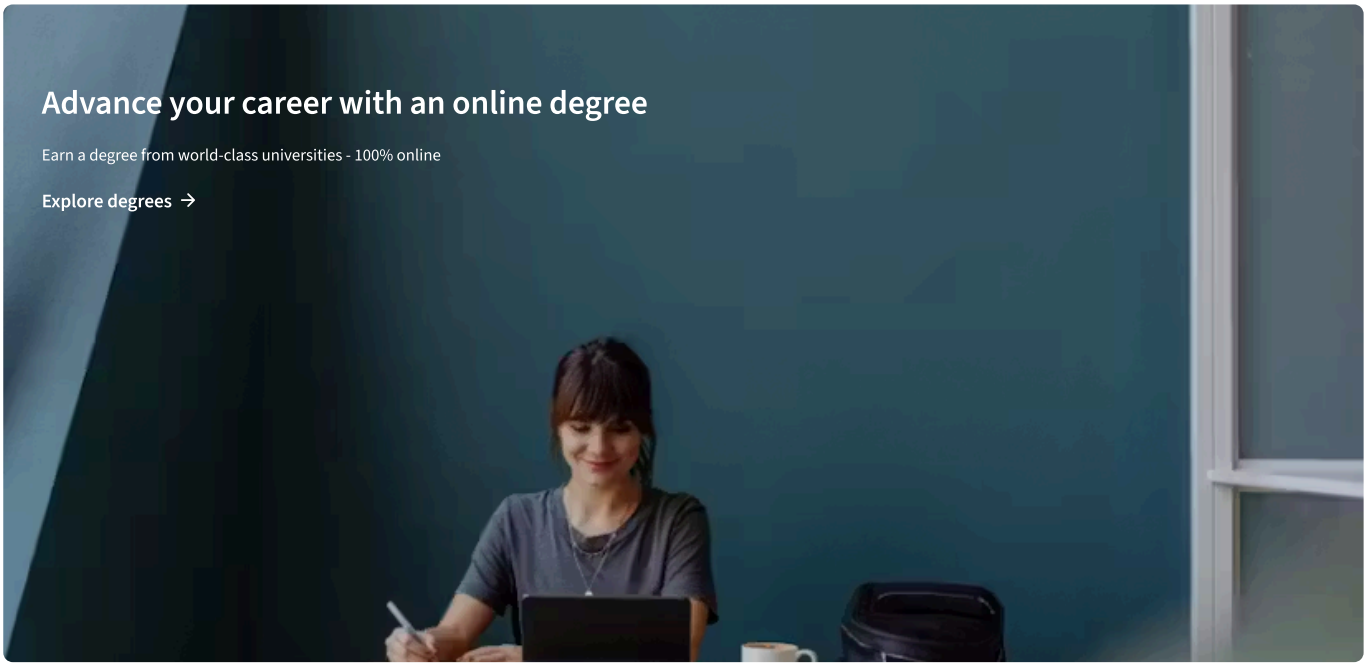

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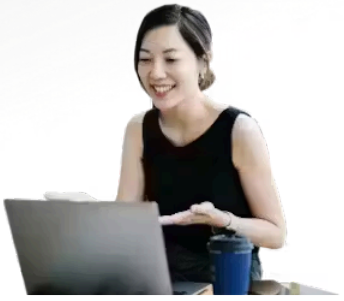

Frequently asked questions

How long does it take to complete the Specialization?

The Specialization is designed to only take a few hours per week, for four months. Each course has approximately 2 hours of video content per week, but you might also want to explore the software tools or try out the methods we're discussing in class for a couple hours each week.

What background knowledge is necessary?

We've crafted these courses such that no experience is necessary, although any familiarity with Linux, science, or electronics will be helpful in allowing you to move quickly to more advanced projects.

Do I need to take the courses in a specific order?

You can take the courses in any order, but they know that they will sometimes reference material in an earlier course (or future material in a later course).

Show all 9 frequently asked questions

More questions

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