Physical Computing and Prototyping PSYCGI16 – 15 Credits

Academic Session	Date Description Last Updated
2017/18	19 June 2017

Module Convenor:

Name	Office	Phone	Email
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Module aims and objectives:
The aims of the module are: (1) to make students familiar with physical computing and digital fabrication methods, toolkits, and theory; (2) to allow them to critically choose and apply appropriate prototyping methods while considering design constraints; and (3) to give them the practical skills for designing and prototyping novel interactive physical and tangible user interfaces.

Module description:
This module provides an introduction to advanced prototyping methods for designing physical user interfaces and devices. Students will explore techniques of extending computation beyond the graphical user interface on a screen into the physical world – for example with a new wearable activity tracking device, interactive tangible blocks for children learning math, or a sensor-based audible installation in the home for communicating with remote relatives.

Inspired by seminal work in ubiquitous computing, tangible user interfaces, and wearable computing, students will learn (1) how to use digital fabrication methods to rapidly *prototype physical designs*; and (2) how to use sensors, actuators, and physical computing toolkits to make devices *interactive and react to sensed properties*. Topics covered include the background in electronics, sensing, actuation, prototyping, and digital fabrication, and the process for selecting suitable prototyping techniques. The course will follow user centered design practice, where students apply methods learned in the first term to observe users and sketch ideas, to then build a series of low- to high-fidelity prototypes by means of the learned techniques towards interactive physical and tangible computing experiences.

The course is delivered through a mix of lectures and practical physical computing labs. During lectures students learn the methods and techniques, and are encouraged to think critically about physical user interface problems. During the lab sessions students will gain practical experience in using tools and techniques, such as programming micro controllers (e.g., Arduino, Raspberry pie, .NET Gadgeteer), introduction to electronics, using sensors (e.g., light, motion, temperature, oxygen) and actuators (e.g., motors and servos), and prototype building (e.g., foam core mockups, 3D printing, laser cutting). Throughout the module students will work on both individual coursework (with a series of applied mini-projects) and a major course project (solving a given design challenge). With its substantial focus on the prototyping of novel interfaces, the module directly complements the learning about design practice methods gained in term 1 of the HCI-E MSc.

Module learning outcomes:
Knowledge and understanding of: Background, history, and seminal work in physical and tangible user interfaces; Techniques and methods for producing physical interface prototypes; Use of prototypes and physical prototyping methodology in design and human-computer interaction.

Intellectual (thinking skills) – able to: Critically choose between design and prototyping methods; Apply physical computing and prototyping techniques to address human-computer interaction design challenges.

Practical skills: Learning to use various toolkits and techniques in physical computing, electronics, and digital fabrication; develop several interactive prototypes using electronics, sensors, actuators, and other materials.

Transferable skills: Prototyping skills; applying physical computing methods in different contexts; Presentation skills; Portfolio skills.

Tentative module schedule:
Term 2. Tuesday afternoons (tbc)

	Tuesday
Week 1	Introduction to Physical Computing
Week 2	Electronics, Input and Output
Week 3	Advanced Electronics and Digital Fabrication I
Week 4	Digital Fabrication II: Laser cutting
Week 5	Electronics: Wireless Communication
	Reading week
Week 6	Digital Fabrication III: 3D printing
Week 7	Advanced Prototyping I
Week 8	Advanced Prototyping II
Week 9	Further Digital Fabrication Techniques
Week 10	Final project demo showcase

Limited number of students:
Due to space constraints and available prototyping and electronics hardware, the number of students participating in the module will be capped. Details about the process to apply for enrollment in this module will be made available at the beginning of term.

Assessment:
Assessment method:
100% Individual Physical Computing Term Project (video, poster, and live demonstration of the prototype). For this module, students will work on their own physical computing project during term time (e.g., wearable-computing, technology in the home, tangible interfaces for learning). Students have the opportunity to propose their own project ideas, or follow given project challenge. Video and live demo will show a fully working prototype of an interactive physical computing prototype, and the poster will explain the application and adaption of physical computing and digital fabrication methods and techniques, and the iterative design process for the individual term project.

Pass conditions: Pass must be above 50% in the assessment listed above.

Note: Module descriptions may be subject to minor alterations due to lecturer availability & changes to regulations.