ECE 581A4 Global Navigation Satellite System Receivers
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Course Description:
The course covers important aspects of software-based Global Positioning System (GPS) receivers, including GPS signal structure, radio frequency front end design, GPS signal acquisition and tracking methods and algorithms, and navigation data extraction using software digital signal processing implementations.

Objectives:
At the completion of this course, the student will be able to:
1. Apply knowledge and skills acquired from calculus, signals and systems, circuits, and electromagnetics to the analysis of satellite navigation signals and receiver signal processing.
2. Simulate GPS code and signal generations in Matlab and use the simulated signals in algorithm performance analysis.
3. Understand each stage of a navigation satellite system receiver radio frequency front end functions.
4. Design and implement navigation satellite receiver signal processing algorithms to acquire, refine, track, and decode GPS signals.
5. Analyze receiver signal processing algorithm performances.
6. Analyze error sources in receiver signal processing and design methodologies to minimize these errors.

Course outline:
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<th>Overview</th>
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<td>Overview of global navigation satellite systems (GNSS)</td>
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<td>GPS signal structure, code generation, and properties</td>
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<td>Wk4-5</td>
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Textbook/References

Prerequisite: ECE 312

Student Experiences
This is a lecture-based course where students will be exposed to fundamentals and latest development in global navigation satellite systems receivers. The first part of this course is more conceptual while the second part is more algorithm-oriented. There will be several homework assignments during the first 5 weeks. For the remaining semester, students will be given 6 project assignments and one final project to practice concept and techniques taught in lectures. Each student will build a software receiver function library based on these assignments. MatLab is the preferred language for the assignments, although students have the option to use Java, C++, C.

You will NOT turn in any homework assignments. You do the homework so you can stay on track with the class. You will have to turn in your programming assignments. I will only accept programs that can execute. Your programs should be well documented and organized in appropriate hierarchy folders.

Grading Policy:
- Projects: 60%
- Midterm Exam: 10%
- Final Project: 30%
- Total: 100%