Estimation theory provides a means of calculating estimates of quantities based on observations of physical systems. The objective of the class is to give the student an understanding of estimation theory and its application. The course will include a derivation of the equations used in estimation, and a computer project in which the equations will be applied. The computer project will involve a simulated satellite orbit determination problem. Previous course work or knowledge in orbit determination or satellite orbit theory is not required. The outline of the course topics is as follows.

1. Linear Algebra
2. Least Squares Fits
   - Unweighted and weighted
   - Normal equations
   - Geometric derivation of normal equations
3. Dynamic Systems
   - State variables
   - Equations of state
   - Observation state relation
4. Linearization
   - Equations of state
   - Observation state relation
   - State solution: state transition matrix
   - Properties of state transition matrix
   - Linear equations
5. Batch Least Squares Estimation
   - Without apriori estimate
   - With apriori estimate
   - Shifting apriori estimate
   - Computational algorithm
6. Sequential (Kalman) Estimation
   - Derivation from batch equations
   - Computational algorithm
   - Extended sequential
7. Random Variables
8. Linear Unbiased Minimum Variance Estimate
   - Without apriori estimate
   - With apriori estimate
9. Minimum Norm Estimate (m < n)
10. Probability Ellipses
11. Maximum Likelihood Estimate
12. Alternate Way To Propagate Covariance
13. Observability
14. Process Noise
15. Other topics, depending on remaining time.

GRADING: Homework 10%, Three exams 20% each, Class Project 30%

* The class project replaces the final exam. The project will be due Monday, May 16, at 4pm.
* The class will fill out a course/instructor evaluation form on the next to last class day.
* Friday, January 21 is the last day of the official add/drop period. After this date, changes in registration require the approval of the department chair and usually the student’s dean.
* The University of Texas at Austin provides upon request appropriate academic adjustments for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4641 TDD or the Cockrell School of Engineering Director of Students with Disabilities at 471-4321.