EE 2310 Course Syllabus – University of Texas at Dallas

Course Information: EE 2310 – Introduction to Digital Systems; Fall, 2016
Class Schedules: Section 001 – 11:30 AM-12:45 PM, TR, ECSS 2.415
Section 501 – 7:00-8:15 PM, TR, MC 2.410

Instructor: Dr. Nathan Dodge Tel: (972) 883-2951 email: dodge@utdallas.edu
Office: ECSN 4.916 Office Hours: T, R, 4:00-6:00 PM and by appointment
Instructors Website: http://www.utd.edu/~dodge/

NOTE: I DO NOT USE WEBCT OR eLEARNING. TO GET INFORMATION ABOUT EE 2310 YOU MUST GO TO THE WEBSITE LISTED ABOVE.

Course Pre-requisite: None. The only required prior knowledge or skill is a working ability in basic algebra and knowledge of some of the fundamentals of programming.

Course Description: This course covers principles of binary numbers, digital circuits and systems, assembly language programming, and an overview of computer architecture. It provides a background in basic technology areas that are required to understand computer architecture and design.

Student Learning Objectives/Outcomes: By the end of EE 2310, the student should have a firm basic knowledge of:

a. **Binary numbers**
b. **Combinatorial and sequential logic circuits**
c. **Boolean algebra and digital logic design**
d. **Assembly language programming**
e. **Computer organization and design.**

Required Textbook (must buy this book, paper copy only):

- **Computer Organization and Design, Fifth Edition, David Patterson and John Hennessy (Morgan Kaufmann, 2013).**

Strongly Suggested Additional Course Book (Note that this includes a text and a DVD of the circuit layout software):

- **LogicWorks 5, Capilano Computing Systems, Inc. (Addison-Wesley, 2009).**

Suggested Course Books (these are very helpful texts, and neither is expensive):

- **A Programmer's Guide to Assembler, Third Edition, William Pervin, (McGraw-Hill, 2010). Note: Some second edition copies may be available, and they are acceptable.**
- **Schaum's Outline of Theory and Problems of Digital Principles, Third Edition, Roger L. Tokheim, (McGraw-Hill).**

There are no other required or reference materials. All homework and practice exercises are available on-line at the instructor's website. In addition, supplementary review material ("test reviews") is also available on-line and will be worked in class during the test review period just prior to each semester test.

