1. *Course number and name*

**ENGR 442: Design with Operational Amplifiers**

1. *Credits and contact hours*

3 credit hours

1. *Instructor’s or course coordinator’s name*

Instructor: M. Hajiaboli

Course coordinator: Hao Jiang, Professor

1. *Text book, title, author, and year*
2. Sergio Franco, *Design with Operational Amplifiers and Analog ICs*, 4th ed. McGraw-Hill, 2015.
3. *Specific course information*
4. *brief description of the content of the course (catalog description)*

Design of op-amp based amplifiers; signal converters; instrumentation blocks; filters; negative feedback, practical op-amp limitations; mixed-signal circuits; digital-to-analog convertors; analog-to-digital convertors.

1. *prerequisites or co-requisites*

Grades of C- or better ENGR 305

1. *indicate whether a required, elective, or selected elective course in the program*

Required for Electrical Engineering and Elective for Computer Engineering

1. *Specific goals for the course*
2. *Specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.*

* To investigate a variety of resistive op–amp circuits with emphasis on feedback principles.
  + To analyze and design active filters.
  + To study the design of popular op–amp based analog systems including mixed-signal circuits, switch-cap amplifiers and filters, sample-and-hold circuits, digital-to-analog convertors and analog-to-digital convertors.
  + To perform SPICE simulation of popular analog circuits.

1. *Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.*

Course addresses ABET Student Outcome(s): 1, 2, 6, 7

1. *Brief list of topics to be covered*

* Review; basic closed-loop configurations; negative feedback; op–amp powering and saturation.
* *I-V*, *V-I*, and *I-I* converters; difference and instrumentation amplifiers.
* 1st-order filters. 2nd-order active filters: *KRC*, multiple feedback, state- variable and biquads.
* Introduction of high-order analog filters.
* Mixed-signal circuits, switch-cap amplifiers and filters, sample-and-hold circuits.
* Digital-to-analog converters and analog-to-digital convertors.