

USC Iovine and Young Academy

Arts, Technology and the Business of Innovation

IDSN-599: Networked Objects

Units: 3.0

Summer 2019 - Mondays, 5:00pm - 8:10pm

Instructors: Aaron Siegel

Office: Online

Office Hours: By Appointment.

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Course Description

Networked Objects is a course that intends to introduce students to concepts of interaction design through the medium of physical computing. Students will become familiar with the technological basics of internet telephony, electrical engineering, and computer programming in order to create innovative interactive experiences in physical objects.

Learning Objectives

- Fundamentals of physical computing through the use of microcontrollers.
- Concepts related to the aesthetic considerations of interactivity and smart product design.
- Networked communication of internet connected objects.
- Telepresent experiences through computer-mediated systems, interfaces, and objects.

Recommended Preparation

Basic knowledge of the principles of internet connectivity.

Course Notes

This course will be conducted online in an entirely synchronous fashion. Students will be required to complete the readings and any assigned projects before the synchronous class session occurs.

Technological Proficiency and Hardware/Software Required

Students must provide their own laptop. The laptop specifications take into consideration that students will be creating, streaming and downloading audio and video, communicating using video conferencing applications and creating and storing large multimedia files.

	Apple	Windows PC
Laptop (Minimum standards)	<ul style="list-style-type: none">● 2.6 GHz dual-core Intel Core i5 or 2.0 GHz quad-core Intel Core i7● Minimum 13" display● 250GB hard drive or larger● 8GB memory/16GB memory recommended	<ul style="list-style-type: none">● Intel Core i5 or Intel Core i7● Minimum 14" display● 250GB hard drive or larger● 8GB memory/16GB memory recommended
Warranty	<ul style="list-style-type: none">● Manufacturer warranty or extended warranty coverage (AppleCare)	<ul style="list-style-type: none">● Manufacturer warranty or extended warranty coverage
Operating System	<ul style="list-style-type: none">● Mac OS X operating system or higher	<ul style="list-style-type: none">● Windows 7, 8, 10 operating system or higher

Peripherals	<ul style="list-style-type: none"> ● HD webcam, speakers, and microphone (Most newer laptops have built-in webcam, speakers, and microphone) ● Headset ● Digital camera (Cameras on newer smartphones are acceptable) ● External drive for cloud account for backup and storage
Software	<ul style="list-style-type: none"> ● Adobe Creative Cloud (Photoshop, Illustrator, and InDesign) ● Adobe Acrobat Reader ● Microsoft Office Suite ● Sophos Endpoint Security (antivirus) ● Browser: Most recent version of Firefox, Chrome, Safari or Internet Explorer.
Network	<ul style="list-style-type: none"> ● Cable modem, DSL, T1/T3 or higher

Required Readings and Supplementary Materials

- [Arduino Uno Wifi Rev2.](#)
- [Banzi, Massimo. *Make: Getting Started with Arduino*. 2015. Maker Press; Sebastopol.](#)
- [Clark, Andy. *Natural-Born Cyborgs*. 2003. Oxford, New York.](#)

Grading Breakdown

Assignment	% of Grade
Hardware Interface Assignment	10%
Sensor/Actuator Research Assignment	10%
Interaction Proposal	20%
System Assignment	10%
Final Assignment	50%
Total	100%

Assignment Submission Policy

All assignments must be delivered, as per instructor guidance, on the date and time. No exceptions. (Early submissions are, of course, encouraged!) Read and heed supplementary Assignment Details, distributed when each assignment is launched, carefully.

All assignments, no matter how late, must be completed in order to pass this class.

Late Submissions

Assignments will be accepted after the deadline with the following grade penalties. Do not ask for extensions; the below *are* the extensions.

- Submission in the 24 hours after the deadline 10% deduction
- Submission between 24 and 48 hours after the deadline 20% deduction
- Submission between 48 hours and 3 days after the deadline 50% deduction
- Submission more than 3 days after the deadline 100% deduction

Keep copies of all your files and emails until the end of the semester.

