AME 394 : Programming the Internet of Things
AME 598 : Scaling IoT Device Deployments

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Office hours: MW 12pm - 1pm or by appointment. Email is the best way; but text works too.
Class Repo: https://github.com/tejaswigowda/AME394Fall2019

Course Description:
With the proliferation of cheap and powerful microcontrollers System-on-Chips (SoC), it is becoming easier to deploy intelligence (with sensors and actuators) into the real-world. There are plethora of stand alone sensor devices (such as a pH sensor, moisture/light sensors) already on the market, but for the vision of IoT to be realized these devices must be able to communicate and be controlled over the Internet. This class focuses on the full stack needed to make any electronic device cloud compatible. At the end of this class students will be able to design IoT devices of intermediate complexity that can log data on to a cloud server. *In the grad version of this class emphasis is on building scalable server architectures that can support large deployments, as well as analytics. Grad students will do a semester long project that is worth 50% of their grade.*

Enrollment Requirements:
AME 240 (or equivalent digital circuits class/previous experience) needed. Programming experience necessary (AME 220, AME230 or equivalent) -- programming language not pertinent. Cannot be taken as one's first programming class.

Course Objectives:
By the end of the course students should be able to conceptualize an IoT consumer product and have the necessary skills to design and prototype and test such devices.

Student Learning Outcomes:
- *Set up and load Arduino programming environment.*
- *Arduino system programming.*
- *Server programming with Node.js (JavaScript).*
- *Gathering and analyzing sensor data with mongoDB.*
- *Controlling sensors and actuators via mobile/desktop apps.*

Assignments:
Assignments in this class will be submitted via a Github repository (You can use any other flavor of git as long as it supports private repos -- but first check with Instructor). There are 8 assignments spaced out throughout the semester. Some assignments will need demo in class. There will be an optional take-home final. More on that in "Grading" section.

Required Primary and Secondary Materials
1. A computer. Any Linux, Mac, Windows laptop/desktop will do. Mac Laptops can be checked out during class, if needed.
2. Atom editor: https://atom.io (or equivalent syntax highlighting editor).
3. AWS account (get student credits: https://aws.amazon.com/education/awseducate/)

Course Schedule:
MW 9:00am - 10:30am, unless it is a University holiday.

Grading, including grade scale

Assignment 1	*10 points*
Assignment 2	*10 points*
Assignment 3	*10 points*
Assignment 4	*10 points*
Assignment 5	*10 points*
Assignment 6	*10 points*
Assignment 7	*20 points*
Assignment 8	*20 points*
Final (take-home;optional)	*10 points*
Total	*110 points* (capped to 100)

Grad students has a semester long applied project for 50% of their grade. The assignments make-up the other 50%.

Grade Scale

98+	A+
93-97	A
90-92	A-
88-89	B+
83-87	B
80-82	B-
78-79	C+
70-77	C
60-69	D
0-59	E

Attendance Policy:

Attendance and participation for the duration of the class period is mandatory. If you have more than 3 absences (unexcused), your final grade will be lowered 1/3 grade for each subsequent absence (i.e. B to B-). You should notify me by email prior to absence if possible and provide doctor's note where applicable. Repeated tardiness and leaving class early will be recorded, and as a result, your final grade will be lowered. It is the student's responsibility to keep track of his/her absences.

Excused absences related to religious observances/practices in accord with ACD 304–04, "Accommodation for Religious Practices." Students may be excused for the observance of religious holidays. Students should notify the instructor at the beginning of the semester about the need to be absent from class due to religious observances. Students will be responsible for materials covered during their absence and should

consult with the instructor to arrange reasonable accommodation for missed exams or other required assignments.

Excused absences related to university sanctioned activities in accord with ACD 304–02, "Missed Classes Due to University-Sanctioned Activities." Students required to miss classes due to university sanctioned activities will not be counted absent. However, absence from class or examinations due to university-sanctioned activities does not relieve students from responsibility for any part of the course work required during the period of the absence. Students should inform the instructor early in the semester of upcoming scheduled absences and immediately upon learning of unscheduled required class absences. Reasonable accommodation to make up missed exams or other required assignments will be made. Consult the instructor BEFORE the absence to arrange for this accommodation.

