AE 242
Aerospace Measurements Laboratory

Car driving

What measurements driver does for safe driving?
When precision and accuracy becomes important?

Car driving

Driver – get the sense from the environment and take decisions
: Speedometer to know the speed of the car
: Rear camera for reverse driving

Driverless car – all the above is sensed and decisions are taken.
Accuracy, response time and content becomes very important.

Aerial vehicles

GSLV

Agni

Nirbhay

Tejas

SU-30

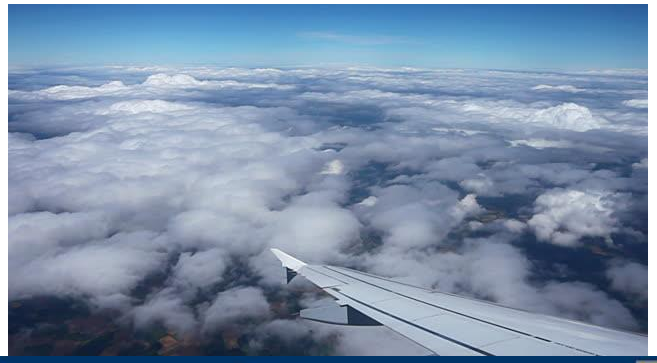
Boeing

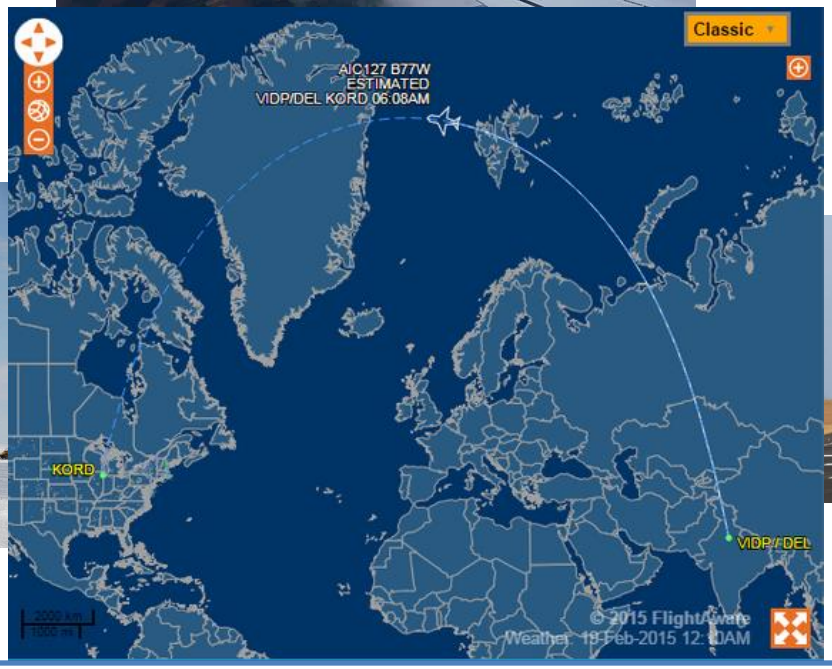
Hexacopter

Helicopter

Solar Powered

Aircraft flight





During the aircraft operation environment changes drastically. Accuracy is very important from safety considerations. Aircraft instrumentation is very challenging.

Course content

Credit structure L-T-P-C 2-0-2-6

Characteristics of measuring systems: Calibration, sensitivity and error analysis.
Air data measurements: Pressure altitude, airspeed
Flow measurements: Hotwire anemometer, manometer, angle of attack sensor
Temperature Measurements: Thermocouples, hot gas and cryogenic measurements, thermopiles
Strain measurements: Strain gage types, strain gage sensitivity.
Pressure measurements: Dependence of measurement dynamics on sensor construction.
Inertial and GPS based sensors: Accelerometers and gyroscopes; position, velocity and time measurements.
Attitude and heading reference systems: Errors in inertial sensors and characterization.
Sensor interfacing: amplifiers, filters, and other signal conditioning circuits, analog and digital conditioning, ADC/DAC, synchronous and asynchronous serial communication.

Course content

Text Books and references:

1.Doebelin, E., Measurement Systems: Application and Design, 4th Ed., McGraw-Hill, New York, 1990.
2.Grewal, M. S., Lawrence, R. and Andrews, A., GPS, INS and Integration, New York: John Wiley, 2001.
3.Collinson, R. P. G., Introduction to Avionics, Chapman and Hall, 1996.
4.Gayakwad, R. A., OPAMPs and Linear Integrated Circuits, 4th Ed., Pearson Education, 2005.
5.Titterton, D. H. and Weston, J. L., Strapdown Inertial Navigation Technology, 2nd Ed., AIAA Progress in Astronautics and Aeronautics, Vol. 207, 2004.
6.Strang, G. and Borr, K., Linear Algebra, Geodesy and GPS, Wellesley-Cambridge Press, 1997.
7.Doebelin, Ernest O. Manik, Dhanesh N., Doebelin's Measurement System, 6th Edition, New Delhi : Tata McGraw-Hill, 2011
8.Setup User Manuals and Component Data Sheets

Important Instructions

Slot L1 Monday: 14:00-17:00; Slot L3 Thursday: 14:00-17:00;

Per week two sessions of one hour lecture for everyone
Per week two session of two hours laboratory. Students have to attend on Monday or Thursday as per the declared list.

Small kit consisting of opAmp, Digital circuits, Arduino board etc. will be sent to your address. Conduct experiments under the guidance of TAs.

Submission of handwritten journals

Evaluation

Credit structure L-T-P-C 2-0-2-6

Activity	Weightage
Quizes 4-5 (20-30 minutes)	20
Mid-sem	20
End-sem	30
Journal	30

How many sensors are directly used by us in our daily life?

How many sensors are used in a modern car?

How many sensors are used in a modern transport aircraft?

How many sensors are used in a modern military aircraft?

Post your answer on moodle, along with source of information.