ECE 5194.12 (Proposed): Group Studies Analog Integrated Circuits II

Course Description

Advanced analog integrated circuits. Linear feedback networks design and stability analysis, multi-stage CMOS op-amp design and compensation, fully-differential op-amps and common-mode feedback networks, comparators, transconductors, bandgaps, sample and hold circuits, switched-capacitor circuits, noise analysis of CMOS circuits.

Transcript Abbreviation: Grp St Analog ICs
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad, Graduate
Student Ranks: Senior, Masters, Doctoral
Course Offerings: Autumn
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Prereq: 5021, or Grad standing in Engineering and permission of instructor.
Exclusions: Not open to students with credit for 720 or 722.
Cross-Listings:

Course Rationale: One-time offering to transition who took the old 5021 in the past to get the material in the revamped 5021.

The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001
Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

General Information

The original 5021 was split into a more introductory course (4021) and then a more advanced version of 5021. Student who took 5021 before Autumn 2018 can take this one-time offering to get the more advanced material. After Autumn 5021, all students interested in Analog ICs would take the (new) 5021.

Course Goals

Learn the principles of linear feedback networks, including stability analysis.
Learn design and analysis techniques of analog integrated circuits building blocks, such as multi-stage op-amps, fully-differential op-amps, comparators, transconductors, bandgaps, sample and hold circuits, and switched-capacitor circuits.
Learn noise analysis and optimization techniques in CMOS analog integrated circuits.
Learn using CAD tools to design and simulate analog integrated circuits

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction to basic analog circuit blocks	2.0							
Linear feedback networks design and analysis	2.0							
Multi-stage CMOS op-amp design and compensation	3.0							
Applications to linear power regulators	2.0							
Fully-differential op-amps and common-mode feedback networks	5.0							
Comparators and Transconductors	7.0							
Bandgaps and Sample and hold circuits	6.0							
Switched-capacitor circuits	6.0							
Noise analysis of CMOS circuits	6.0							

Representative Assignments

HWs and HW-based short quizzes
Cadence design/simulation final project of various CMOS analog building blocks
Comprehensive written report on the assigned design project

Grades

Aspect	Percent
HWs and/or HW-based quizzes	20%
Two Midterm Exams	50%
Final Project/Report	30%

Representative Textbooks and Other Course Materials

Title	Author
Analog Integrated Circuit Design	T. Carusone, D. Johns, and K. Martin
CMOS Circuit Design, Layout, and Simulation	R. J. Baker

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
**	a	An ability to apply knowledge of mathematics, science, and engineering.
**	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
**	c	An ability to design a system, component, or process to meet desired needs.
*	d	An ability to function on multi-disciplinary teams.
**	e	An ability to identify, formulate, and solve engineering problems.
*	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
*	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
*	j	A knowledge of contemporary issues.
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Additional Notes or Comments

This course is to allow students who took the old 5021 in the past to take the new 5021. It should be combined/cross-listed with 5021. Will only be offered for Fall 2018.

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