Line-of-duty absence and missed assignment policy:
A student who is a member of the National Guard, Reserve, or other U.S. Armed Forces branch who misses classes, assignments or examinations due to line-of-duty responsibilities, shall have the opportunity to make up the coursework in accordance with SSM 20-18 Accommodating Active Duty Military Personnel. This accommodation also applies to spouses who are the guardian of minor children during line-of -duty activities. This policy does not excuse students from course responsibilities during their absence. Students should first notify the Pat Tillman Veterans Center of their activation and then the instructor to discuss options.

Instructor Absence Policy:
Students should wait for an absent instructor 15 minutes in class sessions of 90 minutes or less, and 30 minutes for those lasting more than 90 minutes, unless directed otherwise by someone from the academic unit.

Academic Integrity and Student Honor Code:
Besides academic performance, students should exhibit the qualities of honesty and integrity. Every student is expected to produce his/her original, independent work. Any student whose work indicates a violation of the ASU Academic Misconduct Policy including cheating, plagiarism, and dishonesty will be subject to disciplinary action. Plagiarism is defined as deliberately passing off someone else's words or ideas as your own. 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. Arizona State University and the Herberger Institute for Design and the Arts expect the highest standards of academic integrity from all students. Failure to meet these standards may result in suspension or expulsion from the university or other sanctions as specified in the ASU Student Academic Integrity Policy (http://provost.asu.edu/academicintegrity), "[e]ach student must act with honesty and integrity, and must respect the rights of others in carrying out all academic assignments." This policy also defines academic dishonesty and sets a process for faculty members and colleges to sanction dishonesty. Violations of this policy fall into five broad areas that include but are not limited to:

- Cheating on an academic evaluation or assignments
- Plagiarizing
- Academic deceit, such as fabricating data or information

- Aiding Academic Integrity Policy violations and inappropriately collaborating
- Falsifying academic records

I sanction any incidents of academic dishonesty in my courses using University and HIDA guidelines. Should you have any question about whether or not something falls subject to this clause, feel free to contact me or review the university policy on academic integrity at the above link. Per ASU policy, a student may not avoid the consequences of academic dishonesty by withdrawing from a course, and may be placed back in the course in order to face sanctions resulting from academic integrity violations. You are responsible for abiding by this policy.

Copyright:
Students must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement. A statement that the course content, including lectures and other handouts, is copyrighted material. Students may not share outside the class, upload, sell, or distribute course content or notes taken during the conduct of the course (see ACD 304–06, "Commercial Note Taking Services" for more information). THIS CONTENT IS PROTECTED AND MAY NOT BE SHARED, UPLOADED, SOLD, OR DISTRIBUTED.

Student Conduct:
ASU adheres to a university-wide Student Code of Conduct. The philosophy behind this policy states: The aim of education is the intellectual, personal, social, and ethical development of the individual. The educational process is ideally conducted in an environment that encourages reasoned discourse, intellectual honesty, openness to constructive change and respect for the rights of all individuals. Self-discipline and a respect for the rights of others in the university community are necessary for the fulfillment of such goals. The Student Code of Conduct is designed to promote this environment at each of the state universities. You are expected to treat your instructor and your fellow classmates with respect and kindness. In all correspondence and in Discussion Board postings, you should show respect for the viewpoints of others who may disagree with you or see things from a different perspective. Criticizing, ridiculing, insulting, or belittling others will not be accepted. Keep in mind that electronic communications do not have the advantage of nonverbal cues that are so much a part of interpersonal communication. Humor or satire can sometimes be misinterpreted in strictly electronic communication forums.

Threatening or disruptive behavior:
Self -discipline and a respect for the rights of others in the classroom or studio and university community are necessary for a conducive learning and teaching environment. Threatening or violent behavior will result in the administrative withdrawal of the student from the class.
Disruptive behavior may result in the removal of the student from the class. Threatening, violent, or disruptive behavior will not be tolerated in this class, and will be handled in accordance with ASU policy (SSM 104-02). For more information please visit:
https://eoss.asu.edu/dos/srr/PoliciesAndProcedures and
https://eoss.asu.edu/dos/safety/ThreateningBehavior.

