DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS

AA 320 AEROSPACE INSTRUMENTATION

AUTUMN QUARTER

CREDITS AND CONTACT HOURS: 3 credits, Two 50-minute lectures and one 1-hour-50-minute laboratory.

COORDINATOR: Adam P. Bruckner, Professor of Aeronautics and Astronautics

TEXTBOOK: None (class notes prepared by instructors)

REFERENCES: Principles and Applications of Electrical Engineering, Rizzoni, G., 5th ed., McGraw Hill, 2007.

Foundations of Electronics, Cogdell, J.R., Prentice Hall, 1999.

CATALOG DATA: AEROSPACE INSTRUMENTATION, Required
Hands-on laboratory experience for understanding the design and function of electronic circuits and instrumentation utilized in aerospace engineering. Topics include Ohm's law, Kirchhoff's laws, DC and AC circuits, passive and active components, op-amps and comparators, sensors, signal conditioning, electromechanical systems and actuators, digital systems, and data acquisition.

PREREQUISITES BY TOPIC: Junior standing in A&A department.

OUTCOMES:

1) Students will be able to use and understand passive an active circuit components and sensors, and their characteristics.
2) Students will be able to design power supplies and simple circuits for aerospace instrumentation.
3) Students will understand sensors and signal conditioning as applied to wind tunnels and other aerospace systems.
4) Students will understand digital data systems, A/D and D/A conversion, control feedback and stability, and electromechanical actuators

RELATIONSHIP TO STUDENT OUTCOMES:

a) An ability to apply knowledge of mathematics, science, and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data.
e) An ability to identify, formulate and solve engineering problems
g) An ability to communicate effectively
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

TOPICS:

1. Overview of electronic systems in aerospace.
2. Basic concepts: voltage, current, Ohm's law, Kirchhoff's laws, resistors and resistor networks. Use of digital multimeter.
3. Capacitors, RC circuits, temporal behavior; Wheatstone bridge, filters. Use of oscilloscope and function generator.
4. Inductors, transformers, diodes, RL and RLC circuits, rectification, DC power

supplies for aerospace applications.

5. Active components: transistors, op-amps, comparators; gain and feedback. Switches, amplifiers, comparators, analog integrators and differentiators, signal conditioning for aerospace sensors.
6. Sensors for wind tunnel and other aerospace applications: pressure sensors, strain gages, thermocouples, inclinometers. Sensor characteristics: signal level, dynamic range, accuracy.
7. Light sensors and optical communication, current-to-voltage converter.
8. Electromechanical systems and actuators, DC motor characteristics, control systems.
9. Digital systems and data acquisition and control, A/D converter and D/A converter.