Mobile And Ubiquitous Computing (MUC) Georgia Tech: CS4605

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Office Hours are listed in the Canvas Zoom Section

This document describes the general guidelines for and an overview of the MUC class at Georgia Tech. Use this as a reference throughout the semester. Mentors, TAs, and instructors will assist you in case there are any questions or concerns.

General Course Information

Mobile and Ubiquitous Computing are often referred to as the third generation of computing where users continuously interact not with just one but many computing devices. The latter are thereby embedded into the everyday environment of their users in such a way that users—ultimately—will not even be aware of their interaction with computers. In this class students will explore the third generation of computing (and beyond) that enables such continuous and especially ubiquitous computing. Students will learn about the technical foundations of sensing and computing that are the prerequisites for smooth and seamless interactions in a continuous manner. Based on these foundations students will work on practical projects that address cutting-edge real-world problems and will develop innovative solutions to it through means of mobile and ubiquitous computing. Beyond providing a solid technical foundation for mobile and ubiquitous computing the course will focus on aspects of how to actually make, that is build and deploy, mobile and ubiquitous computing systems.

Prerequisites

Formal Prerequisites

Undergraduate Semester level CS 2110 Minimum Grade of C or Undergraduate Semester level CS 2261 Minimum Grade of C.

Mandatory Requirement:

Before students start working on their projects they will need to provide documentation regarding successful completion of CITI IRB Training — specifically the following courses need to be completed (or refreshed):

- Responsible Conduct of Research (1 — Basic Course)
- Human Research (Group 2 Social / Behavioral Investigators and Key Personnel — 1 Basic Course)

Students will have three weeks (at the beginning of the semester) to complete the IRB training and submit their certificates (PDF) through Canvas (see below).

The CITI IRB online training can be accessed through:

- http://researchintegrity.gatech.edu/about-irb/irb-required-trainingLinks to an external site.

and should not take longer than two hours to complete. Students who already have valid, that is not expired, certificates for the aforementioned courses can submit their certificates directly.

Important: Without valid CITI certification students might not be able to work on their projects and as such will not be able to fulfill the requirements of all project-related assignments.

Recommendations

Students shall have a general interest in the subject area of mobile, ubiquitous, pervasive, and wearable computing. Curiosity and eagerness to not only learn about (and understand) the field of mobile and ubiquitous computing, but also to make and experiment in practical, hands-on sessions are of benefit for enjoying the course.

Existing programming skills are of benefit (for mobile platforms, and/or for lower-level device control; for web platforms). For some projects, experience with data analysis frameworks such as Python, R, or Matlab is of benefit. Other projects will build on foundations of electrical engineering and manufacturing.

Final Schedule and Assignment Details

The schedule and course details related to assignments, quizzes, deliverables will be posted on Canvas. Adjustments may become necessary once enrollment details are settled and depending.

Queries Related to Course

Please send your queries related to course work through Ed Discussion. That way your request will be visible to all and everyone will benefit from the response from the TAs / instructor and potential follow-up conversations.

Instructors

Clint Zeagler
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Office

TSRB 219

Office hours

Virtually

Learning Management System (LMS) — Canvas, Zoom, Ed

Course updates, readings assignments, calendar and any other official information are distributed through the course CANVAS website. Please visit this site frequently as all formal communication will go through it. Students who have not used Canvas before are asked to familiarize themselves with the system. On Canvas the course can be found under:

Mobile and Ubiquitous Computing

We will also use Ed Discussions as the central discussion platform for this class. Students will automatically be enrolled and Ed is accessible through Canvas.

Course Objectives and Outcomes

This course aims to provide students with an overview and the foundations of the research field of the third generation of computing (and beyond). Through active, practical explorations the course aims to provide an appreciation of the practical potential the field offers for researchers and practitioners.

Course Outline

Some Modules will be skipped in summer as requirements but will be available for you to view and learn at your leisure.

