



ALLEN ACADEMY

Engineer Your World II Course Description

2019-2020

First Trimester	Second Trimester	Third Trimester
<p>Unit 1: Electronic Music (Programming in Python)</p> <p>Electronic Music introduces Python, the coding language that students will use throughout Engineering Applications of Computer Science. Students develop basic coding skills by programming a piece of electronic music. They explore the style and syntax of Python code, trade code with classmates, then critique and improve one another's code to gain insight into good programming practices.</p> <p>Unit 2: Custom Photo Filters (Exploring Images)</p> <p>Custom Photo Filters invites students to create their own digital image processing programs to convert any color or grayscale image to a six-tone, Warhol-style picture. Students use engineering tools and techniques to "reverse engineer" existing code, model user needs, and develop a project plan for the challenge. They learn to build on existing code, integrate libraries of code, and create a software user interface that will allow an artist to "paint" images by controlling colors with slider bars. Finally, students write instructions for the artist who will be using the program. Students' coding and writing skills are put to the test when the program and its documentation are handed over to students in another</p>	<p>Unit 3: Computer-Assisted Physical Therapy (Analyzing Video)</p> <p>Computer-Assisted Physical Therapy engages students in engineering design to develop a real-time feedback tool for physical therapy patients performing rehabilitation exercises. After analyzing user needs and creating a functional model for the system, students design and build a basic wearable device that allows a web camera to capture information about the range of motion of a joint. Students write programs that analyze large quantities of video data, apply an algorithm for calculating changing joint angles, provide real-time user feedback, and export data to a file for later analysis by the patient's physical therapist. The challenge ends with students developing recommendations for future improvements to their systems.</p> <p>Unit 4: Mechatronic Assistive Devices (Building and Coding)</p> <p>Mechatronic Assistive Devices engages students in building and programming mechatronic devices that incorporate Raspberry Pis (extremely affordable, pocket-sized computers) with structural elements, sensors, motors, lights, and other components. Students build and program scale models of assistive devices such as an automated "lazy</p>	<p>Unit 5: Camera-Controlled Wheelchair (System Design)</p> <p>Camera-Controlled Wheelchair has students develop a wheelchair control system to improve independence and mobility for people with quadriplegia. Students analyze customer needs and generate design concepts for a physical apparatus to capture user head movements via a chair-mounted camera. They integrate original and off-the-shelf hardware and software to control chair speed and direction based on the detected head motion, create testable prototypes of their designs, and refine their systems through iteration.</p> <p>Unit 6: Water Rockets (Model Selection and Performance)</p> <p>Water Rockets ends the year on an engaging note as students use a computer model to customize a water rocket to reach maximum altitude. Students select an initial rocket design, use the model to predict its maximum altitude, build and launch a physical rocket, compare the actual altitude to the predicted altitude, discuss the accuracy of the model, and make informed revisions to their rockets. They then predict the performance of their revised design, relaunch, and compare results to predictions.</p>



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<p>er class, such as an art class, for user testing and feedback.</p>	<p>Susan” to assist people with disabilities and an automated “smart lighting” control system. Once each device is working, students use engineering concept generation and selection techniques to create improvements that enhance functionality. By integrating mechanical redesign with algorithm and code improvements, students develop devices that better serve their customers’ needs.</p>	

Instructional Resources:
Engineer Your World Curriculum (Cockrell School of Engineering, University of Texas)