

Course: **EE 412 ELECTRONIC INSTRUMENTATION DESIGN**

Instructor: Andy V. Olson, 631Cobl, 994-5967
andyo@ece.montana.edu

Prerequisites: EE316- Electronics 2 or equivalent or consent of the instructor.

Text: Design with Operational Amplifiers and Analog Integrated Circuits,
McGraw Hill, S. Franco, 2002, ISBN 0-07-112173-0

Other References: Microelectronic Circuits, Sedra/Smith

Cadence P-spice will be used in class designs.

Grading: Homework25%
Midterm 125%
Lab work25%
Final Examination25%

Class Objectives

To produce graduates with the ability to design the analog circuits utilized in electronic instrumentation.

Course Outcomes

At the conclusion of EE 412, students will:

- Be able to describe and model different electrical transducers
- Design an optimum amplifier for a transducer
- Design signal conditioning circuits for limiting, filtering, and waveform shaping
- Specify the performance required from A/D and D/A converters in a design.

Class Outline (subject to change)

- Course introduction
- Operational amplifiers
 - Specifications, evaluation
 - Limitations – offset voltage and current, drift, noise, large and small signal response, distortion
 - Power supply and physical layout considerations
 - Linear Circuits- Transfer functions, integrators, differentiators, transimpedance amplifiers
 - Nonlinear Circuits- Limiters, Clampers, Wave shaping, Log amplifiers
- Filtering – practical lowpass, bandpass, bandreject, hi-pass active filter designs
 - 2nd and 3rd order active filters
 - Implementation of higher order filters- method of coefficients
- Noise in amplifiers
 - Estimation
 - Effects on measurement accuracy
- Transducers – models and characteristics
- A/D and D/A – specifications, characteristics, implementation
- Time permitting – Oscillators, Phase-Lock-Loops, Modulation