Classroom Behavior (Technology Usage):
It is encouraged that you bring technology (cell phones, tablets and laptops) to class to help you take notes and do research, however please turn off cell phone ringers and do not use your phone to make personal calls in class or use any technology to use social media in class. Do not answer your phone in class. If you believe you are receiving an emergency call, please step

outside to take it.

Withdrawal:
If you are unable to complete the course, it is your responsibility to arrange for withdrawal from the class. You will not be automatically withdrawn and unless you are officially withdrawn from the course you will receive a final grade based upon the total points you have earned for the semester. Students are required to pay all tuition and fees for any registered course unless enrollment is officially cancelled during the 100% refund period. Please visit the Academic Calendar to review the withdrawal deadlines for this semester. For more information on Drop/Add and Withdrawal visit: https://students.asu.edu/drop-add

Special Accommodations:
Your instructor is willing to make any reasonable adaptations for limitations due to any disability documented with the DRC, including learning disabilities. Please contact the instructor during office hours or by appointment to discuss any special needs you may have. You must contact the Disability Resource Center to process the paperwork for special course accommodations. To request academic accommodations due to a disability, please contact the ASU Disability Resource Center (http://www.asu.edu/studentaffairs/ed/drc/# ; Phone: (480) 965-1234; TDD: (480) 965-9000). This is a very important step as accommodations may be difficult to make retroactively.   If you have a letter from their office indicating that you have a disability which requires academic accommodations, in order to assure that you receive your accommodations in a timely manner, please present this documentation to me as soon as possible so that your needs can be addressed effectively.

Disability Support Services:
Students with disabilities must have an equally effective and equivalent educational opportunity as those students without disabilities. Students experiencing difficulty accessing course materials because of a disability are expected to contact the course instructor so that a solution can be found that provides all students equal access to course materials and technology. Qualified students with disabilities who will require disability accommodations in this class are encouraged to make their requests to me at the beginning of the semester either during office hours or by appointment. It may be difficult to make accommodations retroactively. **Note:** Prior to receiving disability accommodations, verification of eligibility from the Disability Resource Center (DRC) is required. Disability information is confidential.

Information for Students with Disabilities:
Students who feel they will need disability accommodations in this class but have not registered with the Disability Resource Center (DRC) should contact DRC immediately. Students should contact the Disability Resource Center on the campus that your class is being held. Campus-specific location and contact information can be found on the DRC website. DRC offices are open 8 a.m. to 5 p.m. Monday – Friday. Check the DRC website for eligibility and documentation policies (https://eoss.asu.edu/drc)

Policy on Sexual Discrimination:
Policy on sexual discrimination as described in ACD 401, "Prohibition Against Discrimination, Harassment, and Retaliation", including the fact that the instructor is a mandated reporter and therefore obligated to report any information regarding alleged acts of sexual discrimination. Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits discrimination, harassment,

and retaliation by employees, students, contractors, or agents of the university based on any protected status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information. As an employee of ASU, I am a mandated reporter and obligated to report instances of reported or suspected incidences of sexual harassment.

Student Rights and Responsibilities:
Students must abide by all the requirements stated in this syllabus. In addition, all students should be aware of their Rights and Responsibilities at Arizona State University and abide by the ASU Student Honor Code.

Student Services & Resources:
You will find a list of student resources at: https://eoss.asu.edu/resources
Resources included are advisement, registration, financial aid, disability services, counseling, tutoring, library, and more.

Non-emergency Student of Concern process:
If you are concerned for a fellow student's well-being, please review the information and complete the form at:
https://herbergerinstitute.asu.edu/resources/new-students/student-of-concern-process
FOR EMERGENCIES CALL 911. (Be prepared with the physical address of the location.)

Academic Calendar and Important Dates:
The academic calendar can be found here: https://students.asu.edu/academic-calendar

Subject to change:
The Instructor reserves the right to change portions of this syllabus (assignments, deadlines etc.) by verbal instructions during scheduled class time. The student is responsible for noting changes and acting accordingly. Grading and absence policies are not subject to change.

Computer, Internet, and Electronic Communications Policy:
http://www.asu.edu/aad/manuals/acd/acd125.html