- Overview of the field and past, present, and future of Ubiquitous Computing
- Prototyping mobile and ubiquitous computing technology
- Sensors and sensor data analysis including applied machine learning
- Eye and gesture based interaction
- Evaluation of mobile and ubiquitous computing systems
- Smart homes and Infrastructure Mediated Sensing
- Overview of wearable computing: Challenges and design processes
- Head mounted displays
- Location technologies and how to use them
- Privacy in mobile and ubiquitous computing
- Context aware computing
- Real world applications: implications and challenges

Intended Outcomes

Knowledge

Upon successful completion of the course students will be able to:

- Build on the foundations of mobile and ubiquitous computing to develop practical applications;
- Discern the capabilities of different components of mobile and ubiquitous computing, which allows for informed decisions on the usefulness and usability of resulting interface and potential technical challenges;
- Exploit the potential of mobile and ubiquitous computing techniques for real-world applications.

Skills

Through active course participation the students will gain:

- The ability to appreciate and analyze the foundations of the third generation of computing (Mobile and Ubiquitous Computing)
- The ability to use methods of mobile and ubiquitous computing in innovative, real-world practical applications.

Course Logistics

Class Participation & Exercises

As mentioned above this class lives from active student participation. As such, students need to be well prepared and complete assignments in a timely manor. Do not expect to simply “catch up” on things in class.

Class material is structured into 13 topic blocks, 10 of which will be covered (roughly) by one week, i.e., two class sessions, each (the other three modules are optional for summer and may be covered at your leisure). Students will need to watch prerecorded instructional videos before class and catch up on provided readings. For most topic blocks we will have practical exercises that students will work on either individually or, more commonly, in teams. TAs and instructor will guide and support those activities.

To structure and guide discussions the instructional team will post questions online. Students are required to actively participate by, for example, posting questions and problems themselves. Furthermore, participation will be monitored.

Projects

Students will work in groups on one practical project (each) throughout the whole semester. Each project will be overseen by a mentor. Students will organize themselves or will be organized into groups of at least four and define the specifics of their project. Teaching assistants will support students during the project definition phase to make sure all students will be able to work on a project they want, find interesting, and lead to achievable results. All projects need to be discussed with and approved by TAs or the instructor. Part of these discussions is an adjustment of complexity (by the TAs in discussion with project teams) that will aim at class appropriate projects — that are neither trivial nor unachievable. Examples of successful projects from previous semesters will be shared with the students.

Process

Students will form project teams of at least four. Based on the initial readings, the example projects from previous years, and on research areas of and suggestions from mentors, teams will start exploring the wider area of mobile and ubiquitous computing in order to get an understanding of what interests them and what direction their project could go. TAs will play an active role in this process and will help students find their passion. TAs will also give feedback on the intended complexity of a project — ideally it should be challenging to push students out of their comfort zone and thus to enable learning, whilst at the same time not being unrealistically over-ambitious. This process

will be iterative and requires substantial work, but —if done well— it will pay off with a project the team will be passionate about, which will lead to mastery of the field of mobile and ubiquitous computing.

Information on Team Formation will be detailed via canvas announcement

Project Teams

Students are responsible for forming teams of at least four members. Students are encouraged to enter some basic information about their background, experience, and motivation / interests into a class-public spreadsheet, which will make the project forming process easier. The link to the document is given on Canvas.

All members of a project team will fill a team contract in which they formulate their goals and objectives, their anticipated roles within the project, and their overall ambitions. This contract is a required deliverable (pass / fail grade) and will be used throughout the project to keep track of project progress and especially the individual contributions of all team members. See grading guidelines below.

Project Deliverables

Schedule for deliverables can be found via canvas assignments or viewing the canvas calendar.

Projects have the following deliverables that will be graded (totaling to up to 45% of the overall grade):

- Team contract — has to be signed by all team members and is binding — will be used for progress evaluation throughout the semester
- Project proposal and project teaser video [10% of overall grade]
- Halftime project update (report, presentation and discussion – details to be specified) [10% of overall grade]
- Project demo (end of project) [10% of overall grade]
- Project report [15% of overall grade].

Guidelines for writing proposals, report, demo, slide and video presentations are available on Canvas (Files section).

Grading (Group Components)

For group assignments and project deliverables every team will submit one copy of the assignment / deliverable to Canvas. Every group assignment must include a statement of the individual team members' contributions to the assignment. TAs and instructor will

regularly discuss group participation with every team. All members of a project team will receive the same grade for the main portion of a deliverable. This is a general rule unless in extreme, well justified cases that will need to be discussed with TAs, mentor, and instructor. In case of unequal contributions to a group assignment the grading team will reduce grades on a case by case basis. TAs will grade the project components using a rubric that corresponds to the guidelines for students as mentioned above.

