Module 1 - Basic Electronic Modules

Avionics and Spacionics

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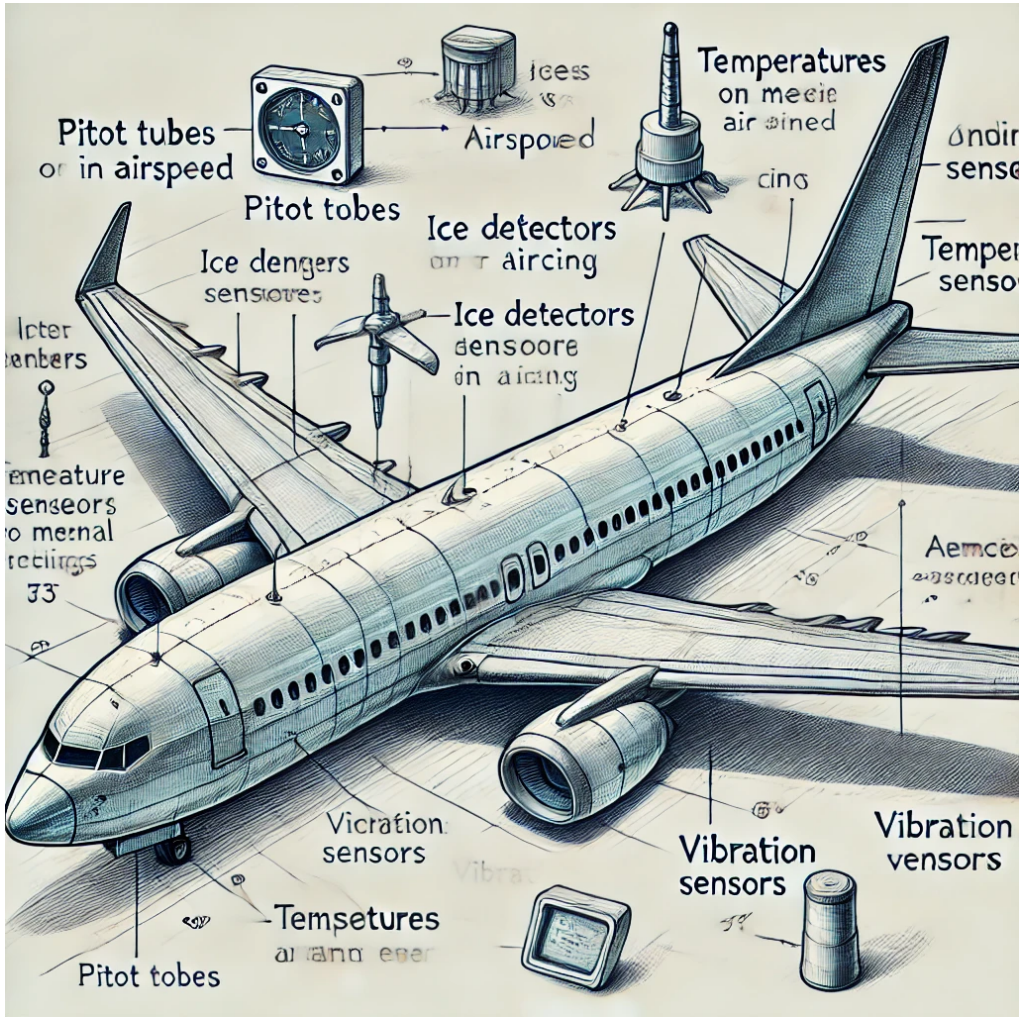
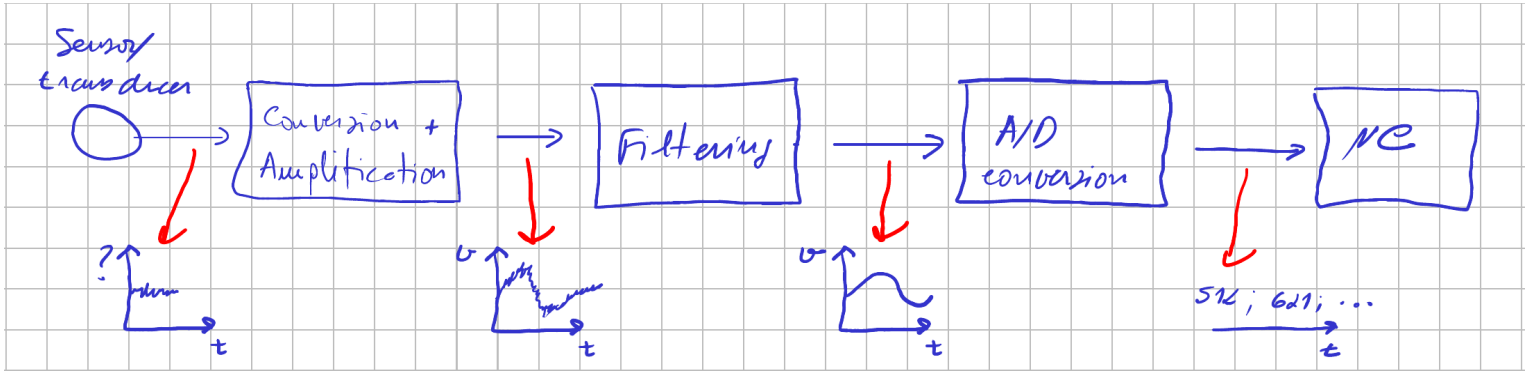
Introduction