Correcting a Grading Error or Disputing a Grade

If you don't inform the instructor of missing or incorrect grades within two weeks of those grades being posted, the grades will be assumed correct. Do not wait until the semester's end to check or appeal any grades. If you feel a grade merits re-evaluation, you are encouraged, within one week of the instructor providing a grade and initial feedback, to send the instructor a memo in which you request reconsideration. The memo should include a

thoughtful and professional explanation of your concerns. Be aware that the reevaluation process can result in three types of grade adjustments: positive, none, or negative. (Note: Complaints on the date of a graded assignment returned to you will not be addressed; it is essential to wait one full day prior to raising a concern.)

Additional Policies

Class notes policy: Notes or recordings made by students based on a university class or lecture may only be made for purposes of individual or group study, or for other non-commercial purposes that reasonably arise from the student's membership in the class or attendance at the university. This restriction also applies to any information distributed, disseminated, or in any way displayed for use in relationship to the class, whether obtained in class, via email or otherwise on the Internet, or via any other medium. Actions in violation of this policy constitute a violation of the Student Conduct Code, and may subject an individual or entity to university discipline and/or legal proceedings. Again, it is a violation of USC's Academic Integrity Policies to share course materials with others without permission from the instructor.

No recording and copyright notice: No student may record any lecture, class discussion, or meeting with the instructor without his/her prior express written permission. The word "record" or the act of recording include, but is not limited to any and all means by which sound or visual images can be stored, duplicated, or retransmitted whether by an electro-mechanical, analog, digital, wire, electronic or other device or any other means of signal encoding. The instructor reserves all rights, including copyright, to his/her lectures, course syllabi and related materials, including summaries, slides (e.g., Keynote, PowerPoint), prior exams, answer keys, and all supplementary course materials available to the students enrolled in the class whether posted to the LMS or otherwise. They may not be reproduced, distributed, copied, or disseminated in any media or in any form, including but not limited to all course note-sharing websites. Exceptions are made for students who have made prior arrangements with The USC Office of Disability Services and Programs and the instructor.

Participation: Students are expected to actively participate in this course. In an online forum, participation includes:

- Careful reading and viewing of assigned materials by the date due
- Regular, substantive contributions to discussions
- Active engagement with online content
- On-time attendance and full attention in synchronous sessions
- Significant collaboration with classmates and teammates

Course grades may be affected for students who do not contribute to the course through active participation. Students should notify the instructor in advance if they are unable to attend class.

Contact Hours

This 3-unit course requires 2,250 minutes of instructional time per semester. During fall and spring, this equals 150 minutes (2.5 hours) of synchronous instructional time each week. In addition, it is expected that students will work, on average, an additional 300 minutes (5 hours) per week outside of class — on readings/viewings, homework assignments, field experiences, and individual or team projects. Synchronous class sessions will be offered as regularly scheduled evening or weekend classes, once each week. During the summer, this equals 187.5 minutes (3.125 hours) of synchronous instructional time each week. It is expected that students will work, on average, an additional 375 minutes (6.25 hours) per week outside of class in the summer.

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism — presenting someone else's ideas as your own, either verbatim or recast in your own words — is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Support Systems:

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs

Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

Student Support and Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.

Provides overall safety to USC community. dps.usc.edu

Course Schedule:

