COURSE INFORMATION Fall 2012
60-265-01 Computer Architecture I: Digital Design
School of Computer Science, University of Windsor

***Instructor*:** Dr. Robert D. Kent
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Tel: 519-253-3000 ext. 2993

Lecture: Dillon Hall 361, Tuesday/Thursday 11:30AM to 12:50PM
Laboratories: Erie Hall 3119 Section 51 Tuesday 1:00pm-2:20pm
Section 53 Wednesday 1:00pm-2:20pm
Section 52 Thursday 1:00pm-2:20pm
Office Hours: Monday 12:00pm – 1:30pm, Wednesday 12:00pm – 1:00pm

NOTE: Only email originating from a valid University of Windsor student account will be accepted from students wishing to contact the instructor through email. All students must provide the course number and student ID in emails sent to instructors.

Laboratory Instructor: Dr. Robert Kent

Graduate Teaching Assistants:

GA	Office Hours	Lab
Arushi Arora	Wed 12:00-3:00pm	Thurs (alternate Wed)
Morteza Mashayekhi	Tues/Thurs 2:30-4:00pm	Tues (alternate Wed)

Calendar Description of Course:
60-265. Computer Architecture I: Digital Design
Number systems, switching algebra, logic gates, circuit minimization. Combinational circuits. Read-only memory, random-access memory, programmable logic. Synchronous and asynchronous sequential circuits. Latches, flip-flops, registers, counters, register transfer language. Digital integrated circuits. Hardware description languages. (3 lecture, 1.5 laboratory hours a week; plus unsupervised study and work on individual assignments.)

Pre-requisites:
Passing grade in 60-140. Students must be aware that courses may only be taken a maximum of two times in order to achieve a passing grade. Failure to obtain a passing grade upon the second attempt may require that the student withdraw from their program of study.

Last Date to Voluntarily Withdraw from a course: Wednesday, November 7, 2012.
Last day to voluntarily withdraw from Fall term courses. After this date students remain registered in courses and receive final grades as appropriate. Last day for partial tuition refund.

Purpose of the course and learning resources:
This course presents a variety of topics on the design and use of modern digital computers, including: Number systems, switching algebra, logic gates, circuit minimization. Combinational circuits. Read-only memory, random-access memory, programmable logic. Synchronous and asynchronous sequential circuits. Latches, flip-flops, registers, counters, register transfer language. Digital integrated circuits. Hardware description languages.

Required Textbook:

M. Morris Mano, Michael D. Ciletti. *Digital Design (With An Introduction to the Verilog HDL), 5th Edition,* Pearson, *2013.*

Lecture slides will be provided on the course website. Note that these notes may not be available until after they have been discussed in the lecture. In addition, a considerable amount of reading and independent studying of the textbook is required for this course. Examinations, Laboratories and other assigned work may involve design and programming for which details from the text will be useful, if not essential.

Teaching assistance provided

- The course instructor will give lectures and supervise the laboratories. He will directly supervise the marking of all tests and exams.
- The instructor will also be available for consultation on all course related matters. (see Office Hours)
- Graduate Assistants will also be available in the laboratories, and hold regular office hours

Student Contact

Students will have the opportunity to meet with the instructor and with other students through the following:

- Formal lectures every week.
- Formal laboratories every week.
- One-to-one or group consultations with instructor, as required.
- Discussion and interaction with other students, both face to face and through the Internet.

Course web site: http://cs.uwindsor.ca/60-265/

All students must attend lectures and laboratories regularly in order to learn effectively and achieve academic success. The website notes are abbreviated versions of the full notes given in the lectures. Students who do not attend lectures will likely have problems that cannot be dealt with during laboratory or office hours. Students who experience any difficulties attending lectures and laboratories should seek advice from the Instructor, or from the Academic Advisors.

Computing resources

The following computing resources will be available for students taking this course:

- A distributed-computing network, accessible through a graphic interface provided by computers located in dedicated laboratories on the 3rd floor of Lambton Tower and Erie Hall, or through PCs in an open laboratory in the Computer Centre, or, for students who have the necessary equipment, from home via networking capabilities.
- State-of-the-art, parallel-processing computer servers.

Student will be encouraged to work with easily discovered and downloadable software tools for circuit design and simulation testing. However, these software tools are not supported by Computer Science or the University of Windsor, and full responsibility for their installation and use rests with each student.

Work to be undertaken by students:

Preparation for lectures

Attendance at all lectures is highly recommended; indeed, attendance is viewed by the instructor as necessary for academic success. Some of the concepts covered may be difficult for some students and professors will attempt to

present the concepts in such a way as to make them easier to understand. Students should **read the assigned text chapters and course notes ahead of lectures.** The topic of each lecture will be discussed in advance, within the lectures. Lectures are not substitutes for student reading. **Students who do not read ahead may find themselves lost in the lectures. Students should come prepared to ask questions in the lecture, as well as ask questions about any material.**

NOTE: The Instructor strongly supports and invites direct interaction and discussion of the relevant course content during the lectures.