Typical airplane sensors

Introduction



- In aerospace, **sensors and transducers** play a critical role in various functions, from monitoring and controlling aircraft systems to ensuring safety and efficiency.
- But these sensors and transducers often have outputs that are unsuitable for direct processing.
- So we need to **condition these signals** before they can be used (e.g. for registration, information or control systems)
- Nowadays display, registration and control systems are predominantly digital, so we need to learn how to **interface the "real world" and the "digital world"**
- All these electronic modules need support circuitry, e.g. **power supplies** and **clocks**

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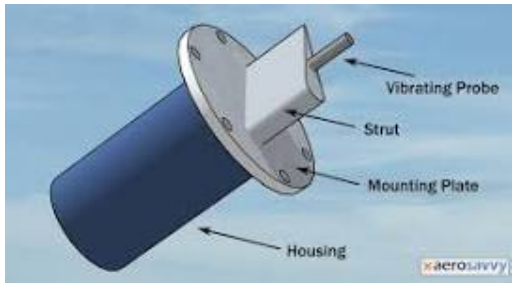
Topics

Class 1: Sensors and transducers



Temperature sensors : Thermocouples, RTD Integrated and thermistors

Force, torque and vibration sensors: strain Gauges and load cells

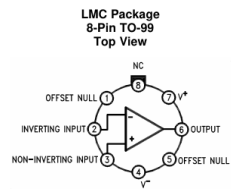
Pressure sensors and transducers: Pitot Tubes and static Pressure Sensors

Environmental sensors: humidity Sensors and Ice Detection Sensors

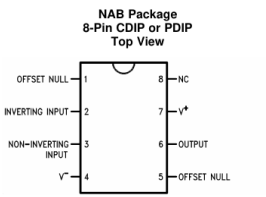
Inertial sensors: Accelerometers and Gyroscopes

Topics

Class 2: Signal Conditioning and AD conversion



LM741H is available per JM38510/10101



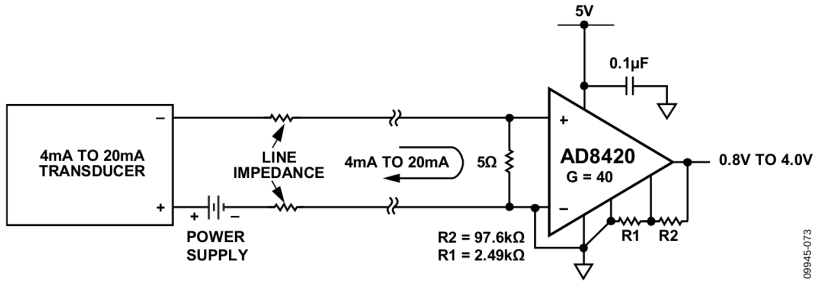
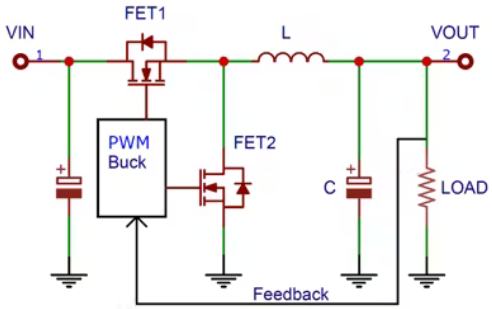


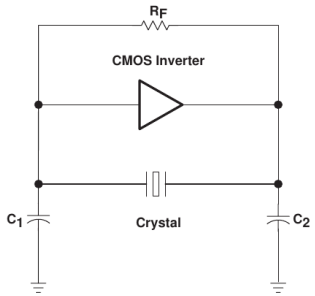
Figure 71. 4 mA to 20 mA Receiver Circuit

- OpAmp fundamentals
- Circuits with OpAmps
- Instrumentation Amplifier
- AD and DA conversion

Topics

Class 3:Voltage sources and Clock Generators





- Linear regulators
- Switching regulators
- Precision voltage sources
- Clock generators

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Teaching methodology

Teaching methodology

- Classes are split in a T part complemented by a P/Lab part.
- Theoretical part: expository sessions accompanied by problem-solving with the objective of:
  - Applying theoretical concepts to practical scenarios
  - Developing problem-solving skills, critical thinking
  - Get immediate feedback about the student's progress
  - Promote active learning.
  - Promote collaboration and discussion to enhance learning through peer interaction.
- The practical part closely aligns with the theoretical one, consisting, whenever possible, of sequences of tasks that address the concepts discussed in the theoretical part.
- One project with three parts, each one corresponding to the topics addressed in each class.

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Assessment

Module assessment is divided in two parts.

- Written test (WT, individual)
- Report of practical work (Rep, groups of two)
- The written exam is at the last class of the module.
- The report must be submitted until one week after the last class.
  - The module's grade (MG) is compute as follows:

$$MG = 0.7 \cdot WT + 0.3 \cdot Rep$$