Two team evaluation surveys will be conducted throughout the semester (at about half time, and at the end of the semester) in which each team member assesses the contributions of themselves and all their team members. For the first evaluation a total of three stars can be given to each team member. The median of the star evaluation received by a team member determines a scaling factor for all (!) group and project deliverables. If the median is 3 stars then no scaling is applied (scaling factor of 1). If it is less than 3 stars then a scaling factor of <1 is applied to all (!) group and project deliverables – effectively lowering grades for non-participating team members. The second team survey is based on a four star ranking and follows the same logic as the first one. However, team members who underperformed in the first half of the semester can make up for this in the second half. If they really improve their contributions then they can earn up to 4 stars and as such eliminate the down-scaling from the first team survey. Note that no upscaling (extra credit) will be implemented.

To clarify: The expectation is that each team member contributes such that the workload is equally shared in a fair way. This has been true for the vast (!) majority of projects in previous semesters and down-scaling individual grades has been the rare exception. Yet, this instrument of team evaluation and scaling of grades has proved to be very effective to ensure fair sharing of workload.

Plagiarism Quiz

Students will have to take a quiz on plagiarism in order to demonstrate that they have understood the academic code of conduct and are able to work on the class assignments and project components according to good academic practice. Details of the academic honor code and pointers to background information are given below.

The plagiarism quiz is available online on Canvas. Students will have an infinite number of attempts but will have to answer all questions correctly in order to be able to proceed with the class (pass / fail). Deadline for successful completion of the plagiarism quiz:

Schedule

See calendar. Note that the schedule is subject to (minor) changes. So, please check the site frequently.

Exam

The final exam will be administered as take-home exam and students can work on it during the **week commencing.**

The exam will contribute 10% of the overall grade**.** All covered materials incl. video lectures, readings, activities, and project components are relevant for the exam. This is an individualized assessment and no cooperation is allowed. Strict plagiarism / cheating checking will be implemented.

Grading & Evaluation

Grading Scheme

Overall course grading is based on the Georgia Tech letter grading system (A through F) The various components of the course contribute to the overall grade as follows:

Contributions to Overall Grade component	Max. grade contribution
Class participation: Readings Discussions in-class exercises Graded quizzes 1 graded group exercise	40%
Project deliverables: proposal + video [10%] Halftime update [10%] final presentation and demo [10%] final report [15%])	50%
Exam	10%
Total	100%

TAs will use detailed grading schemes for each component, which ensures fair and objective grading.

Calculating Final Grades

Each component (as described above) will be graded separately accumulating points towards the overall course grade. The final, overall course grade is then calculated as follows:

Accumulated percentage	grade
90-100%	A
80-89%	B
70-79%	C
60-69%	D
<60%	Not passing

Learning Resources

Textbook

We will make use of the following textbook:

Krumm, J. (2009). Ubiquitous Computing Fundamentals (1st ed.). Chapman & Hall/CRC. http://www.amazon.com/Ubiquitous-Computing-Fundamentals-John-Krumm/dp/1420093606Links to an external site.

This semester we will put more focus on scientific articles rather than on a single textbook. The majority of the readings will be provided through the course website. For some assignments — and of course for the project work — students are expected to conduct their own, independent literature research (and reading).

Hardware Kit

Some of the exercises will require rapid prototyping with microcontrollers, sensors, and common items like safety glasses and straws. We will attempt to keep the cost for these

items under $45 and will provide links to places that the hardware can be purchased. In some instances, we will make group purchases to reduce the cost and students can purchase the hardware through the course.

For the prototyping exercise, as well as for general prototyping activities, we will use the following kit, which students are asked to purchase at the beginning of the class:ou

Name	ELEGOO UNO Project Super Starter Kit with Tutorial and UNO R3 Compatible with Arduino IDE
Description	Starter kit for Arduino-like prototyping containing breadboard, jumper cables, selection of sensors and actuators, power supply, tutorial etc. Compatible with Arduino UNO R3, MEGA 2560 R3, NANO.
Purchasing option	https://tinyurl.com/MUChardwareLinks to an external site. (Amazon; likely to be available elsewhere as well)
Approximate cost	$45
Note	If students already have access to similar hardware, then there is no need to purchase. Yet, in-class activities and potentially project work is based on access to hardware like this.

