

**ME 345 Aerospace Engineering Instrumentation and Measurement
Every Semester**

20005 Catalog Data: Fundamentals of measurement systems; standards; dynamic characteristics of instruments; statistical data treatment; transducers; signal conditioning; strain, pressure, temperature and flow measurements. Coreq: ME 363; Prerequisites: AE 341, EE 301.

Textbooks: Figliola and Beasley, Theory and Design for Mechanical Measurements, 3rd edn., Wiley
Johnson, Exercises in Engineering Experimentation, Laboratory manual

Prerequisite by topic:

1. Dynamics of vibrating systems
2. Calculus and differential equations
3. Bernoulli equation and pipe flow
4. Basic DC electrical circuits, wheatstone bridges
5. Bending and tensile stress and strain

Objectives:

(Letters in brackets refer to the Educational Objectives of the Aerospace Engineering Program)

Objective 1: Develop knowledge and understanding of instruments [A, B, D]

Objective 2: Develop an understanding of data collection, transmission and reduction [A, B, D]

Objective 3: To interpret experimental results and form appropriate conclusions [A, B, D]

Topics:

1. Basic instrument characteristics
2. Digital data collection
3. Signal analysis
4. Dynamic characteristics of instruments
5. Statistics and uncertainty
6. Flow measurement
7. Temperature measurement
8. Strain measurement
9. Graphical programming

Evaluation: 1. Midterm and final examinations
2. Homework/class participation

3. Individual Laboratory projects and individual reports (8)
4. Team Laboratory projects and team reports (1)

Objective 1:

Performance criteria:

(Numbers in brackets refer to the evaluation methods used to assess student performance)

- 1.1 Students will demonstrate knowledge of instruments, an understanding of their specifications including both static and dynamic characteristics. [1,2,3]
- 1.2 Students will demonstrate knowledge in the application and selection of instruments to make various types of measurements. [1,2]

Objective 2:

Performance criteria:

- 2.1 Students will demonstrate an understanding of digital data collection, transmission, and A/D conversion. [1,2,3,4]

Objective 3:

Performance criteria:

- 3.1 Students will demonstrate an ability to present and analyze data including time and frequency domain analysis, uncertainty analysis and statistical evaluation. [1,2,3,4]
- 3.2 Students will demonstrate an ability to analyze experimental results and to report appropriate conclusions in a professional manner. [2,3]

Class/Laboratory schedule: 1 one hour lecture and 1 two hour laboratory sessions per week

Relation of course to program objectives:

The educational objectives are expressed in terms of the program outcomes. This course covers the following outcomes:

AE: a), b), e), g), k)

ME: a), b), e), g), k)

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