

**The University of California, Irvine
Department of Informatics**

**IN4MATX 248 – Into to Ubiquitous Computing
Fall 2016**

Instructor: Dr. Darren Denenberg

Class Times: 12:30 – 1:50, T / Th, DBH 1300

Office Hours: M / W 12:00 – 3:00

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Course Description:

Ubiquitous computing, more colloquially known as UbiComp, the Internet of Things or even Industry 4.0, moves technology and computing beyond the model of one person, one device and into a vast, networked world where everything is connected, everything is sharing data, and everything has embedded technology. This class will examine the phenomenon from the technological, societal, regulatory and development perspectives.

Learning Objectives

Develop an understanding of the evolution of Ubiquitous Computing, the underlying, foundational issues that serve to enable and support it, and the impact and future development / trends that will likely be seen as the field moves forward.

Handouts / Text

There will be no official text for this class – rather, there will be a series of presentations along with in-class exercises, case studies, and topical research assignments that will further your knowledge and understanding of the topic.

Grading

- Each in-class assignment will be worth 30 points arranged as such:
 - 10 points for the support of your writing, including references to research and media, class discussion/notes, and experimentation.
 - 10 points for the relatedness/completeness of your response/selected topic
 - 10 points for quality of writing (grammar, punctuation, spelling, capitalization, sentence structure, etc.)
- Each research submission will be worth 20 points (10 for submission, 10 for evaluation)
- Each project will be worth 50 points
 - Project 1: Topic (10), Writing (10), Support (10), Evaluation (10), Presentation (10)
 - Project 2: Works? (20), Justification (10), Analysis / Explanations (10)

This gets repeated ad-nauseum, but pay attention to writing, structure, spelling, grammar, support, etc.

Attendance, Make-Ups, and Due Dates

Attendance is expected and will be noted, occasionally for lecture and always for discussion. If your attendance becomes an issue, it will be factored into your overall grade.

All materials are due on the assigned due date, which is considered to be an integral part of the assignment.

Miscellaneous

During lecture portions of the class, any electronic devices used for anything other than life support should be turned off. This includes, but is not limited to: cell phones, GameBoys (all types), media players, devices used for communicating with the dead, oscilloscopes, UFO scanners, rocket powered roller skates, unmanned spy planes, sphygmomanometers, robots that serve you drinks, imaginary friends, or anything whose use would be a distraction to the class.

During discussion portions of the class these rules are more lenient, however please keep in mind that cell phone conversations are never allowed, and anything that disturbs another member of the class or is inappropriate must stop.

Academic Misconduct

Don't cheat. The university takes academic misconduct very seriously and considers it a serious offense. If you are found to be cheating on an exam, handing in work that isn't your own, plagiarizing, or otherwise engaging in academic dishonesty, you will receive a zero for that assignment. If the instructor determines that the offense(es) are serious enough, the student will be referred for academic sanctions.

GRADED ASSIGNMENTS

Research submission (seminar component)

Every Thursday, the members of each team will be required to bring in three scholarly articles relating to the topic presented on Tuesday, with one of the three articles chosen as their contribution for discussion. Each team will then have approximately 20 minutes to discuss the articles brought in by its members, and choose one to present to the class. In the event that multiple team members have chosen the same article, the other two can be used as a fallback.

Once each team has decided on its choice, it will select a member to present the article to the class and talk about what the article says, why it was chosen, why it's important, and what was learned from it. Be aware that this is not etched in stone; there is significant flexibility in how you present, however these are general themes that should be touched on.

Regardless of which article was selected by the group for presentation, each member should hand in the three articles they brought in, in hard copy, with their name written on each.

Scholarly articles include research publications, trade and professional publications, and in rare cases mainstream news publications, however the latter must first be cleared by the instructor.

Course Projects

This class will consist of two projects; one is a half-quarter research / evaluation project and the other is a full-quarter development project that will have you developing your own ubiquitous computing device or technology.

Write well, research well, support well, cite and source well. Each bullet requires one scholarly reference and one trade reference related to that topic *and* to your topic.

