Fall 2010

CEG 360/560-01: Digital System Design

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WRIGHT STATE College of Engineering and Computer Science
UNIVERSITY Department of Computer Science and Engineering

Digital System Design

CEG 360/560 - EE 451/651

Fall Quarter, 2010

Professor: Travis E. Doom, Ph.D.
   Professor's Office: 331 Russ Engineering Center
   Office Hours: 3:45-4:45 T R. Other office hours by appointment (via email).
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Room & Time:
   Section 01: 2:15 - 3:30 T R 155 Russ

Laboratory: 357 Russ Engineering Center

Course Description:
   Design of digital systems. Topics include flip-flops, registers, counters, programmable logic
   devices, memory devices, register-level design, and microcomputer system organization. Students
   must show competency in the design of digital systems. 3 hours lecture, 2 hours lab. Prerequisite:
   CEG 260.

Textbook:
   Required: Vahid, Frank (2007). "Digital Design", First Edition, John Wiley and Sons, ISBN 978-
   0-470-04437-7.
   Reference: Mano, Morris and Kime, Charles (1997). "Logic and Computer Design Fundamentals",
   any edition, New Jersey: Prentice-Hall, ISBN 0-13-031486-2 (2e), 0-13-140539-X (3e).

Prerequisites: CEG 260 or equivalent
   1. Fundamentals of Boolean Algebra, including the minimization of logic functions to SOP or POS
      form.
   2. Analysis of logic circuits.
   3. The design and testing digital designs using SSI and MSI components.
   4. Optimizations techniques to minimize gate count, IC count, or time delay.
   5. The design and use of simple memory devices and sequential circuits
   6. Decoders, multiplexors, and bus logic.
   7. Documentation standards for logic designs.

Objectives: This course has two primary objectives. The first is content-based. We hope to teach students the fundamental principles of design for sequential digital devices. At the end of this course, each passing student should be able to:
1. Describe all the basic types of flip-flops with their characteristics.
2. Describe the characteristics of standard sequential devices, including counters and registers.
3. Describe the characteristics of a variety of programmable devices, including PLDs, RAMs, and ROMs.
4. Discuss basic microcomputer organization.

The second objective is skill-based. Students will exercise their ability to apply these principles in practical application though laboratory projects. At the end of this course, each passing student should be able to:
1. Analyze a given sequential circuit, producing an appropriate state table and state diagrams.
2. Design sequential systems of moderate complexity to satisfy given specifications for function and predict its timing behavior.
3. Produce an appropriate state table and state diagrams for a sequential system.
4. Utilize CAD tools to implement and debug simulations of any combinational or sequential design of moderate complexity.
5. Rigorously apply accepted standards to document sequential logic designs to their work.

Grading: A student's demonstration of their ability to discuss issues, solve problems, and demonstrate mastery of digital design will be the underlying metric for the determination of a student's overall grade in this course. Students will be provided the opportunity to demonstrate their mastery through examinations and laboratory projects. Grades will be assigned on a standard A/90%, B/80%, C/70%, D/60%, F/60%- scale. Clustering of grades may cause the thresholds to be lowered; they will not be raised. The instructor reserves the right to fail any student who does not a student attain both a passing grade (70%+) in the laboratory and at least a grade of 50% on the final. The overall course grade will be the weighted sum of the three grades:

40%	Laboratory Projects	Labs #1-3: @ 30 pts.; Lab #4 @ 40
30%	1/2-Hour Examinations	3 (of 4) @ 34 pts. each
30%	Final Examination	100 pts.
332 pts. Total		

Retakes: Students who take this course a second time are strongly encouraged to also retake the laboratory. However, students who are re-taking this course and who have passed the laboratory component may choose to waive the laboratory with instructor permission. In this case, their overall course grade will be determined on the basis of all four quizzes (no drop) and the final (236 point total). Laboratory grades from previous quarters are never used in grade calculation.

Laboratory Projects: The laboratory projects are designed to help you learn the course concepts and are the primary course "homework". The laboratory projects may be very time consuming if you are not comfortable with the necessary concepts before beginning the project. Each lab consists of one or more "pre-lab" designs which must be turned in before your scheduled "in-lab" section where you will be asked to demonstrate and answer questions about your project.

Students must attend their scheduled lab section every week. This is the only time that a lab instructor is guaranteed to be present to sign-off in-lab demonstrations and to explain concepts necessary for the next pre-lab homework. Some pre-labs require that students have access to the laboratory tools. Student ID cards will permit access to the Lab in 355 RC at any time in which a scheduled lab section of CEG 260

or CEG 360 is not using the room. Students may perform their inlab work at home by installing the software that comes with the most recent version of the textbook.

Points will be deducted for projects submitted late. No points will be awarded for projects that are more than one week late. Corrupt files or other computer problems will not be considered a sufficient excuse to extend this deadline. It is your responsibility to back-up your work. I strongly suggest that you save your work to multiple storage media to aid in the recovery of corrupt files.

Examinations: Four 1/2-hour midterm examinations and one final examination will be administered as announced throughout the quarter. Midterm examinations are "extended homeworks" and are designed to encourage students to cover course material at a steady pace and to provide feedback throughout the quarter. All students may drop their lowest quiz grade automatically. Thus, make-ups of 1/2-hour examinations are only permitted for documented emergencies on two or more quiz dates.

