Highlights of other topics of as time/interest permits (e.g. set-valued & event-triggered estimation; negative & soft data fusion, active sensing and decision-making; intro to PHD/FISST; GraphSLAM for localization; extended object tracking).

Students will complete programming projects related to target tracking, vehicle navigation, localization, control, and other applications connected to their research or professional interests.

Prerequisites: (FIRM REQUIREMENTS) (1) ASEN 5044: Statistical Estimation for Dynamical Systems (or equivalent graduate level coursework in probability and linear estimation/Kalman filtering with permission of instructor); and (2) demonstrable competency completing projects and assignments on ones own in a technical programming language (e.g. Matlab/Octave, Python, C/C++, C#, Java, Julia, etc.).

Course Details

Grading and Project Assignments Course work will largely be assignment and project-oriented. There will be no exams. Several required topical exercises related to the lectures will be posted as assignments to ensure that students demonstrate understanding of the course material, as well as to provide periodic feedback and guidance as students try to integrate/explore concepts into their final projects. These exercises will consist of short theoretical and programming problems for toy applications, as well as questions to guide the development of final project applications.

Four exercise-based assignments will be posted, to coincide with major lecture topics being covered. The final project will be developed over the course of the semester, and will serve in place of a final exam. Students are highly encouraged to collaborate with one another on assignments, although individual assignments must be submitted. Students have the option of working together in groups of two (max) on the final project if they so choose, though some level of individual contributions/work will be expected on group projects.

Grading breakdown: assignment exercises: 40% (10% each); final project: 40%; class participation: 20% (students are highly encouraged to ask and answer questions during class, office hours, via e-mail, etc.). Note that group final project report submissions will result in the same grade for both group members.

Benefits and Learning Objectives This course will enable students to:

1. define, explain and demonstrate fundamental problems in non-linear non-Gaussian state estimation along with algorithmic tools for recursive Bayesian filtering, including: non-linear least squares and maximum likelihood techniques; Monte Carlo techniques including the particle filter and Rao-Blackwellized particle filters; Gaussian mixutre filters; multiple model filters; data association filters; decentralized data fusion techniques.

2. develop and implement software to simulate and evaluate the performance of advanced state estimation algorithms for real-world/research applications.

Tentative Course Schedule (may vary somewhat)

Week(s)	Topic
1	Course intro & overview
1-2	

should contact the O ce of Discrimination and Harassment (ODH) at 303-492-2127 or the O ce of Student Conduct (OSC) at 303-492-5550. Information about the ODH, the above referenced policies, and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at http://www.colorado.edu/odh