

## The Hebrew University of Jerusalem

Syllabus

### Advanced Analog VLSI - 83414

Last update 07-09-2024

HU Credits: 4

Degree/Cycle: 1st degree (Bachelor)

**Responsible Department:** Applied Physics

<u>Academic year:</u> 0

Semester: 2nd Semester

<u>Teaching Languages:</u> Hebrew

<u>Campus:</u> E. Safra

Course/Module Coordinator: David Madar

Coordinator Email: david.madar@mail.huji.ac.il

<u>Coordinator Office Hours:</u> Coordinate in advance after the lectures

Teaching Staff:

Mr. David Madar, Mr. Yoel Krupnik

### Course/Module description:

The course equips students with the theoretical and practical knowledge necessary for designing integrated circuits, particularly advanced analog circuits using CMOS technology. Students will delve into the unique considerations and characteristics that shape the design of such circuits on silicon chips (VLSI). A substantial portion of the course will focus on gaining hands-on experience with the various circuit design processes that serve as building blocks and subsystems in the implementation of advanced analog circuits.

Students will have the opportunity to plan and execute a limited engineering project from its initial definition to its final realization.

<u>Course/Module aims:</u> See learning outcomes

# Learning outcomes - On successful completion of this module, students should be able to:

Acquiring the theoretical and practical knowledge essential for designing advanced analog circuits in CMOS technology. This course will delve into the considerations that shape the design of such circuits on a silicon chip. A significant portion of the course is dedicated to gaining hands-on experience with the various circuit design processes that serve as building blocks and subsystems in the implementation of advanced analog circuits

<u>Attendance requirements(%):</u> 80

Teaching arrangement and method of instruction: Frontal lecture + Exercise + engineering project

### Course/Module Content:

Chapter #1- Amplifiers and fundamentals:

- Feedbacks and Stability
- Miller Amplifier
- Noise
- mismatches

Chapter #2- Advanced Analog circuit:

• Digital to Analog converters (DAC)

- Analog to Digital Converters (ADC)
- PLL (phase-locked loop)

### Required Reading:

1. CMOS Analog Circuit Design by Phillip E. Allen , Douglas R. Holberg , Allen ,

- 2. Introduction to CMOS OP-AMPs and Comparators Roubik Gregorian
- 3. Design of Analog CMOS Integrated Circuits Behzad Razavi
- 4. CMOS Circuit Design, Layout, and Simulation, Second Edition by R. Jacob Baker
- 5. Phase-Locked Loops: Design, Simulation, and Applications by Roland E. Best
- 6. CMOS Mixed-Signal Circuit Design by R. Jacob Baker.

7. The Design of CMOS Radio-Frequency Integrated Circuits, Second Edition by Thomas H. Lee

8. Intuitive Analog Circuit Design by Marc Thompson

### Additional Reading Material:

Grading Scheme:

Essay / Project / Final Assignment / Home Exam / Referat 65 % Submission assignments during the semester: Exercises / Essays / Audits / Reports / Forum / Simulation / others 30 %

Attendance / Participation in Field Excursion 5 %

Additional information:

The students will experience design and implement a limited engineering project from its initial definition to its final realization.