It is neither possible, nor desirable, to discuss every nuance of the material covered in this course during our limited class time. Students should be aware that although we will discuss the most important materials in class, the textbook contains important facts that may not be discussed in class. Students should not only be able to discuss course concepts in detail, but they should also be able to demonstrate their mastery by applying these concepts on examinations to related problems with which they have no previous experience.

Undergraduate students: The examinations will be closed-book but undergraduate students may use one sheet of 8.5 x 11" notes (double-sided) as reference. Four such sheets may be used on the Final.

Graduate Students: Graduates students are expected to master this material and commit it fully to memory. Graduate students may not use notes during the examination.

Midterm examinations will occur at the normally scheduled class time and location unless announced otherwise in class. The final examination is cumulative and will take place during the university scheduled time period in the normally scheduled class location unless announced otherwise in class.

Course Assignments: The instructor will provide a number of opportunities for students to develop their mastery of the subject throughout the course through ungraded course assignments. Homework will be assigned at the end of each class period as recorded in the on-line class schedule. Homework assignments should always be completed as if they were to be turned in and added to the student portfolio. Students are encouraged to work on homework problems in collaborative groups.

Each student is expected to keep a portfolio of course material. This portfolio should consist of a 3-ring binder containing returned examinations, lecture and textbook notes, textbook problems corresponding the the assigned readings, documented excuses for absences, and other course material. Your *course portfolio* (in conjunction with your lab notebook) is the physical representation of your course effort and may be a factor in determining "border-line" grades; take care not to misplace it!

Students who follow the majority of the lecture material during class, complete the assigned readings and homework problems in full, and ask questions when confused will be well prepared to get a B on examinations. Exceptional students who, additionally, prepare for lectures by reading ahead, come to lectures with points of confusion identified in advance, spend time discussing class topics in small groups, and actively seek the answers to these questions both in lecture, via email, and during office hours are the most likely to achieve an A on examinations and in the course.

Academic Integrity : Student-teacher relationships are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the courses that they teach, and teachers must trust that the assignments which students turn in are their own. Acts which undermine this trust undermine the educational process. It is the policy of Wright State University to uphold and support standards of personal honesty and integrity for all students consistent with the goals of a community of scholars and students seeking knowledge and truth. Furthermore, it is the policy of the university to enforce these standards. The following recommendations are made for students:

1. Be honest at all times.
2. Act fairly towards others. For example, do not seek an unfair advantage over others by cheating with or by looking at other individual's work during examinations or laboratory assignments.
3. Take group as well as individual responsibility for honorable behavior. Collectively, as well as individually, make every effort to prevent and avoid academic misconduct, and reports acts of misconduct that you witness.
4. Know the policy -- ignorance is no defense. Read the policy contained in the student handbook. If you have any questions regarding academic misconduct, contact your instructor.

Students are encouraged to get together in small study groups to discuss the course topics and homework problems. Small group discussion and collaboration is a vital aid to mastering the concepts presented in this course. Modern designs are rarely the work of a single engineer! Being able to communicate and work in teams is a necessary skill for any computer engineer. However, **students must work on all graded course assignments and examinations on an *individual* basis**.

Conduct for Laboratory Assignments: Students may discuss "general concepts" of laboratories assignments with each other, but may not, under any circumstances, work with anyone on their actual implementation. If you work with other student on "general concepts" be certain to acknowledge the collaboration and its extent in the assignment. Unacknowledged collaboration will be considered dishonest. Sharing (or copying) schematics or datafiles (including work from previous quarters) is strictly disallowed. If the same work is turned in by two or more students I will consider all students involved equally culpable. *You are responsible for ensuring that other students do not have access to your work* - do not give another student access to your account, do not leave printouts in the recycling bin, pick up your printouts promptly, do not leave your workstation unattended, etc. If you suspect that your work has been compromised notify your instructor immediately.

Conduct for Examinations: The academic code demands that no student should have an unfair advantage over any other student during examinations. Thus, it is strictly forbidden for any student to refer to information from previous offerings of this course unless this information is provided by the instructor to all students fairly. Thus, the use of test banks of previous quizzes or asking questions about examinations or laboratory assignments to prior students is strictly forbidden.

Absences: Class attendance will not be a direct factor in your grade but will strongly effect the quality of your education. Students are expected to attend every class. Things may make less sense to students that do not attend class or arrive late. Students who miss class are responsible for the material or announcements presented. Any extenuating circumstances which impact on your participation in the course should be discussed with me as soon as those circumstances are known. Make-ups for laboratory demonstrates may be arranged if a student's absence is caused by documented illness or personal emergency. It is the student's responsibility to provide a written explanation (including supporting evidence) to the instructor in a timely manner. Students registering after the term begins are responsible for all missed assignments and cannot expect that due dates will be altered.

Additional Information: Copies of the transparencies used in lecture, supplementary textbooks, and additional course-related information are available in the laboratory for student reference. Information regarding assigned course readings, homework, and syllabus updates will be available via course web page. Students are responsible for reading this material on a weekly basis. Students that do not have active computer accounts or are otherwise unable to access the course WWW page should contact me.

Additional Needs: Students with disabilities or any additional needs are encouraged to set up an appointment at their convenience to discuss any classroom accommodations that may be necessary.

CEG 360/560 - EE 451/651 Web Page: http://www.wright.edu/~travis.doom/courses/CEG360

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