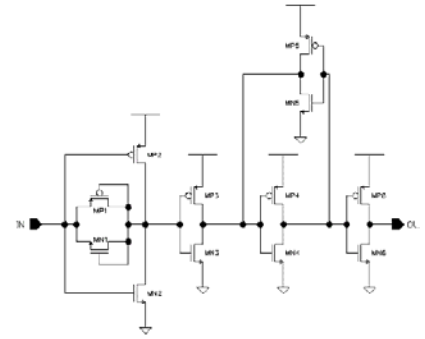


ECE 733: Digital Electronics
Spring 2006
Course Overview & Policies



Class Schedule: Monday, Wednesday, Friday, 12.50 – 2.05 pm, EB1 1005

Instructor: Professor Paul D. Franzon, Ph.D.
 Office: EGRC 443, (919) 515-7351
 E-mail: paulf@ncsu.edu
 Home page : www.ece.ncsu.edu/erl/faculty/paulf.html
 Office Hours: Monday, Wednesday 2.30 – 3.30; Friday 11.00-12.00 (EB2 2116)
 (Only on days with scheduled classes)

Lab TA/Graders: Announced on web site. Due to the size of this class, please use the wolfware bulletin board and the TAs as your first point of contact to resolve lab and HW questions.

Class Schedule: Though the schedule is three 75 minute lectures a week, only 26 lectures will be taught. Schedule classes that will be skipped will be announced each week in advance.

Textbooks & Notes:

- W.J. Dally, J.W. Poulton, Digital Systems Engineering (Cambridge), ISBN 0-521-59292-5

References include the following:

- S-N Kang, and Y. Leblecici, CMOS Digital Integrated Circuits, ISBN 0-07-038046-5
- R.X. Gu, K.M. Sharaf, M.I. Elmasry, High Performance Digital VLSI Circuit Design, ISBN 0-7923-9641-3

Course notes, papers, project assignments, etc.: The wolfware course locker will be used to distribute course notes, papers, and assignments. *Please make sure that you print the first set of notes before the first class from the website.* Also note that the notes distributed on-line are NOT the complete notes for the class. Classroom attendance and note-taking is expected.

You will find the course website and bulletin board on wolfware, as linked from the page www.courses.ncsu.edu/ece733. I emailed the class several times last week. If you did NOT receive these emails, check your “official” email address at www.ncsu.edu “directories” in the top right corner.

Prerequisite: Grade of C or better in ECE 746 or equivalent. Functionally, I am assuming that students are familiar with the basics of MOSFET operation and MOSFET circuit design, e.g. linear and saturation modes, and the design and operation of CMOS static logic gates. I will assume that you also have access to, and know how to use, a suitable circuit simulator, such as Hspice, and know how to perform schematic capture and simulation within the NCSU Cadence environment.

Course Objectives. Provide an in depth study of selected topics in the design of digital CMOS circuits, at the transistor level. Topics will include CMOS scalability; high-speed logic design; memory design; and high-speed I/O design.

Course Outcomes

- Student will understand the impact of technology scaling on circuit design
- Student will be able to describe the different types of high-speed circuit styles and how to design in them
- Student will be able to design a high-speed synchronous logic circuit to specifications
- Student will be able to describe how to design the different sub-circuits in memory blocks
- Students will be able to describe the factors that go into high-speed I/O design
- Students will be able to describe the different approaches to high-speed I/O design
- Students will be able to design a high-speed I/O system to specifications

Course Projects: In order to provide an in-depth experience, you will also carry out two small design projects. The projects are not finalized yet but are likely to be a high-speed CMOS flip-flop design, and a CMOS transceiver design. An informal lab will be organized to provide active help for the projects and provide a forum

for evaluation of the projects. Though lab attendance is not required, little assistance will be available outside of the labs.

Software Requirements. You will need access at least to a Spice simulator for this course, and preferably also a schematic capture tool. On campus students will be encouraged to use Hspice, and Composer. Off campus students will be given access to these tools but can also use their companies or third party tools (e.g. <http://www.duncanamps.com/spicesim.html> lists a number of free Spice tools).

Student Evaluation. You will be evaluated as follows:

- *Homeworks.* There will be a small number of homeworks to force review of specific issues. (20%)
- *Midterm.* (20%)
- *Projects.* You will be individually graded on two small projects. Each project is worth 20% of the grade. (40%).
- *Final exam.* On material covered since the midterm. (20%)

Midterm Exam	March 17	In class
Final Exam	Monday, May 1	tbd

Collaboration is encouraged on the homeworks and projects but you are expected to turn in individual solutions and reports. The exams will be open-book, open-notes, multiple-choice exams.

Important Dates

- No class on Jan 16, Mar 6-10, Apr 13-14. Other no-class dates to be announced on the class website.
- Last date to drop ECE 464 : February 20
- Last day to drop ECE 520 : March 17
- Last class : April 28

Instructor Research Interests

- Application specific processors. Current projects are in network security and speech recognition.
- Interconnect, including transceivers, electronic packaging, on-chip interconnect, optical & electronic interconnect, network switch ICs, MEMS-based interconnect.
- Nanocomputing – how to build the computers that will eventually displace or complement CMOS.

Students with disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653. http://www.ncsu.edu/provost/offices/affirm_action/dss/ For more information on NC State's policy on working with students with disabilities, please see http://www.ncsu.edu/provost/hat/current/appendix/appen_k.html

Academic integrity

All the provisions of the [code of academic integrity](#) apply to this course. In addition, it is my understanding and expectation that your signature on any test or assignment means that you neither gave nor received unauthorized aid.