USC Iovine and Young Academy
Arts, Technology and the Business of Innovation

IDSN 599: Designing Networked Objects: From IoT to Smart Environments
Units: 3.0
Spring 2021—Tuesdays—5:00pm-7:20pm

Location: Online

Instructor: Aaron Siegel & Trent Jones
Office: Online
Office Hours: By Appointment
Contact: aaronsie@usc.edu; trentjon@usc.edu

IT Help: 2U Student Support
Hours of Service: Available 24/7, 365 days/year
Contact Info: studentsupport@design.usc.edu, 1-855-487-3504

Course Description
Designing Networked Objects: From IoT to Smart Environments 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
IDSN 530: Technology Essentials. 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)	• 2.6 GHz dual-core Intel Core i5 or 2.0 GHz quad-core Intel Core i7 • Minimum 13" display • 250 GB SSD or larger • 16 GB memory	• Intel Core i5 or Intel Core i7 • Minimum 14" display • 250 GB SSD or larger • 16 GB memory
Warranty	• Manufacturer warranty or extended warranty coverage (Apple Care)	• Manufacturer warranty or extended warranty coverage
Operating System	• Mac OS X 10.13 or higher	• Windows 7, 10 operating system or higher
Peripherals	• 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	• 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	• 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	20%
Interaction Proposal	20%
System Assignment	20%
Final Assignment	40%
Total	**100%**

Grading Scale
Course final grades will be determined using the following scale:

A   95-100
A-   90-94
B+   87-89
B   83-86
B-   80-82
C+   77-79
C   73-76
C-   70-72
D+   67-69
D   63-66

D-   60-62
F   59 and below

Assignment Submission Policy

<u>All</u> 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.

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 re-evaluation process can result in three types of grade adjustments: positive, none, or negative. (Note: Complaints on the date of a graded assignment's return to you will not be addressed; it is essential to wait one full day prior to raising a concern.)

Academy Attendance Policy

The Academy maintains rigorous academic standards for its students and on-time attendance at all class meetings is expected. Each student will be allowed two excused absences over the course of the semester for which no explanation is required. Students are admonished to not waste excused absences on non-critical issues, and to use them carefully for illness or other issues that may arise unexpectedly. Except in the case of prolonged illness or other serious issue (see below), no additional absences will be excused. Each unexcused absence will result in the lowering of the final grade by ⅓ of a grade (e.g., an A will be lowered to A-, and A- will be lowered to a B+, etc.). In addition, being tardy to class will count as one-third of an absence. Three tardies will equal a full course absence.

Students remain responsible for any missed work from excused or unexcused absences. Immediately following an absence, students should contact the instructor to obtain missed assignments or lecture notes and to confirm new deadlines or due dates. Extensions or other accommodations are at the discretion of the instructor.

Automatically excused absences normally many not be used for quiz, exam or presentation days. Using an excused absence for a quiz, exam or presentation, such as in the case of sudden illness or other emergency, is at the discretion of the instructor.

In the case of prolonged illness, family emergencies, or other unforeseen serious issues, the student should contact the instructor to arrange for accommodation. Accommodation may also be made for essential professional or career-related events or opportunities. All accommodations remain at the discretion of the instructor, and appropriate documentation may be required.

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 e-mail 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 includes, 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. Those unable to attend will be required to review the online recording for the session missed, and submit thoughtful feedback to the Instructor.

Contact Hours
This 3-unit course requires 2,250 minutes of instructional time per semester, which equals 150 minutes (2.5 hours) of instructional time each week. Instructional time may be further broken down into 75 minutes (1.25 hours) of asynchronous time and 75 minutes (1.25 hours) of synchronous time. 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.

Course Schedule:

WEEK	TOPIC	ASSIGNMENTS (due the week listed)
1	**Interaction Design** ● Cybernetics ● Hypermedia ● Human-Computer Interface ● Software Interface ● Hardware Interface ● Context, Location	
2	**The Electronic Brain** ● Sensing & Actuating ● Haptics **Workshop: Arduino Programming** ● Digital Out (LED) ● Digital In (Buttons and Switches) ● PWM Out / Analog In	READ: Banzi, ch. 1-4.
3	**Internet Infrastructure** ● Networks ● Servers ● Clients ● Communication Technologies ● Telepresence ● Social Networks	READ: Manovich - Introduction to Info-Aesthetics (2008). READ: Manovich - Social Data Browsing (2000).
4	**Workshop: Electrical Engineering Fundamentals** ● Ohm's Law ● Passive Components ● Schematics ● Load and Logic	DUE: Hardware Interface Assignment. READ: Banzi, ch. 5, 7.
5	**Human Evolution** ● Tool + Technique = Technology ● Augmenting the Body ● Cyborgs	READ: Clark, ch. 1-2.
6	**Workshop: Microcontroller Networking** ● Connecting ● Transmitting ● Receiving ● Pairs ● Events	READ: Banzi, ch. 8. READ: Clark, ch. 3-4.
7	**Computer-Mediated Human Contact** ● Virtual Reality ● Science Fiction Interfaces ● Teledildonics ● Relationship Ethics	READ: Clark, ch. 5-6.
8	***Midterm Presentations***	DUE: Interaction Proposal.

