LINC 78D: PHYSICAL COMPUTING FUNDAMENTALS

Foothill College Course Outline of Record

<table>
<thead>
<tr>
<th>Heading</th>
<th>Value</th>
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<tbody>
<tr>
<td>Effective Term:</td>
<td>Summer 2021</td>
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<tr>
<td>Units:</td>
<td>2</td>
</tr>
<tr>
<td>Hours:</td>
<td>2 lecture per week (24 total per quarter)</td>
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<tr>
<td>Advisory:</td>
<td>Basic computer skills and knowledge of Macintosh or Windows operating systems; familiarity with web browsers, email, downloading, and uploading.</td>
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<tr>
<td>Degree &amp; Credit Status:</td>
<td>Degree-Applicable Credit Course</td>
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<tr>
<td>Foothill GE:</td>
<td>Non-GE</td>
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<tr>
<td>Transferable:</td>
<td>CSU</td>
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<tr>
<td>Grade Type:</td>
<td>Letter Grade (Request for Pass/No Pass)</td>
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<tr>
<td>Repeatability:</td>
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Description

This introductory makerspace-oriented course covers the foundational components of physical computing, specifically as it relates to makerspace projects and activities. Participants will build and use a basic computer by connecting circuits, creating inputs and outputs, writing code, and programming physical devices to interact with users. Computational and design thinking practices will be emphasized throughout. Participants will gain a fundamental knowledge of the form and functions of computers, as well as the ways in which computers can solve simple and complex problems. Practical skills include model construction, circuitry, algorithm design, troubleshooting, debugging, and engineering for design.

Course Objectives

The student will be able to:

a. Build a fully functioning computer, determining how key components work together to form a complete system.

b. Understand and explain basic circuitry and the function of different electrical components.

c. Identify the functions of inputs and outputs by building basic series circuits.

d. Connect parallel circuits and develop circuit diagrams.

e. Use computational thinking methods to write code and develop algorithms.

f. Apply coding concepts and computational thinking to create a program that simulates a common device.

g. Develop interactive projects that combine programming with physical computing elements such as lights and sound.

h. Use design thinking fundamentals to develop a physical computing device to solve a real world problem.

Course Content

a. Build a computer
   i. Engineering diagrams
   ii. Case construction
   iii. Key components
   iv. Connectors
   v. Screens

b. Circuitry and electrical components
   i. Open vs. closed circuits
   ii. Electrical current
   iii. Circuit building
   iv. Breadboards and jumper wires
   v. Buttons

c. Inputs and outputs
   i. Electrical flow and voltage
   ii. Functions of inputs and outputs
   iii. Switches vs. buttons
   iv. Polarity and diodes
   v. Audio output

d. Parallel circuits
   i. Series vs. parallel circuits
   ii. Drawing circuit diagrams
   iii. Troubleshooting circuit issues
   iv. Stacking functions

e. Computational thinking
   i. Decomposition
   ii. Pattern recognition
   iii. Abstraction
   iv. Algorithm design
   v. Sequences and loops

f. Simulate a common device
   i. Decomposing device mechanics
   ii. Cause and effect
   iii. Events
   iv. Conditionals
   v. Testing and debugging programs

g. Program interactive projects
   i. Hardware and software interface
   ii. Project design and mapping
   iii. Variables to store and modify data
   iv. Combining events, loops, and conditionals

h. Device development
   i. Design thinking process
   ii. Empathy and user centered design
   iii. Prototyping
   iv. Iterative engineering cycle
   v. Product testing and revision

Lab Content

Not applicable.
Special Facilities and/or Equipment
1. When offered on campus: Lecture room equipped with computer projector system, whiteboard, and internet connectivity. Computer laboratories with internet connectivity and computers or internet enabled devices running standard operating systems (e.g., iOS, MacOS, Windows, Android, Linux)
2. When taught online via Canvas students must have current email accounts and/or ongoing access to computers with email and web browsing capability

Method(s) of Evaluation
Methods of Evaluation may include but are not limited to the following:

Designing and developing a physical computing plan and product or project
Presenting the product or project to peers, capturing feedback, and using it to revise the product or project
Making constructive contributions to class discussions and peer review feedback

Method(s) of Instruction
Methods of Instruction may include but are not limited to the following:

Writing notes, listening, and participating in lecture presentation
Observing an instructor-led demonstration and/or actively practicing the demonstrated skills
Presenting and communicating their ideas in discussion and/or participating in peer reviews

Representative Text(s) and Other Materials

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments
a. Writing assignments include a major course project and multiple developmental projects, online discussion response, and critical analysis of peer’s educational projects.
b. Outside assignments include conducting project development, planning, reading, and developing the project through an iterative process.
c. When taught online these methods may take the form of video, audio, animation and webpage presentations. Writing assignments are completed online.

Discipline(s)
Instructional Design/Technology