

## ***MAE 415 -- Course Improvement***

The Sibley School's paradigm for course improvement is based on three components.

- A statement of the course's *Goals*.
- *Assessment procedures* for determining how well the goals are being met.
- *Improvement procedures* for improving the course using the assessment results.

The sections below summarize each component for MAE nnn.

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### **GOALS**

Summarize here, in bulleted form, the goals (aims, objectives – generally <10 in number) of the course. *For example:*

On completion of the course, students should ...

1. Be able to use different coordinate systems and to transform vectors between coordinate systems (A, K)
2. Be able to use a GPS receiver development system (B, K)
3. Understand orbital mechanics at the level of being able to calculate GPS satellite positions from the navigation message ephemerides (A)
4. Know the code and phase observables and be able to demonstrate that the receiver clock offset is independent of receiver channel (B, E)
5. Be able to calculate the navigation solution and determine the accuracy (C,E)
6. Understand the concept of dilution of precision and be able to create situations that minimize and maximize dilution of precision.(B, E)
7. Know the sources of error for a GPS receiver and be able to recognize their presence in GPS data (B, E)
8. Be able to implement a design solution to a GPS application or problem (A, B, C, E, G, J, K)
9. Know the significance of GPS to our technical infrastructure and the social, political, and the ethical implications of GPS in a world balancing the needs of privacy, security, and safety (F, G, I, J)

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### **ASSESSMENT PROCEDURES**

Summarize here, in bulleted form, the means used to determine how well the course is meeting its goals. *For example:*

- Each student's knowledge of fundamental principles is assessed by evaluating their performance in laboratory and grading their laboratory reports, prelab, and homework.
- Ability to achieve specific measurable goals such as determining the receiver location, coordinate transformations, error mitigation, and exercising receiver functions to determine the observables are assessed through design problems in laboratory.
- The ability to communicate is determined through their laboratory reports and a final project report.
- Each student's competence in analyzing problems is assessed by open-ended exam questions, and by short design problems assigned as pre-laboratory exercises
- Student competence in synthesizing the course material to achieve design goals through an open-ended design project is assessed through their final project report.

## IMPROVEMENT PROCEDURES

Every offering of MAE 415 GPS:Theory and Design requires continuous improvement because the subject is continuously changing. The improvements fall into two categories: improvements in delivery of material and changes in course content. During the most recent offering the laboratory equipment consisting of GPS receiver design kits was replaced with PCI bus compatible hardware and the GUI was redesigned to make the navigation message and GSP observables more accessible. In addition three new lectures on Global Navigation Satellite Systems (including GPS modernization and Galileo), ethical and privacy issues in the use of GPS, police use and mis-use of GPS, and future changes in signal/code structure.

Assessment of improvements is conducted through student course evaluations, an end-of-the-semester meeting of the course staff, and weekly TA meetings to address student progress in the initial design problem of creating a standard GPS receiver.