

**UNIVERSITY OF SISTAN AND BALUCHESTAN (USB)**  
**DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING**

**Analog CMOS Integrated Circuit Design**

**Winter 1398**

**Instructors:**

Mojtaba Shahraki ([m.shahraki@ece.usb.ac.ir](mailto:m.shahraki@ece.usb.ac.ir)),

Majid Ghadrddan ([ghadrddan@ece.usb.ac.ir](mailto:ghadrddan@ece.usb.ac.ir)),

**Schedule:** Wednesdays: 07:30-09:30 and 18-20,

**Course Outline:**

The subject of this course is the analysis and design of analog CMOS integrated circuits. Simple modelling techniques are used to gain a better understanding of the functions of the circuits. Intuitive design methods, quantitative performance measures and practical circuit limitations are emphasized. Circuit performance is predicted by means of both hand calculations and computer simulations. The course contains a review of device modelling, dc and small signal properties of single- and multi-stage amplifiers, followed by the study of biasing circuits, current mirrors, and active loads, differential pairs and operational amplifiers. Next, frequency response characteristics and compensation of operational amplifiers will be examined. If time permits, other topics such as switched-capacitor circuits, analog-to-digital (A/D) and digital-to-analog (D/A) converters fundamentals (Nyquist-rate and oversampling), oscillators, and phase-locked loops (PLLs) will be discussed.

**Textbook:**

Behzad Razavi, Design of Analog CMOS Integrated Circuits, McGraw Hill, 2001.

**Other Useful Reference Material (in no particular ordering):**

David Johns and Ken Martin, *Analog Integrated Circuit Design*, John Wiley & Sons, 1997.

Adel S. Sedra and Kenneth C. Smith, *Microelectronic Circuits*, Fifth Edition, Oxford University Press, 2004.

Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, and Robert G. Meyer, *Analysis and Design of Analog Integrated Circuits*, Fourth Edition, John Wiley & Sons, 2002.

Phillip E. Allen and Douglas R. Holberg, *CMOS Analog Integrated Circuit Design*, Second Edition, Oxford University Press, 2002.

Journal and conference articles including *IEEE Journal of Solid-State Circuits* and *International Solid-State Circuits Conference*.

**Assignments and Project:**

There will be a number of assignments and a project associated with this course. Some of the assignments and the project will require the use of HSPICE. Some assignments and the project may take a fair amount of time, so be sure to start each early.

**Mark Breakdown:**

Seminar:	15%
Assignments (5 or 6 assignments):	15%
Design Project:	20%
Final:	60%