COMP 590/790-136
Ubiquitous Sensing and Intelligent Systems

Bulletin Description

This course discusses the literature on ubiquitous systems – which includes research papers on ubiquitous systems and applications; mobile and embedded systems; sensing, control and actuation systems; autonomous and intelligent systems; and cyber-physical systems.

Permission of the instructor is required to enroll into the course. This course has variable content and may be taken multiple times for credit.

General Course Info

Term: Fall 2022
Department: COMP
Course Number: 590/790
Section Number: 136
Time: M/W 9:30 AM – 10:45 AM
Location: TBD
Website: https://eisys.web.unc.edu/

Instructor Info

Name: Prof. Shahriar Nirjon
Office: FB 212
Email: nirjon@cs.unc.edu
Phone: 919-590-6039
Web: http://www.cs.unc.edu/~nirjon/
Office Hours: By email appointments (typically before/after the class).

Teaching Assistants

Kedrian James (kedjames@live.unc.edu)

Textbooks and Resources

There are no specific textbooks for this course. The course uses research papers from top-tier conferences and journals as well as online tutorials on technologies related to the course. Course materials such as slides and lab descriptions will be made available to the students through the course webpage and/or Sakai.

Each student must bring his/her own lab supplies. This includes an Amazon Alexa device. There are a limited number of Amazon Alexa devices that a student can borrow for a semester. The emulator (free and online) is also okay for this class.

Course Description

The goal of this course is to learn about the advances in ubiquitous systems. The course content mainly includes research papers on ubiquitous systems, mobile and embedded systems, sensing, control and actuation systems, autonomous and intelligent systems and cyber-physical systems. Each offering of this
course has a different flavor. In this semester, we will study motion, audio, image, and radio sensing systems. We will also learn how to program Amazon Alexa devices to develop a voice-enabled application. There are several activities in the course:

- Lecture/Presentation: The instructor or the TA will deliver some of the earlier lectures. Each student will present a research paper (the actual number depends on the number of enrolled students and availability of time slots).
- Programming Practice/Assignments: There will be some lab classes where each student will implement simple applications. Each lab exercise will start in the class, and the student will have about a week to finish and submit it.
- Midterm Exam: An open-book exam on the research papers covered in the class.
- Final Exam: An open-book exam on all the research papers covered in the class.

**Target Audience**

COMP 590-136 and COMP 790-136 versions of this course are offered simultaneously. Computer science graduate students of all levels are the target audience of COMP 790. It satisfies the “systems” breadth requirement for Ph.D. The scope of this course is broader than most graduate level courses offered in the computer science department. An MS or Ph.D. student should be able to relate some part of the course contents to their own research area and will be able to combine their expert knowledge with the rest of the course to show a broader impact of his research in solving real world problems. COMP 590 targets undergraduate students who want to pursue research-focused higher education or want to acquire special skills such as programming special-purpose embedded systems. Typically, most of the COMP 590 students of this course are in their junior or senior years.

**Prerequisites**

This course does not have any formal prerequisites. In general, required background knowledge to understand a topic will be covered in class. However, it is expected that students have a basic understanding of embedded systems and have experience in some programming language such as python, node.js, and web APIs. Typically, most of the COMP 590 students of this course are in their junior or senior years.

**Goals and Key Learning Objectives**

Students will learn key technologies and concepts that are driving the ongoing revolution of ubiquitous systems. Students will learn to design an end-to-end system and will be familiar with existing tools to implement the system.

**Course Requirements**

In the lecture/presentation classes, students will participate in the discussion. Students are required to read the assigned papers for the class and submit the corresponding home assignments. During lab exercises, students will develop a small application with the help of the instructor or the TA. Each student is responsible for bringing their own lab supplies.

**Key Dates**

- Home assignments are due prior to the beginning of each class.
- Presentation slides should be shared with the instructor at least 3 days before the class so that the instructor can provide his feedbacks.
• Midterm exam will be in late September or early October.
• Final exam will be on the scheduled date by the university.

**Grading Criteria**

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Programming Practice</td>
<td>10</td>
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<tr>
<td>Programming Assignments</td>
<td>40</td>
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<tr>
<td>Presentation/Class Activity</td>
<td>20</td>
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<tr>
<td>Mid-term Exam</td>
<td>15</td>
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<tr>
<td>Final Exam</td>
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**Course Policies**

• Attendance is mandatory.
• Late submissions of assignments and labs are not allowed unless an extension is given beforehand.
• Student presentations cannot be rescheduled.

**Honor Code**

Students are allowed to collaborate on labs, assignments, and presentations to brainstorm together and challenge each other. Books and online resources are allowed for learning and for reference purposes. Any written material, software and hardware developed by a student must be their own contribution. A student must cite any work that is not their own but has been used in the project or assignments.

**Course Schedule (always check course webpage for an up-to-date schedule)**

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<thead>
<tr>
<th>Date</th>
<th>Monday</th>
<th>Wednesday</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Lecture + Practice Lab 1</td>
<td>Programming Assignment 1</td>
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<tr>
<td>Week 2</td>
<td>Presentation 1</td>
<td>Practice Lab 2</td>
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<tr>
<td>Week 3</td>
<td>Presentation 2</td>
<td>Programming Assignment 2</td>
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<tr>
<td>Week 4</td>
<td>Presentation 3</td>
<td>Practice Lab 3</td>
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<tr>
<td>Week 5</td>
<td>Presentation 4</td>
<td>Programming Assignment 3</td>
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<tr>
<td>Week 6</td>
<td>Presentation 5</td>
<td>Practice Lab 4</td>
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<td>Week 7</td>
<td>Presentation 6</td>
<td>Programming Assignment 4</td>
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<tr>
<td>Week 8</td>
<td>Presentation 7</td>
<td>Practice Lab 5</td>
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<td>Week 9</td>
<td>Presentation 8</td>
<td>Programming Assignment 5</td>
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<tr>
<td>Week 10</td>
<td>Presentation 9</td>
<td>Practice Lab 6</td>
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<td>Week 11</td>
<td>Presentation 10</td>
<td>Programming Assignment 6</td>
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<td>Week 12</td>
<td>Presentation 11</td>
<td>Project Part 1</td>
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<tr>
<td>Week 13</td>
<td>Presentation 12</td>
<td>Project Part 2</td>
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<td>Week 14</td>
<td>Presentation 13</td>
<td>Project Submission</td>
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**TBD** Final Exam

**Disclaimer**

The professor reserves to right to make changes to the syllabus and the schedule. These changes will be announced as early as possible.