9	**Workshop: Advanced Electronics** • Sensor Kits • Motors • High Voltage Relays	READ: Clark, ch. 7-8.
	SPRING BREAK: No Class!	
10	**Smart Products** • Artificial Intelligence • Data Management and Display • Service and Connectivity • Value Offering	WATCH: Objectified (2009) [1h15m]. READ: Rams - 10 Principles of Good Design
11	**Workshop: Advanced Service Development** • Database Configuration • Application Programming Interface • User Management	
12	**Infrastructure and Sustainability** • Servers, Software, Libraries • Materials, Mechanics, Actuators • Longevity, Performance • Maintenance, Upgrades • Open Source Community • PCB and SMD Manufacturing • Environmental Impact	DUE: System Assignment.
13	**Evaluation** • User Testing • Service Debugging • Contingency Management **Iteration** • Additional Features • Optimization and Refinement • Production and Manufacturing	
14	**Workshop: Group Meetings** • Finalizing API connectivity. • Documentation Preparation.	
15	***Final Presentations***	DUE: Final Assignment.

Assignments

1. *Hardware Interface Assignment* **(20%)**
   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.

   Present your hardware interface as a 16x9 slide deck with as many visuals and as much descriptive text as possible to help communicate the functionality of your device. Submit your final presentation document as a PDF file via Blackboard.

2. *Interaction Proposal* **(20%)** **(Group)**
   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. This proposal should be preparation for the devices you intend to make for the final assignment.

   Present your interaction proposal as a 16x9 slide deck with as many visuals and as much descriptive text as possible to help communicate the functionality and experience of your interaction. Submit your final presentation document as a PDF file via Blackboard. Only one member of your team needs to submit.

3. *System Assignment* **(20%)** **(Group)**
   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. Including information about what input is received by your devices, the required hardware components for sensing, the database schema required for storage of sensed data, and the type of hardware components required for expressing physical output of interaction activity. This planning document should be preparation for the infrastructure needed to support the functionality of your devices being created for the final assignment.

   Present your system description as a 16x9 slide deck with as many visuals and as much descriptive text as possible to help communicate the functionality and technical requirements of your system. Submit your final presentation document as a PDF file via Blackboard. Only one member of your team needs to submit.

4. *Final Assignment* **(40%)** **(Group)**
   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.

   Document the functionality of your networked objects through well shot and edited video as well as still photos. Present your final assignment as a 16x9 slide deck with as many visuals and as much descriptive text as possible to help communicate the development process, functionality of your objects, and what future potential the devices could have as commercial quality products. Submit your final presentation document as a PDF file in a ZIP file with the rest of your documentation via Blackboard. Only one member of your team needs to submit.

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, policy.usc.edu/scientific-misconduct.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call
engemannshc.usc.edu/counseling
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org
Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP)
-213-740-9355 (WELL
https://studenthealth.usc.edu/sexual-assault/
 Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Relationship and Sexual Violence Prevention and Services provides immediate therapy services for situations related to gender- and power-based harm (e.g., sexual assault, domestic violence, stalking). (wording from the site)

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086
equity.usc.edu, titleix.usc.edu
Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

USC Policy Reporting to Title IX (213) 740-5086
https://policy.usc.edu/reporting-to-title-ix-student-misconduct/
The university encourages individuals to report prohibited conduct to the *Title IX Office*. Individuals can report to the university *Title IX Coordinator* in the *Office of Equity and Diversity.*

Bias Assessment Response and Support - (213) 740-2421
studentaffairs.usc.edu/bias-assessment-response-support
Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710
studentaffairs.usc.edu/ssa
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101
diversity.usc.edu
Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
dps.usc.edu, emergency.usc.edu
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call
dps.usc.edu
Non-emergency assistance or information.