Master Course Description for EE201

Title: Computer Hardware Skills

Credits: 1

Course Catalog Entry:

EE 201: Computer Hardware Skills An exclusively lab-based class focused on basic hands-on skills for Electrical and Computer Engineers. Topics include soldering, PCB layout, basic microcontroller coding, 3D printing, use of basic test & measurement equipment, file management & version control. Prerequisite: CSE 142 or CSE 143, either of which may be taken concurrently.

Coordinator: Bruce Darling, Professor, Electrical and Computer Engineering

Goals: To give early ECE students a toolkit of basic skills and techniques that will help them in later classes, and in their engineering career. Provides both an introduction to the individual techniques, as well as a set of tutorials to help refresh the skills later in their undergraduate program. Serves as a launchpad for students to investigate further into topics of interest.

Learning Objectives: At the end of this course, students will be able to:

1. *Create basic printed circuit boards, including schematic, layout, and soldering assembly with components.*
2. *Write simple microcontroller programs within a standard tool flow.*
3. *Create simple 3D printed objects, including CAD design and 3D printer based fabrication.*
4. *Measure steady-state and time-varying voltages and currents.*
5. *Use modern version-control systems.*

Textbook: None.

Prerequisites by Topic:

1. Basic familiarity with computer programming (CSE 142 or CSE 143).

Topics:

1. Version control systems using Git.
2. Schematic capture and PCB layout using Eagle.
3. Soldering of through-hole parts to a premade circuit board.
4. Wired interconnections for prototyping.
5. Arduino programming basics.
6. Interfacing of elements (LEDs, switches, etc) to Arduino.

7. Modeling of simple shapes using Fusion 360.
8. 3D printing of basic objects.
9. Basic measurement techniques with oscilloscopes and multimeters.
10. Free-choice student project based upon techniques from prior labs.

Course Structure: The class meets for one 3-hour lab section a week, as well as open lab hours supported via undergraduate TAs. Students progress through a series of individual labs guiding them through major techniques, which involves a step-by-step creation of a premade basic electronic system within a 3D printed enclosure. Students then pursue a creative project that harnesses some of the topics learned in previous labs. The course includes written and/or video tutorials on major techniques, deployed via a permanent wiki maintained long-term for future reference. Collaboration on class material is encouraged, though each student must apply the techniques to their individual lab deliverables.

Computer Resources: Class will use PC workstations preloaded with the course software, found in either the department computer (ECEB 361) and/or hardware (ECEB 137, ECEB 347) labs.

Laboratory Resources: Students will use test and soldering stations within the department hardware labs (ECEB 137, ECEB 347). In addition, students will have access to 3D printers via UW's MakerSpaces.

Grading: Grades will be completely determined via the lab assignments, including the final project. 65% weekly lab assignments, 35% Final Project.

ABET Student Outcome Coverage: This course addresses the following outcomes:

H = high relevance, M = medium relevance, L = low relevance to course.

(1) *An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics* **(L).** The labs require students to learn and apply engineering techniques to create useful objects.

(3) *An ability to communicate effectively with a range of audiences* **(L).** Students are required to write and/or video record a report describing the final project implementation and results achieved.

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