Laboratories and Project Work

There will be laboratories to attend and assigned exercises to be completed by individual students each week. There will be a single, larger scale project to be completed by each student working independently. The detailed requirements of the laboratories and project will be provided to students in the lectures, laboratories and on the course website.

Teaching Evaluation

Student Evaluation of Teaching (SET) forms will be administered during the last full week of the class schedule.

Weekly work schedule

In order to keep up with the work required for this course it is a good idea for students to write down a weekly schedule, such as the following, filling in the time and location column according to which sections you are in and when you can schedule reading time, etc.

Students should note that self-directed study is necessary in all University courses. The required textbook will be used and referenced extensively during the course and all students are required to read and study all material assigned. Additional material may be covered, or referenced, from other sources – students will be advised in such cases.

Task	**Duration (minimum)**	**Time(s) and location(s)**
Reading of lecture notes and text	3 hour	
Lectures	3 hours	
Laboratories	1 hour 30 minutes	
Assigned work	2-3 hours	
Weekly TOTAL (excluding revision for tests and exam)	8.5-9.5 hours	

Evaluation Scheme

Assessment of students taking 60-265 consists of various components, weighted as follows in the calculation of the final grade. Note that the class tests (Midterm Exams) will be held during the scheduled lecture times. The location of the final exam will be announced later by the Registrar. All communications during evaluation procedures must be in English.

Consistent with University Bylaws, no work will be assigned or become due during the last week of lectures.

Project Work	10%	Thursday November 22, 2012 (In Lab)
Laboratories	10%	Erie Hall 3119
Midterm Exam 1	20 %	Tuesday, October 23 In lecture
Midterm Exam 2	20 %	Tuesday, November 13. In lecture
Final Exam	40%	Thursday, December 13, 2012 8:30AM – 11:30AM, Location TBA

Students who wish to appeal the midterm exams, or laboratory or assignment marks should do so immediately after receiving their mark and within the time period specified by the instructor. For Final Examinations students must

follow the procedure outlined in the University Calendar for the appeal of a course grade. Numerical errors in adding marks on examinations or assignments or project will be corrected when identified and approved by the instructor. The instructor's decision will be final, subject to a Formal Appeal which must be done, following the course and final grade assignment and using the procedures outlined in the University Calendar and Senate Bylaws.

Makeup Exams and Absenteeism

In the event that a student misses an examination due to illness or other excuse, it is required that an official (ie. Registrar approved) **Student Medical Certificate** form be filled out and submitted to the instructor.

Students who miss the first midterm examination for an acceptable excuse will have their grade calculated based on the second midterm, reweighted to 30% and the Final Examination, worth 50%, plus the Laboratory (10%) and the Project (10%) components. Students who miss the second midterm examination for an acceptable excuse will have their grade calculated based on the first midterm, worth 20% and the Final Examination, worth 50%, plus the Laboratory (10%) and the Assignment (10%) components.

Students who miss both midterm examinations are advised to voluntarily withdraw from the course. It is the instructor's opinion, based on experience and past student performance, that students in such circumstances have essentially no chance for academic success and should repeat the course at the next opportunity.

Students who miss the Final Examination (with minimum weight 40% of the course mark) will not necessarily qualify for Aegrotat Standing. In the event of a legitimate excuse (eg. medical) for missing the Final Examination, a special Make-up Final Examination will be scheduled, with permission and approval of the Director of the School of Computer Science.

Students who do not submit Laboratory Assignments will receive a mark of zero (0) for each missed assignment.

Students who do not attend the Laboratory will receive a mark of zero (0) for each missed laboratory – although the instructors will take attendance in the Laboratory, it is the responsibility of each student to ensure their attendance is recorded – this applies to students who may come late to the lab, or leave early, and who miss the attendance recording. Note that the laboratory for this course is mandatory and students are expected to arrive on time and leave at the end of the laboratory period.

Students will earn 1 mark for each laboratory attended (and recorded) – there will be 10 labs. Students must complete the assigned lab work as a take-home assignment that will be marked in the lab period following each assignment (that is, one week to complete assigned work). All assignments are equally weighted. There will be 9 assignments. The final lab period will be used to view and assess student Project work. Thus, the total mark for Attendance is 10 and for Assignments is 90 and upon adding these two marks, the total is divided by 10 to yield the laboratory mark (out of 10). Note that students may be examined orally on the assigned laboratory work and evaluated, in part, based on verbal answers by teaching staff.

The mark for the Laboratory component will be calculated as follows: (Attendance + Assignments)/10.
The mark for the assigned Project will be out of 10 and assessed during the final laboratory.

All examinations and laboratory assignments will be marked by the Graduate Assistants, under direct supervision of the Instructor. The Project will be marked by the Instructor and Graduate Assistants, under direct supervision of the Instructor.

Course Grading

The final letter grade will be calculated from the raw scores using the following table:

≥ 93	<100	A+	≥ 63	<67	C
≥ 86	< 93	A	≥ 60	< 63	C-
≥ 80	< 86	A-	≥ 57	< 60	D+
≥ 77	< 80	B+	≥ 53	< 57	D

≥ 73	< 77	B	≥ 50	< 53	D-
≥ 70	< 73	B-	≥ 35	< 50	F
≥ 67	< 70	C +		<35	F-

Students must understand that the professor reserves the sole right to adjust the marks of the entire class at the end of the semester and before submitting grades to the Registrar. If such adjustments are made, they are made by adding a constant value to all student total marks before calculating the letter grade.

