Course Outline

525.661: UAV Systems and Control

This outline provides an overview of the course and assignments by week. Please remember to check the calendar for specific due dates.

Each course module runs for a period of seven (7) days, i.e., one week. New modules are assigned on Wednesdays. Weekly non-hardware assignments are due by 11:59pm Tuesday evenings (i.e. 7 days to complete). Weekly hardware assignments are due the following Friday (i.e. 10 days to complete).

Note that no assignments will be due Thanksgiving Break week and Spring Break week.

Module	Module Title	Assignments
Module 1	Introduction, Vector Geometry, System Modeling	• Beard & McLain (2012) – Chapter 2 • Module 1 Discussion • Module 1 Assignment
Module 2	Control Systems, Vector Operations, Rotating Coordinates, Vector Differentiation	• Beard & McLain (2012) – Chapter 2 • Module 2 Discussion • Module 2 Assignment • Module 2 Hardware Assignment
Module 3	Kinematics, Dynamics, Equations of Motion	• Beard & McLain (2012) – Chapter 3 • Module 3 Discussion • Module 3 Assignment • Module 3 Hardware Assignment
Module 4	Forces & Moments, Gravity, Aerodynamics	• Beard & McLain (2012) – Sections 4.0-4.2 • Module 4 Discussion • Module 4 Assignment • Module 4 Hardware Assignment
Module 5	Propeller Modeling, Scalar Equations of Motion, Trim, Linearization, Aircraft Response Modes	• Beard & McLain (2012) – Sections 4.3, 4.5, 5.5, 5.6 • Module 5 Discussion • Module 5 Assignment • Module 5 Hardware Assignment
Module 6	Winds & Gusting, Autopilot Control Structure, Manual Autopilot Tuning	• Beard & McLain (2012) – Section 4.3 • Module 6 Discussion • Module 6 Assignment • Module 6 Hardware Assignment

Module	Module Title	Assignments

Module 7	Linear Response Models, Roll Autopilot	• Beard & McLain (2012)
		  ○ Chapter 5: pp. 60-77
		  ○ Chapter 6: pp. 95-102
		• Module 7 Discussion
		• Module 7 Assignment
		• Module 7 Hardware Assignment

Module 8	Analytically Derived Autopilot Tuning	• Beard & McLain (2012) - Chapter 6 • Module 8 Discussion • Module 8 Assignment
Module 9	Waypoint Control, Sensors	• Beard & McLain (2012) Chapter 7 & Appendix H • Module 9 Discussion • Module 9 Assignment • Module 9 Hardware Assignment
Module 10	State Estimates, Kalman Filter Introduction	• Beard & McLain (2012) - Sections 8.1 - 8.5 • Module 10 Discussion • Module 10 Assignment
Module 11	State Estimates using Extended Kalman Filters	• Beard & McLain (2012) - Sections 8.6, 8.8 • Module 11 Discussion • Module 11 Assignment • Module 11 Hardware Assignment
Module 12	Quadcopter Modeling (Quadcopter Simulation Design Project)	• No Reading Assignment • Simulation Design Project Assigned
Module 13	Quadcopter Flight Software (Quadcopter Hardware Design Project)	• No Reading Assignment • Simulation Design Project Due • Hardware Design Project Assigned
Module 14	Semester Wrap-up, Gimbaled Cameras	• No Reading Assignment • Hardware Design Project Due