EE 2310 Session Schedule, Fall, 2016, Sections 001 and 501

Week of (Monday)	Session #	Lecture #	Text Chapter/Sect. References	Class Date	Topic
8/22	**1**	**1**	**PH 1 (for interest)**	**Aug. 23**	Class overview, history of computing.
	2	**2**	**PH 1; T 1-2**	**Aug. 25**	Binary, hexadecimal, and decimal numbers.
8/29	**3**	**3**	**PH 1; T 1-2***	**Aug. 30**	Signed binary numbers and binary codes.
	4	**4**	**T 4; PH C.1-C.3**	**Sept. 1**	Boolean algebra and combinational logic.
9/5	**5**	**5**	**T 5; PH C.5-C.6**	**Sept. 6**	Logic simplification using Karnaugh maps. Lab 1 brief.
	6	**6**	**T 8; PH C.7-C.9**	**Sept. 8**	More complex Combinational logic.
9/12	**7**	**7**	**T 9**	**Sept. 13**	Flip-flops, the foundation of sequential logic. Lab 2 brief.
	8	**8**	**T 9, 10 (Ignore iufo on counters!)**	**Sept. 15**	Registers, counters, and latch-based circuits.
9/19	**9**	**---**	**---**	**Sept. 20**	Test #1 review. TR #1 due, start of class.
	10	**---**	**---**	**Sept. 22**	**Test #1**
9/26	**11**	**9**	**T 10, 11**	**Sept. 27**	Test #1 recap; Designing sequential logic.
	12	**10**	**P 3, PH 2.5-2.10****	**Sept. 29**	Programming fundamentals; SPIM set-up, Lab. 3 brief.
10/3	**13**	**11**	**P 2-2.2, App. B & D, 6.4**	**Oct. 4**	More instructions, directives, and system calls. Semester design project brief.
	14	**12**	**P 3, class notes**	**Oct. 6**	System calls 5 and 8 and data memory Instructions. Lab 4 brief.
10/10	**15**	**13**	**P2.3, 4, App. B & D**	**Oct. 11**	Decision support instructions.
	16	**---**	**---**	**Oct. 13**	Reserved for review/programming.
10/17	**17**	**14**	**App. B & D**	**Oct. 18**	Shift and rotate, procedures, and the stack
	18	**15**	**App. D, class notes**	**Oct. 20**	Constructing loops in SPIM. Lab. 5 brief.
10/24	**19**	**---**	**---**	**Oct. 25**	Test #2 review. TR #2 due, start of class.
	20	**---**	**---**	**Oct. 27**	**Test #2.**
10/31	**21**	**16**	**---**	**Nov. 1**	Test #2 Recap; SPIM programming example and practice.
	22	**17**	**---**	**Nov. 3**	Final programming demonstration and bonus material. Lab. 6 brief.
11/7	**23**	**18**	**PH 4.1-4.3**	**Nov. 8**	Computer architecture: ALU design.
	24	**19**	**PH 4.4**	**Nov. 10**	ALU review; design of CPU control unit. Multicycle implementation.
11/14	**25**	**20**	**P 11-11.2, PH 4.5-4.8**	**Nov. 15**	Pipelined processors.
	26	**21**	**P 11.3, PH 5, 6*****	**Nov. 17**	Modern memory architecture.
11/21	**---**	**---**	**---**	**Nov. 22**	**Fall Break.**
	---	**---**	**---**	**Nov. 24**	**Thanksgiving.**
11/28	**27**	**---**	**---**	**Nov. 29**	Software practice session.
	28	**---**	**Class notes**	**Dec. 1**	Test #3 review. TR's 3a and 3b due, start of class.
12/5	**29**	**---**	**---**	**Dec. 6**	**Test #3.**

Abbreviations: P – Pervin, A Programmer's Guide to Assembler; T – Tokheim, Schaum's Outline of Theory and Problems of Digital Principles; PH – Patterson and Hennessy, Computer Organization and Design.

*** Appendices C, D, and E are on the CD-ROM which comes with the PH textbook.**

**** PH Chapter 2 is an excellent programming reference. *** Optional.**

Grading Policy: Grading will be on the following basis:

Homework		--	**10 %**
Test Review Sheets		--	**3 % (1 Bonus Point each)**
Lab Grades		--	**15 %**
Semester Design Project		--	**5 %**
Semester examinations	**#1**	--	**15 %**
	#2	--	**20 %**
	#3	--	**35 %**
Total		--	**103 %**

Grade ranges for EE 2310 are: A+: 97+ ; A: 93-96; A-: 90-92; B+: 87-89; B: 83-86; B-: 80-82; C+: 77-79; C: 73-76; C-: 70-72; D+: 67-69; D: 63-66; D-: 60-62; F: below 60.

Course & Instructor Policies: Homework and a copy of this syllabus are available on-line at the instructor's faculty home page (address shown above). All on-line material is in Adobe Acrobat® (.pdf) format. You will need Adobe Acrobat Reader to read pdf files. It may be downloaded from the UTD software web site (whose web address is: http://www.utdallas.edu/ir/local/index.html), or from the Adobe website (http://www.adobe.com/products/acrobat/readstep2.html).

Exams: Three exams will be given during the semester. **No make-up exams will be given, except under dire circumstances, such as (serious) illness.** Although 2310 sections 001 and 501 are taught on identical schedules, there will be no switching of class periods for test-taking purposes. **You must take each test at the time of the class session that you attend**. You may, however, attend the other class lecture if you have a conflict on a particular day with your usual lecture period.