Students who obtain a mark that is just below a mark range lower limit will not have their mark adjusted to the next higher grade, **even if the difference is within 0.1 mark**.

University Regulations and Policies Concerning Final Examinations:

EXAM CONFLICTS DUE TO OBSERVANCE OF RELIGIOUS HOLY DAYS.

Students who are unable to write a final examination(s) during the regularly scheduled time slot because of a conflict with religious conviction must apply for the alternative examination(s) in the course(s) involved by the end of the normal add/drop period for the particular session. The Registrar's Office will schedule the alternative examination(s) for those students in another slot(s) within the regular examination period. Please download the appropriate form from http://www.uwindsor.ca/registrar and submit to the Office of the Registrar.

WRITING THREE OR MORE EXAMS ON THE SAME DAY.

A student scheduled to write three invigilated final examinations in one calendar day may apply to have one examination rescheduled on an alternate examination day. The determination of which examination shall be rescheduled and the date of the alternate examination (may be the last possible day of the examination period) shall be made by the Vice-Provost, Students and Registrar. Please download the appropriate form from http://www.uwindsor.ca/registrar and submit to the Office of the Registrar.

Note: These applications must be submitted by the end of the fourth week of classes.

Schedule of Topics:

The table below provides a list of topics and the week of lectures they will most likely be discussed. The selection of topics and level of detail is at the discretion of the instructor. Some topics may not be discussed, while others may be expanded.

Week		Topic(s)
1		Introduction, von Neumann architecture, Numeric representations **LABS BEGIN: Tues/Wed/Thurs, September 11/12/13**
2		Boolean Set Theory, Axioms, Algebra, Theorems
3-4		Digital functions and representations, simplification, Karnaugh maps, Combinational (static) and Sequential (time-dependent feedback) circuits, clocks
5		Micro-instructions, basic CPU elements
6		Instruction cycle, clock based control and sequencer based timing, decoder logic
7		Volatile memory (RAM), Flip-flop storage, bus architectures and multiplexers
8-9		Instruction architecture, Assembly language
10-11		Assemblers and object code, Assembly language programming: Examples **Project Due – Assessment during final laboratory**
12		Interrupts and subroutines, SET and Review

Policy on academic dishonesty (ie. cheating):

The professor and teaching assistants for 60-265 will put a great deal of effort into helping students to understand and to learn the material in the course. However, they will not tolerate any form of cheating.

The professors and teaching assistants will report any suspicion of cheating to the Director of the School of Computer Science. If sufficient evidence is available, the Director will begin a formal process according to the University Senate Bylaws. The instructor will not negotiate with students who are accused of cheating but will pass all information to the Director of the School of Computer Science.

The following behavior(s) will be regarded as cheating (together with other acts that would normally be regarded as cheating in the broad sense of the term):

- Copying assignments
- Allowing another student to copy an assignment from you and present it as their own work
- Copying from another student during a test or exam
- Referring to notes, textbooks, etc. during a test or exam
- Talking during a test or an exam
- Not sitting at the pre-assigned seat during a test or exam
- Communicating with another student in any way during a test or exam
- Having access to the exam/test paper prior to the exam/test
- Asking a teaching assistant for the answer to a question during an exam/test
- Presenting another person's work as your own
- Modifying answers after they have been marked
- Any other behaviour which attempts unfairly to give you an advantage over other students in the grade-assessment process
- Refusing to obey the instructions of the officer in charge of an examination.

All students will be required to sign a formal declaration that they have not cheated during the writing of each examination.

Instructor Comments:

Students learn best when they are fully engaged in learning. Many students become used to working independently and quietly and think that is the best way. It is only one way. In preparation for professional life, which very often includes a group activity, I strongly encourage students to mix and exchange ideas, questions and answers. Use the lecture as a discussion forum in addition to listening to the instructor present material – ask questions and answer them also. Practice your communications skills. Be prepared, organized and disciplined!

On a lecture-by-lecture basis you should organize your notes and study. Every weekend, take time to fully review the week`s learning activities, read ahead and review the entire course. By taking a layered approach to learning, you constantly re-emphasize important points and you will also come to realize where your weaknesses may lie so that you can take remedial actions early to build a strong foundation for success.

Characteristics of a University of Windsor Graduate:

A University of Windsor graduate will have the ability to demonstrate:

A. the acquisition, application and integration of knowledge
B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
C. critical thinking and problem-solving skills
D. literacy and numeracy skills
E. responsible behaviour to self, others and society
F. interpersonal and communications skills
G. teamwork, and personal and group leadership skills
H. creativity and aesthetic appreciation
I. the ability and desire for continuous learning

Students should understand that education and personal development result from the mutual investment of time and effort spent by both student and the instructional team. Without the full participation of all partners learning is less effective, so motivate yourself to do your best at all times.