Boston University
Department of Electrical and Computer Engineering

EC412   **Analog Electronics**   **Spring 2025**

<u>Class Organization</u>

<u>Professor:</u> Alexander Sergienko
Office: PHO 729, Tel. 3-6564; e-mail: <AlexSerg@bu.edu>
Office hours: Mon, Wed   4:30 pm – 5:30 pm

Lecture: Mon, Wed   2:30 pm – 4:15 pm   PHO 202

<u>Teaching Assistant:</u>   Jivesh Jain <jiveshj@bu.edu>

<u>Content:</u> Differential amplifiers, multistage amplifier circuits, operational amplifiers, active filters, oscillators, feedback, MOS amplifiers.

Laboratory design project.

<u>Prerequisite:</u> ENG EC410

<u>Text (required):</u> Microelectronic Circuits & Devices, M. Horenstein, Prentice Hall, 2nd Edition, 1995

<u>Supplementary Text (not required):</u> Tuinenga, SPICE: A Guide to Circuit Simulation & Analysis Using PSpice, Prentice Hall, 1995.

<u>Laboratory Manual (required):</u> Microelectronic Circuits & Devices, M. S. Wasserman, Prentice Hall, 1995.

<u>Lecture:</u>   Mon-Wed 2:30 p.m.- 4:15 p.m. in   PHO 202
<u>Discussion:</u>   Fri 5:30 p.m. – 6:30 pm in   PHO 202
<u>Laboratory:</u>   Fri 10:10 a.m. -   11:55 p.m. in   PHO 105
You must be registered for a laboratory section.

<u>Handouts:</u> The primary method for course announcement and information dissemination will be through a Blackboard site.
It is your responsibility to obtain all handouts, including homework, labs, and notes.

at the Monday lecture the following week. Late homework will **<u>not</u>** be accepted. Graded papers and solutions will be handed out in lecture.

<u>Examinations:</u>
Exam #1 (two hours) – Monday, February 26,   2:30 p.m. - 4:15 p.m.   in PHO 202
Exam #2 (two hours) - Wednesday, April 2,   2:30 p.m. - 4:15 p.m   in   PHO 202
Final Exam (two hours) – TBD in May ,   3:00 pm – 5:00 pm   in   PHO 202

<u>Design Project:</u>

A Laboratory design project will be assigned during the week of February. THE DEFENSE OF THE PROJECT WILL BE SCHEDULED ON MAY 2, THE LAST WEEK OF THE SEMESTER.
This project will require much time and effort, but the opportunity to do real design work should make the effort worthwhile.

<u>Rules for SC412 Laboratory:</u>

All students must have a bound 8 1/2 x 11 lab notebook and put all relevant data in it. <u>There is no place for loose data sheets in the laboratory! Never use any.</u> If you purchased a similar notebook for SC410, and have enough room, you may use the same one. You may also be required to write laboratory reports. You may work on your regular experiments in pairs and in groups up to four students on the design project.

<u>Makeup</u>: We do not give makeup exams. If you miss an exam without a valid excuse, you will get a zero. If you have a valid medical excuse, you must get a note from your doctor or the BU infirmary specifically excusing you from the exam.

<u>Snow</u>: If a snowstorm occurs on the day of an exam, it will be held unless the University officially closes for the day.

<u>Grading</u>: final exam - 35%; midterm exams - 15% each; homework - 15%; laboratory - 10%; lab project - 10%.

ATTENTION: WE DO NOT GIVE GRADES OF INCOMPLETE FOR THIS COURSE!
If you do not think you can finish the semester, you should withdraw by the final drop date, which is <u>April 4, 2025.</u>

EC412   **Analog Electronics**   **Spring 2024**

Course Syllabus

Week of

Jan. 22   Course Introduction, DC Biasing circuits
            Sections 8.3.6 - 8.3.8

Jan. 27   Current-source biasing, active bypass
            Sections 8.3.6 - 8.3.8

Feb. 3   BJT differential amplifier, differential and common mode
             Sections 8.2, 8.3.1-8.3.3;

Feb. 10   Large-signal performance; Sections 8.3.3-8.3.5, 8.5.1, 8.5.4,
            Frequency response, active pull-ups; cascode stage; high-gain stages;
            Sections 9.4.1, 6.3.2, 12.2.2

Feb. 17   Multistage amplifiers Sections 11.1-11.5 (Tuesday on Monday schedule);

Feb. 26   Midterm EXAM #1

Mar. 3   Output stages; inside the 741 op amp
            Sections 11.6, 11.7, 12.1, 12.2.1, 12.2.3, 12.

Mar. 10   SPRING BREAK (no classes)

Mar. 17   Linear op amp circuits, Sections 2.1-2.3

Mar. 20   Nonlinear op amp circuits, Non-ideal op amp circuits
            Sections 2.4-2.6, 12.2.7, 12.2.8,

Mar. 24   Active filters
            Sections 13.1, 13.2,13.3-13.5

April 2   Midterm EXAM #2 (April 3)

April 7   Oscillators
            Section 13.7.1, 13.7.2,13.7.5

April 14   Feedback; amplifier stability
            Sections 10.1-10.7, 10.8.1-10.8.3

April 21   Amplifier stability; frequency compensation;
            Sections 10.8.4, 10.8.5, 12.2.5, 8.4.1

April 30   Project presentations

May 5-9   Final Exam

EC412 LABORATORY TOPICS

Date	Experiment
Jan. 24	NO LAB
Jan. 31	Expts. 17, 18: Current Mirror, Differential Amplifier
Feb. 7	Expt. 18: Differential Amplifier (continued)
Feb. 14	Expt. 21: Multistage Amplifier
Feb. 21	Expt. 21: Multistage Amplifier (continued)
Feb. 28	Project
Mar. 7	Project
Mar. 14	NO LAB (Spring Break)
Mar. 21	Expt. 2: Nonlinear Op Amp Circuits
Mar. 28	Expt. 3: Nonideal Op Amp Circuits
Apr. 4	Expt. 24: 1st-Order Active Filters
Apr. 11	Expt. 25: 2nd-Order Active Filters
Apr. 18	Project
Apr. 25	Project
April 30	Project Presentations