Homework:

1. Homework is due on the dates shown on the homework schedule. Homework answers will be posted on-line after the due date. Homework is worth 15% of your final grade (counting the semester design project).
2. Note that **software homework 5** will be handed in as a paper homework at the beginning of class as usual, since it contains relatively simple programs, and paper copies are easier to check by our teaching assistants. **Homeworks 6 & 7** should be emailed as an attachment directly to the TA's as a Notepad text file, as this homework contains more complex problems that must have a check-run to verify their correctness.
3. "Test review sheets" will be worked in class during the test review class period. Test reviews are posted on-line and are basically a second type of homework. These are due at the beginning of the class period. Test review sheet answers are NOT posted on-line. The three reviews constitute a small bonus to your final grade. The test reviews must be shown to the instructor at the beginning of class, to receive a "check." The three test reviews are worth 3 points on your final grade, 1 point each.
4. Selected in-class exercise sheets may be turned in, for a +1-3 bonus on the next test. A few select class problems may not be worked in class, but assigned as bonus problems. Correctly completed, they can be worth up to 3 bonus points on the next test after the problem is turned in. Note that up to 5 bonus points on each test are allowed. If you earn more than five bonus points between tests, the additional points roll over to the next test.

Labs:

There are four digital circuit labs in EE 2310 which must be done in the lab room (ECSS 4.622). The labs are listed on the EE 2310 web site (labs 1-4). You will do labs on your own, write the lab reports, and turn then in on the due date shown. Late lab reports are not accepted. You will work with a lab partner, and each lab team will submit a single lab report. Partners must take turns writing the lab report. The initial EE 2310 class period will include a lab introduction. There are also two software assignments that count as labs, but no report is required for these two exercises. The team simply works together on the software problem and emails one completed program to the TA for grading. Labs count 15 % of your final grade. BE SURE TO PUT BOTH PARTNER'S NAMES ON THE PROGRAM! Note: Although labs require only one input per team, all homework must be submitted by each student. You may, however, work on a homework assignment with your lab partner if you wish.

Notes on Semester Project:

1. The semester project is a digital logic project that you will design per a specification.
2. The design must be done using a computer layout tool. LogicWorks ™ (see list of texts above) can do this very well.
3. Although you do not have to purchase LogicWorks, #2 still applies. You may use another tool (such as Pspice) if you have access to it. Some students have even used Word Draw, although this can be very tedious. If you choose not to purchase LogicWorks, some free layout software tools are listed on the 2310 website.
4. You may work with your lab partner on the design and construction of your project if you wish, but in this case, each person must submit a design, as this is homework and not a lab exercise.
5. **Late semester projects are not accepted.** You are allowed plenty of time to complete this project, so it is expected that you will submit it on time.

Class attendance:

You are expected to attend class to be sure that you can master all the (considerable) course material by the end of the semester. Although points are not usually deducted for lack of attendance, it **can** be done in particularly abusive circumstances. **More importantly, if you do not attend EE 2310 classes regularly, you will fail.**

Classroom citizenship, etc.):

Proper classroom deportment for engineering students is taken for granted. When you enter the classroom, speak in hushed tones if you are carrying on a loud conversation. **MAKE SURE YOU TURN OFF YOUR CELL PHONE.** Do not listen to mp3 players, Ipods, etc., in class. Students found playing computer games in class will be criticized, ridiculed, and possible have points taken off their next test grade! **Note: Keep your laptop turned off unless advised otherwise by the instructor.** Students are not allowed to have laptops operating, except during the lectures on Assembly language programming. During software lectures, students will be allowed to use their laptops at appropriate, **designated** times.

Field Trip Policies and Off-campus Instruction and Course Activities: No off-campus activities in this course.

Student Conduct & Discipline:

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, *A to Z Guide*, which is provided to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the *Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3*, and in Title V, Rules on Student Services and Activities of the university's *Handbook of Operating Procedures*. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391).

A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

Academic Integrity:

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.

Email Use:

The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.

Withdrawal from Class:

The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

Student Grievance Procedures:

Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's *Handbook of Operating Procedures*.

In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates

(hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the deal will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties.

Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

Incomplete Grade Policy:

As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of **F**.

Disability Services:

The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m.

The contact information for the Office of Disability Services is:
The University of Texas at Dallas, SU 22
PO Box 830688
Richardson, Texas 75083-0688
(972) 883-2098 (voice or TTY)
Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.

Religious Holy Days:

The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment.

If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor

may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.

These descriptions and timelines are subject to change at the discretion of the instructor.