

University of Puerto Rico at Mayagüez
College of Engineering
Department of Electrical and Computer Engineering

Syllabus & Instructor Information Sheet Form

A. COURSE SYLLABUS

1. General Information:

Course Number: INEL 6080
Course Title: VLSI SYSTEMS DESIGN
Credit-Hours: 3

2. Course Description:

MOS (Metal-Oxide-Semiconductor) devices and circuits. Design, implementation, and fabrication of very large scale integration (VLSI) circuits. System timing analysis. Physical implementation of computational systems.

3. Pre/Co-requisites:

Graduate Level or professor authorization for advanced undergraduates.

4. Textbook, Supplies and Other Resources:

Textbook(TBA): N. Weste and D. Harris, "CMOS VLSI Design: A Circuits and Systems Perspective – 4th Edition", Pearson Education, Inc. publishing as Addison-Wesley, Boston, MA 02116, 2011

References

1. J. Baker, "*CMOS: Circuit Design, Layout, and Simulation*", Third Edition. IEEE Press/Wiley Interscience, Hoboken, NJ 07030, 2010.
2. Z. Navabi, "*VHDL Modular Design and Synthesis of Cores and Systems*", Third Edition, McGraw-Hill, Inc., 2007.
3. S-M Kang and Y. Leblebici, "*CMOS Digital Integrated Circuits: Analysis and Design*", McGraw Hill Corporation, Inc., New York, NY 10020, 2003
4. J. Rabaey, A. Chandrakasan, B. Nikolic, "*Digital Integrated Circuits: A Design Perspective, 2nd Edition*", Prentice Hall, Inc., 2003.
5. J. P. Uyemura, "*Introduction to VLSI Circuits and Systems*", John Wiley & Sons, Inc., New York, NY 10158-0012, 2002
6. Hastings, "*The Art of Analog Layout*", Prentice Hall, Inc., 2001.
7. Sedra and K. Smith, "*Microelectronic Circuits*", Oxford University Press, 1998.
8. Technical papers from journals and conferences in Circuits and Systems and Computer Aided Design of Electronic Circuits.

5. Purpose:

This course is open to graduate level and senior year students in Electrical and Computer Engineering. This course is intended to provide students an understanding of various contemporary techniques for the design, simulation, and fabrication of CMOS VLSI Digital circuits. Students will learn about current research problems in these areas at the same time that use state of the art CAD tools for designing, evaluating, and analyzing practical circuits developed as part of the class.

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6. Course Goals:

After completing this course, each student should be able to design, simulate, and develop fabrication specs for CMOS VLSI digital circuits. Students will also learn about the contemporary research problems faced in the design of such circuits.

7. Requirements:

All students are expected to have basic notions on:

- 1- Design techniques for digital circuits
- 2- Familiarity with transistor operation
- 3- Spice circuit modeling and simulation
- 4- Basic programming skills

8. Laboratory/Field Work (If applicable):

Students will be expected to use CAD tools on engineering workstations for class homework and to develop a term paper.

9. Department/Campus Policies:

9a. Class attendance: Class attendance is compulsory. The University of Puerto Rico, Mayagüez Campus, reserves the right to deal at any time with individual cases of non-attendance. Professors are expected to record the absences of their students. Frequent absences affect the final grade, and may even result in total loss of credits. Arranging to make up work missed because of legitimate class absence is the responsibility of the student. (Bulletin of Information Undergraduate Studies, pp. 39 1995-96)

9b. Absence from examinations: Students are required to attend all examinations. If a student is absent from an examination for a justifiable reason acceptable to the professor, he or she will be given a special examination. Otherwise, he or she will receive a grade of zero or "F" in the examination missed. (Bulletin of Information Undergraduate Studies, pp. 39, 1995-96)

9c. Final examinations: Final written examinations must be given in all courses unless, in the judgment of the Dean, the nature of the subject makes it impracticable. Final examinations scheduled by arrangements must be given during the examination period prescribed in the Academic Calendar, including Saturdays. (see Bulletin of Information Undergraduate Studies, pp. 39, 1995-96).

9d. Partial withdrawals: A student may withdraw from individual courses at any time during the term, but before the deadline established in the University Academic Calendar. (see Bulletin of Information Undergraduate Studies, pp. 37, 1995-96).

9e. Complete withdrawals: A student may completely withdraw from the University of Puerto Rico, Mayagüez Campus, at any time up to the last day of classes. (see Bulletin of Information Undergraduate Studies, pp. 37, 1995-96).

9f. Disabilities: All the reasonable accommodations according to the Americans with Disability Act (ADA) Law will be coordinated with the Dean of Students and in accordance with the particular needs of the student.

9g. Ethics: Any academic fraud is subject to the disciplinary sanctions described in article 14 and 16 of the revised General Student Bylaws of the University of Puerto Rico contained in Certification 018-1997-98 of the Board of Trustees. The professor will follow the norms established in articles 1-5 of the Bylaws.

10. Campus Resources (If applicable):

Engineering workstations and CAD tools necessary in the elaboration of homework and term papers are located in S-2010B (Integrated Circuits Design Laboratory -- ICDL).

A. COURSE SYLLABUS

11. General Topics:

Topic	Lectures	Reference
1. Introduction	1.5	I.N./Ch. 1
2. Logic Design with MOSFETS	3	Ch. 1.
3. Review of MOS Transistor Theory	3	Ch. 2
4. Fabrication Process CMOS ICs	3	Ch. 3
5. MOS Transistor Modeling Using SPICE	1.5	Ch. 8
6. MOS Inverters: DC & Transient Response	4.5	Ch. 4, 5
7. Elements of Physical Design	1.5	Ch. 6, 14
8. Combinational & Sequential CMOS Design	3	Ch. 9, 10
9. Advanced CMOS Techniques	3	Ch. 9
10. Power, I/O, and Clock Design	3	Ch. 13
11. Design of High-speed CMOS Gates	3	Ch. 4
12. Introduction to HDLs	3	Apx. A
13. VLSI System Components	1.5	Ch. 11
14. CMOS VLSI Arithmetic Components	3	Ch. 11.
15. Reliability and Testing of VLSI Circuits	3	Ch. 15
16. Tests & Presentations	4.5	--
Total:	<hr/> 45 Hours	