PROJECT I – Evaluation of Current Technology - Due October 27th

- Describe, in detail, your chosen ubicomp topic.
 - What is it, what are its primary functions, what are its secondary functions (if any)?
 - Who manufactures it? Is this a core product for them? If so, what is their market stance, and if not, what is the motivation behind developing this technology.
 - Are there different models of it (Pro v. Consumer, different software capabilities, different applications, etc.)?
 - Are there similar products in the market? If so, compare and contrast them with yours, explaining the pros and cons as they relate to the one you've chosen.
 - What is its impact? What are the social, technical, security, privacy, and other issues that your technology presents? Back up your claims with research / evidence.
- How does it connect, protocols, what data does it gather, what is done with that data?
 - What are the protocols by which it connects to the Internet? Describe each in detail and describe how they manifest in your device. In other words, how specifically would you connect it to a network or other device?
 - What data does it gather, and what data does it send? How does it use that data to carry out the functions it was designed to do?
 - Why does it send that data? How is that data important in terms of the technology? Where is that data stored? Who has access to that data? How is the data used?
- How is security implemented, or not implemented, in your thing?
 - What security measures are in place to prevent unauthorized access and manipulation of the technology, and to prevent the theft of the data it is generating and sending?
 - On a scale of one to five, how would you rate the security of the technology? Justify your answer, and highlight two areas in which security could be improved, explaining each.
- How could it be redesigned / redeveloped to improve on its design. Be specific. Indicate why you need to fix the things you're fixing.
 - If your thing is a hardware/software hybrid, choose one aspect of the physical interface and one aspect of the software interface that could be improved, and redesign it to make it more useable and more functional. Explain why.

PROJECT II – Designing Your Own - Due December 1st

- For the second project, your group will need to develop your own Internet of Things technology. Find a function, a device, a purpose around which you could develop that technology.
- Explain why there might be a need for what you are developing. What area does it address or improve upon? Are there competitive examples that already exist? How do they lack, and how will yours be different or better?
- Determine the hardware that will serve as your platform; as expected, the two most common choices are Raspberry Pi and Arduino, however you can use any platform and any language(s) you like.
- Chart out the logic of how your IoT device will work.

- Blueprint or provide a technical drawing / diagram of the device, labelling all the components, and how they connect to other devices or the larger network.
- How will the data it collects and transmits be stored, and how will it be used? Who will have access to it?
- Describe its components, functionality, and indicate its uses.
- Provide a technical or user manual for the device.
- What will be the security measures put in place to prevent unauthorized access? What data will be collected and transmitted, why, how will data be stored, and where? Will that data be shared?

Each of these bullets should be given careful consideration and discussed in significant detail. If it appears that what you hand in was hastily thrown together three hours before class on the day it was due then it will be graded as such. In other words, very poorly.

The project should be well written, with consideration paid to spelling, grammar, and punctuation. It should be presented professionally in a folder (**No three-ring binders or manila folders**). If I have to extract meaning from what you've written because of poor writing, that will negatively affect your grade.

On the final day of class, we'll have an in-class showcase where each team can demonstrate their IoT device.

There will be a form to completed each time the group meets, that will be a record of the attendees and activities. That form, if meetings were held, will need to be submitted in class each Tuesday to serve as a formal record. Additionally, all group members will have the chance to anonymously evaluate the other members of their group at the project's conclusion. The information I receive in these evaluations will be treated with strict confidence. When grades for the project are given, the evaluations will be very seriously considered.

All projects will be due on their due date, no exceptions.

TENTATIVE CLASS SCHEDULE

<u>Date</u>	<u>Topic</u>
Sep 22	Intro / Groups
Sep. 27	What is UbiComp / How did we get here?
Sep. 29	History Research / Exercise
Oct. 4	Networking
Oct. 6	Networking Research / Exercise
Oct. 11	Security
Oct. 13*	Security Research / Exercise
Oct. 18	TBA
Oct. 20	TBA
Oct. 25	Data, databases, and storage
Oct. 27	DB / Information Research / Exercise
Nov. 1	Sensors, hardware, and related issues
Nov. 3*	Case study / Discussion
Nov. 8	Wearable computing (*)
Nov. 10	Case study / Discussion
Nov. 15	Health / Home
Nov. 17	Case Study / Discussion
Nov. 22	Social impacts
Nov. 24	THANKSGIVING
Nov. 29	The Future
Dec. 1	Showcase