AE 4580 Introduction to Avionics Integration
Spring 2008
Tuesday and Thursday 12:05-1:25 pm

Dr. Eric N. Johnson
Aerospace Office: Knight 415-2
Office Hours: 11am – 12pm on TTh or by appointment
Email: Eric.Johnson@ae.gatech.edu

Course Goals

By the conclusion of this course, you should understand the scope and extent of avionics in modern aerospace vehicle systems, and how they impact vehicle design and performance. Specific systems will be used as case-studies in lecture and in the homework, covering: navigational systems, GPS, radar, autoflight systems, alerting/health-monitoring systems, databuses, human-interaction issues, and flight software.

Pre-Requisites

AE 3521 Flight Dynamics
ECE 3710 Circuits and Electronics

Text

Kayton and Fried, *Avionics Navigation Systems*, 2nd Edition, Wiley, 1997.

Grading: 35% homework, 15% midterm, 15% project, 35% final exam

- Students are encouraged to discuss homework verbally with each other, but you may not work together when preparing written answers – nor may written answers be compared. Homework is due at the *beginning* of class on the day it is due.
- Midterm will occur February 28th during the normal class meeting time.
- Project will be due April 17th at 12:05pm.
- Final Exam will occur May 1st 8:00 – 10:50 am (tentative).

Course Topics

Topic	Hours
1. Introduction	1
2. Radio Navigation Systems	8
Antennas, Frequency vs. propagation, line-of-sight	
Characteristics of transmitters and receivers, modulation principles	
Time and phase difference position fixing	
Specific systems: LORAN, VOR, TACAN, ILS, DME, GPS	
3. Inertial Navigation Systems	6
Inertial sensors, strapdown techniques	
Integration of GPS and INS	
4. Principles of Radar Systems	6
Radar range equation and the constraints it imposes	
Range and doppler tracking	
Applications to safety and military requirements	
5. Communication Systems	2
Communication methods, rates, and reliability	
Over-view of major communication networks (e.g., IntelSat)	
6. Flight Control Systems	5
Stability augmentation, autopilot, and flight management systems	
Elements of the control loop: actuators, flight computer, sensors	
Impact on aircraft design, e.g. relaxed static stability, load alleviation	
7. Reliability and Redundancy	5
Reliability theory, including models	
Redundancy and its affects	
Parity space and analytic methods of redundancy	
8. Systems-Level Analysis of Avionics	3
Decomposition methods and important component interactions	
Information passing and databuses	
9. Safety-Critical Software	2
Processes for developing and testing software	
New challenges to aircraft flight test and certification	
10. Human Interaction Concerns	5
Controls and displays, complexity	
Supervisory control issues and problems	
11. Exams	2
Total	**45**