Readings

Students are expected to read the required readings prior to the session when they are due. Class exercises and discussions and any examinations will assume familiarity with any reading material or videos as distributed through the course website. All the readings and when they are due will be posted on the Canvas.

Course Policies

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563
or http://disabilityservices.gatech.edu/Links to an external site., as soon as possible, to

make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail the head TA and the professor as soon as possible in order to set up a time to discuss your learning needs.

Anti-Harassment Policy

We will implement a strict anti-harassment, zero tolerance policy in line with the institution's general anti harassment policy as it is defined here:

http://titleix.gatech.edu/anti-harassment-policyLinks to an external site.

Honor Code

Students are expected to follow the Georgia Tech Honor Code, available at https://osi.gatech.edu/students/honor-codeLinks to an external site., including but not limited to the section on plagiarism (see below). Thanks for reading this far! We love it when students read the syllabus. If you're reading this, please send a private email message to the instruction team (Professor and Head TA; include MUC in the subject line) with a picture of a Ubicomp-related meme in it to receive a bonus toward extra credit. Please don't tell your classmates about this little Easter egg though – we want them to discover it on their own! This offer expires two weeks after class started (May 29).

Group Work

Group work is explicitly encouraged for the project students will be working on throughout the course. Project reports will be written in groups (all members of a team submit the same report and receive the same grade). Group discussions in the classroom will be fostered — at appropriate times — throughout the course.

Academic Misconduct: Plagiarism & Cheating

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit

ttp://www.catalog.gatech.edu/policies/honor-codeLinks to an external site. or http:// www.catalog.gatech.edu/rules/18Links to an external site..
Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations. Instructor(s) and TAs will implement a zero-tolerance policy on plagiarism & cheating. This policy is based on the Code of Conduct as

cited by the Georgia Tech Honor Code. As per the Georgia Tech honor code, plagiarism is defined as “Submission of material that is wholly or substantially identical to that created or published by another person, without adequate credit notations indicating authorship (plagiarism);“ [https://osi.gatech.edu/students/honor-codeLinks to an external site.] Plagiarism or any other kind of cheating as defined by the Georgia Tech Code of Conduct will result in failing the course. As a reminder it is worth noting that class exercises will be treated the same way as any other material that shall be submitted by students. Signing up for anyone else other than oneself is considered forgery and counts as cheating for both parties involved.

Submission Policy

All work needs to be submitted through Canvas using the Assignments feature. For group assignments only one submission per team has to be made. We will use the group feature in Canvas as soon as project teams are finalized. TAs will assist students with submissions.

Acceptable format for written reports is PDF (only).

Acceptable format for slides submission (not presentation) is PDF (only). Use your favorite presentation software for the presentation in class but please export slides to PDF for submission to Canvas. Alternatively, students may submit links to online resources (such as Google Slides) that can be used for in-class presentations.

When submitting videos, please use standard codecs that can be played on either Mac or Windows machines (test before). However, it is strongly encouraged to rather provide links to online resources (such as youtube) were the videos have been uploaded.

Extensions, Late Assignments, & Re-Scheduled / Missed Exams

Late assignments will not be accepted without a suitable excuse (doctor’s note, police report, etc.). Note that extenuating circumstances have to be brought to the instructor’s attention **before the fact** — through the regular channels, that is *do not send doctor’s notes to the instructor or TAs* but rather send them to student services who will get in touch with the instructor. Late submission without evidence of extenuating circumstances will result in zero marks for the particular component. In case of a planned absence (e.g., for interviews) students are required to communicate this well in advance such that the team and instructor can discuss options. In case of unplanned yet excused absences (illness etc.) instructor and team will discuss options on how a student can make up what has been missed. Missing a quiz — without evidence of extenuating circumstances as defined before — will result in failing the quiz and thus zero marks for this component.

However, in case of extenuating circumstances as defined before quizzes / exams may be rescheduled or other accommodations discussed— according to the official Gatech policy and procedure. In any case it is strongly advised to consult with the instructor well in advance (at least one week notice) should extenuating circumstances result in extraordinary difficulties with the schedule. Within the constraints of fair treatment and within reason we will always aim for finding a satisfying solution.