How to Build a Digital-Physical System
Syllabus Outline

Course Prefix and Number:	**AME 394**
Schedule Line Number:	**DSC-84697**
Instructor Name:	**Daragh Byrne**
Instructor Email:	**daragh@daraghbyrne.me**
Office Number:	**Brickyard Building, #396**
Office Hours:	**TBC by appointment**
Classroom:	**STAUF B125**
Meeting Days and Hours:	**Monday, Wednesday, 3-4.15**
Semester and Year:	**Fall 2011**
Hours of operation:	**Mon-Fri, 6.30pm-9.30pm**
Course Wiki:	**http://DC-bdps.wikispaces.asu.edu/**

This outline syllabus is flexible and subject to change

Catalogue Description

How to Build a Digital-Physical System is an introductory, hands-on course where students will explore digital-physical systems by working with the fundamental building blocks of interactive technologies and examining exemplar works of media art. Students will learn the basics of electronics, circuit design, sensors, actuators, simple mechanical design, the iterative design process, and microcontroller programming. We will emphasize media and arts applications such as real time interactive performance, robotic installations, and tangible computer interfaces. Prior knowledge in hardware/circuit design is not required for this course.

Prerequisites

None. The course will teach all core skills required.

General Description

This course will provide a general introduction into creating physical digital systems. Physical-digital systems seek to move beyond the confines of the computer and introduce digital systems into the wider world. This includes tangible, wearable, ambient, embedded, public and personal display technologies. Throughout this course students will be introduced the the technical possibilities for such systems. This will be combined with a consideration of the various design considerations for form, physicality, environment, and use which apply to these technologies. Students will be versed in the core skills required to build technology through instructor led tutorials with Arduino and trained in using appropriate fabrication methods (e.g. Lazer cutting, machining, 3d Printing). Students will also be introduced to design methods for ideating and developing concepts and for iterative and rapid prototyping from a human-centred perspective.

Learning Objectives

- Gain knowledge of prior and related work.
- Develop an understanding of relevant design factors & considerations in building physical digital systems
- Develop an understanding of the technical possibilities for delivering physical digital systems
- Gain core skills in building electronic components and fabricating enclosures
- Gain practical experience in designing physical digital systems through project assignments

Instructional Methods

Classes will involve lectures, discussions, critique sessions and labs with occasional guest presentations. Students will participate in and lead class discussion/presentations.

Attendance Policy

Students are expected to attend all classes. In the case of absence, please inform the instructor before the class if possible, and/or after the missed class. Classroom attendance and participation is 10% of the overall grade.

Required Texts

There are no required texts for this class. Digital and photocopied reading/viewing material will be provided by the instructor and available on the class wiki.

References

The following is a useful practical resource for many of the practical examples and tutorials which will be performed as part of the course.

- Getting Started with Arduino, Massimo Banzi, 2008, O'Reilly Media, Inc, USA
- The Make Blog is also an invaluable resource http://blog.makezine.com/ as is the Arduino webpage and reference content http://arduino.cc/

Recommended reading for the course includes:

- Emotional Design: Why We Love (or Hate) Everyday Things, Donald A. Norman, 2005, Basic Books
- Where the Action is: The Foundations of Embodied Interaction, Paul Dourish, 2004 MIT Press

Other reading may include excepts and academic research papers from: Daniella Petrilli, Lucy Dunne, Bill Gaver, Alan Dix, Kees van Overbeeke, and Yvonne Rogers.

Schedule

30 Classes - 4 modules

- **Module 1 (4 classes) - Introduction:** A general introduction to the electronics, fabrication and design of physical digital systems will be provided.
- **Module 2 (12 classes) - Core Skills:** Students will be introduced to Arduino and the fabrication of enclosures. Classes will be split equally between introduction to technical concepts and tutorials where worked examples will be created within the lab.
- **Module 3 (6 classes) - Designing Physical Digital Systems:** This section will verse the students in the design and human factors considerations required when building physical digital systems (form, texture, physicality, appearance, ergonomics, interaction, presentation, placement, environment, persuasion.) Students will also perform practical exercises each week to identify and design a physical digital system.
- **Module 4 (6 classes) - Technical Skills:** This section will introduce the students to more advanced components of physical digital systems including sensing the environment, movement and communication with computers and online sources. Practical instructor led lab sessions will develop the core skills.

Each module (with the exception of the introductory components) will be split equally between theory and practical skills building.

Note: September 5 - Labor Day; Classes end December 6; Final Report due December 14

Regular Assignments and Term Projects

- Classroom discussion of readings/screenings/works
- 8-10 Practical Lab/In-Class Assignments (Group work)
- Conceptual Design Project (Group work)
- Final Report **(December 14th)**

To facilitate marking all students are expected to maintain a page on the course WiKi which documents each practical lab assignment completed in class *and* each stage of the design project.

Evaluation

Active, productive participation in classroom discussion. Fabrication and Arduino specific projects to be completed during in class lab sessions and documented on the class wiki. Final project deliverables negotiated between the student and the instructor. You will receive module specific grades throughout the semester, together with overall mid-term and final grades.

Field Trips

There are no field trips for this course

Lab Fee

To be confirmed.

Grading Policy

- Attendance and Participation (10%)
- 8-10 Practical / In Class Assignments (40%) - *Groupwork*
- Conceptual Design Project (20%) - *Groupwork*
- Final Report (20%) - *Individual*

Academic Integrity

Expected at all times. All necessary and appropriate sanctions will be issued to all parties involved with plagiarizing any and all course work. Plagiarism and any other form of academic dishonesty that is in violation with the Student Code of Conduct will not be tolerated. *Please refer to the following link for additional information: http://provost.asu.edu/academicintegrity/students*

Academic Accommodations

To request academic accommodations due to a disability, please contact the ASU Disability Resource Center (http://www.asu.edu/studentaffairs/ed/drc/#. This is an important step as accommodations may be difficult to make retroactively.