WEEK	TOPIC	ASSIGNMENTS (due the week listed)
1 (5/13)	<p>Interaction Design</p> <ul style="list-style-type: none"> ● Cybernetics ● Hypermedia ● Human-Computer Interface ● Software Interface ● Hardware Interface ● Context, Location <p>The Electronic Brain</p> <ul style="list-style-type: none"> ● Sensing & Actuating ● Haptics <p>Workshop: Arduino Programming</p> <ul style="list-style-type: none"> ● Digital Out (LED) ● Digital In (Buttons and Switches) ● PWM Out / Analog In 	
2 (5/20)	<p>Internet Infrastructure</p> <ul style="list-style-type: none"> ● Networks ● Servers ● Clients ● Communication Technologies ● Telepresence ● Social Networks 	<p>WATCH: The Mother of All Demos (1968) [1h40m].</p> <p>READ: Banzi, ch. 1-4.</p> <p>READ: Manovich - Introduction to Info-Aesthetics (2008).</p> <p>READ: Manovich - Social Data Browsing (2000).</p>
3 (6/3)	<p>Human Evolution</p> <ul style="list-style-type: none"> ● Tool + Technique = Technology ● Augmenting the Body ● Cyborgs <p>Workshop: Electrical Engineering Fundamentals</p> <ul style="list-style-type: none"> ● Ohm's Law ● Passive Components ● Schematics ● Load and Logic 	<p>DUE: Hardware Interface Assignment.</p> <p>READ: Banzi, ch. 5, 7.</p> <p>READ: Clark, ch. 1-2.</p>
4 (6/10)	<p>Workshop: Microcontroller Networking</p> <ul style="list-style-type: none"> ● Connecting ● Transmitting ● Receiving ● Pairs ● Events 	<p>DUE: Sensor/Actuator Research Assignment.</p> <p>READ: Banzi, ch. 8.</p> <p>READ: Clark, ch. 3-4.</p>
5 (6/17)	<p>Computer-Mediated Human Contact</p> <ul style="list-style-type: none"> ● Virtual Reality ● Science Fiction Interfaces ● Teledildonics ● Relationship Ethics 	<p>READ: Clark, ch. 5-6.</p>
6 (6/24)	<p>Midterm Presentations</p>	<p>DUE: Interaction Proposal.</p>

7 (7/1)	Workshop: Advanced Electronics <ul style="list-style-type: none"> ● Sensor Kits ● Motors ● High Voltage Relays 	READ: Clark, ch. 7-8.
8 (7/8)	Smart Products <ul style="list-style-type: none"> ● Artificial Intelligence ● Data Management and Display ● Service and Connectivity ● Value Offering 	WATCH: Objectified (2009) [1h15m] . READ: Rams - 10 Principles of Good Design
9 (7/15)	Workshop: Advanced Service Development <ul style="list-style-type: none"> ● Database Configuration ● Application Programming Interface ● User Management 	
10 (7/22)	Infrastructure and Sustainability <ul style="list-style-type: none"> ● Servers, Software, Libraries ● Materials, Mechanics, Actuators ● Longevity, Performance ● Maintenance, Upgrades ● Open Source Community ● PCB and SMD Manufacturing ● Environmental Impact 	DUE: System Assignment.
11 (7/29)	Evaluation <ul style="list-style-type: none"> ● User Testing ● Service Debugging ● Contingency Management Iteration <ul style="list-style-type: none"> ● Additional Features ● Optimization and Refinement ● Production and Manufacturing 	
12 (8/5)	Final Presentations	DUE: Final.

Assignments

1. *Hardware Interface Assignment (10%)*

Come up with a new type of hardware interface based around a singular purpose. Design as if you are working on a science fiction film and you can create any type of tangible interface available. The primary limitation is that the interface elements must be physical (not virtual elements on a screen). Your interface must accommodate at least three (3) different functions. Some virtual elements can be used to augment the interface and indicate status, mode, progress, etc.

2. *Sensor/Actuator Research Assignment (10%)*

Working with your team, research the type of sensor input and actuator output that falls along the lines of the sensory definition that has been provided to you. Light, audio, touch, taste, smell, temperature, etc.

3. *Interaction Proposal (20%)*

Create a presentation that proposes a new type of interaction between multiple people over the internet. The interaction should tap into some sense of empathy or engagement that encourages or rewards people

to continue interacting. Consider aspects like gamification, notifications, and network effect that will help be a catalyst for more people to take part in the interaction.

4. *System Assignment (10%)*

Propose a design for a system that will facilitate a specific type of interaction over telecommunication and computer mediated means. The system should be able to facilitate the transmission and storage of data, events caused by sensed input, and retrieval of latest events for actuating.

5. *Final Assignment (50%)*

Networked object connected with one or more of your classmates. The sensory input of one object should communicate and translate to the sensory output of another object. The objects should use Wifi enabled Arduino microcontrollers to handle the logic and communications. The objects must be physical in some manner and use some type of sensing/actuating in order to communicate behaviors with the user.