

Intro and Outline

Related Resources:
Course Syllabus, [urcourses](http://urcourses.org) web site

Introductions: Me

- Instructor: David Gerhard
- Office: CW 308.8 or Lab: LB 143
- Phone: 585-5227
- Email: david.gerhard@uregina.ca
- Office hours (in CW308.8, occasionally LB143):
 - 10:00am-11:00am TR and 1:00pm-4:00pm W
 - Any time you find me, But I reserve the right to say I am busy.

Introductions: TA and LI

- Marker: TBA
- Lab Instructor: Guili Liu guili@cs.uregina.ca
 - ▶ Office hours in CL119
- Labs (in CL105):
 - ▶ Labs begin the week of September 13
 - ▶ 12 labs total
 - ➔ 7 logic labs; 5 Assembly language labs
 - ➔ last lab involves programming actual hardware
 - ➔ Lab Website:
<http://www.cs.uregina.ca/Links/class-info/201/>

Course Syllabus (on urcourses)

- Contains:
 - contact information
 - textbook information
 - course objectives
 - mark distribution
- This information will also be summarized now.
- assignment and exam expectations and notes on academic integrity are also available on URcourses

Course Objectives

- Computer Architecture
 - Starting from first principles, build a “complete” computer system
 - Understand much of the hardware in “modern” computer systems, phones, embedded devices etc
- Assembly language programming.
 - Understand low-level computer operation
 - ▶ Better high-level programming
 - Write assembly code for embedded devices
- Prepare for CS 301

Course Topics and estimated lecture hours

Topics	Description	Hrs
Boolean Logic	Boolean Algebra, Logic Functions Representations, Truth Tables, Logic Gates, Proving the Equivalence of Logic Expressions, Simplification of Logic Expressions, Physical Considerations (gate delays), Canonical and Standard Forms, Minimization through K-maps, Universal Gates (NAND and NOR), XOR and XNOR, Single Error Detection using the Parity Bit.	7
Combinatorial Circuits	Design Procedure, Arithmetic Circuits, Half and Full Adders, Decoders and Encoders, Multiplexers and Demultiplexers, Read Only Memory (ROM), Programmable Logic Array (PLA).	3
Sequential Circuits	SR and S'R' Latches, D Latches, JK flip-flop, Master Slave flip-flop, Sequential Circuit Design, State Table, State Diagram, Registers and Counters.	3

Topics	Description	Hrs
Computer Arithmetic	Bits, Bytes and Words, Unsigned and Signed Number Representations and Number Bases, Sign and Magnitude, 1's and 2's Complement, Addition, Subtraction, Overflow Detection, Pencil and Paper Approach for Multiplication and Division, Hardware Approach for Multiplication and Division, Booth Algorithm.	4
Intro to MIPS and SPIM	The von Neumann machine, Mini MIPS Instruction Set Architecture, Instruction Fetch, Decode and Execution, Introduction to SPIM, Assembly/ Machine Language Programming, Instruction formats, MIPS Program Structure and Statements, System I/O Services, Arithmetic and Logic Instructions, Load and Store Instructions, Jump and Branch Instructions, Addressing Modes.	8
MIPS Procedures and Data	Memory and Processing Subsystems, Multiplication and Division, Logic and Arithmetic Shifts, Simple Procedure Calls, Nested Procedure Calls, Stacks and Recursion, Memory Map, Data Types, Representation of Nonnumeric Data (character codes), Loading and Storing Bytes, Arrays and Pointers, Fixed- and Floating-point Systems.	9

How You Learn

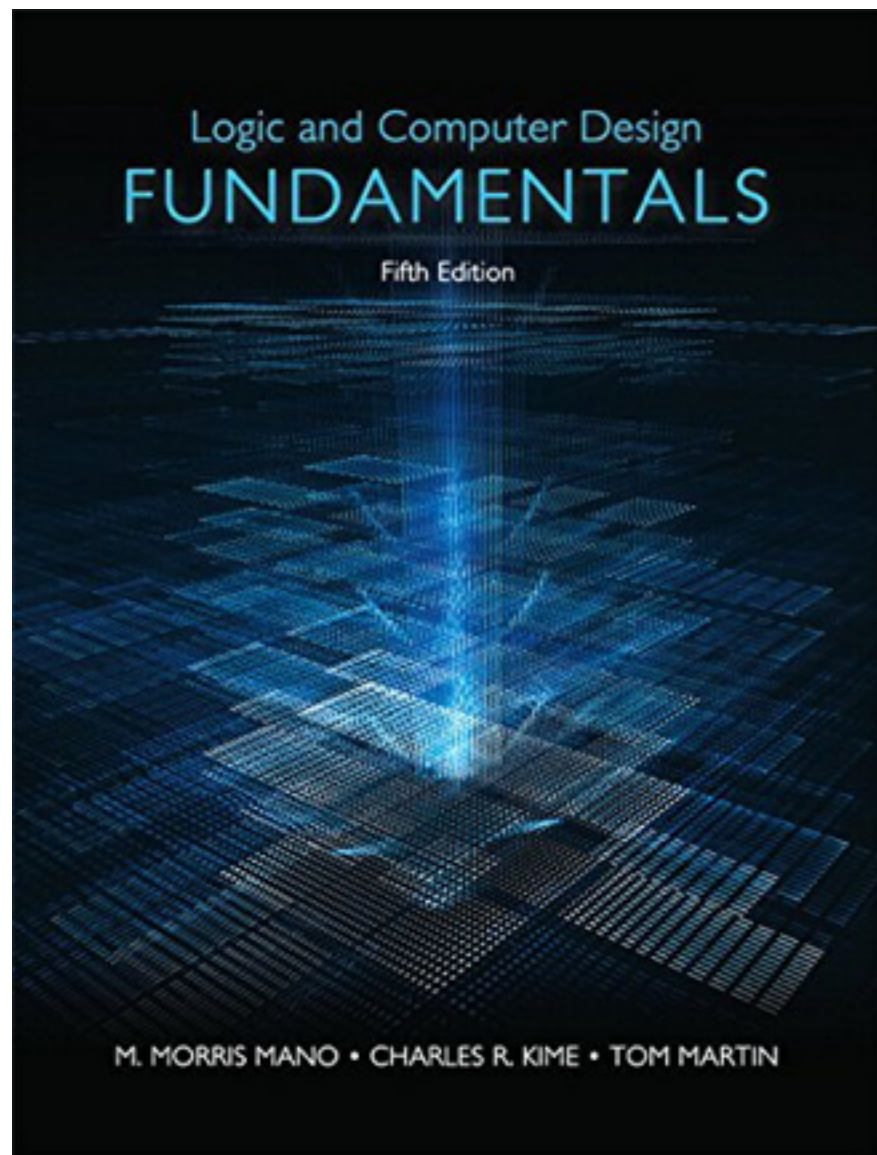
- (in other words, how you pass)
- Attend Lectures
- Read the Text
- Attend the Labs
- Do the Assignments
- Prepare for the Midterm
- Prepare for the Final exam

Attend Lectures

- Slides (like this)
 - also perhaps software demos, overheads...
- Bring lecture notes to class.
 - You can print them from URcourses
 - My notes may not be exactly as those available:
 - You may have to fill things in, so...



Read the Text

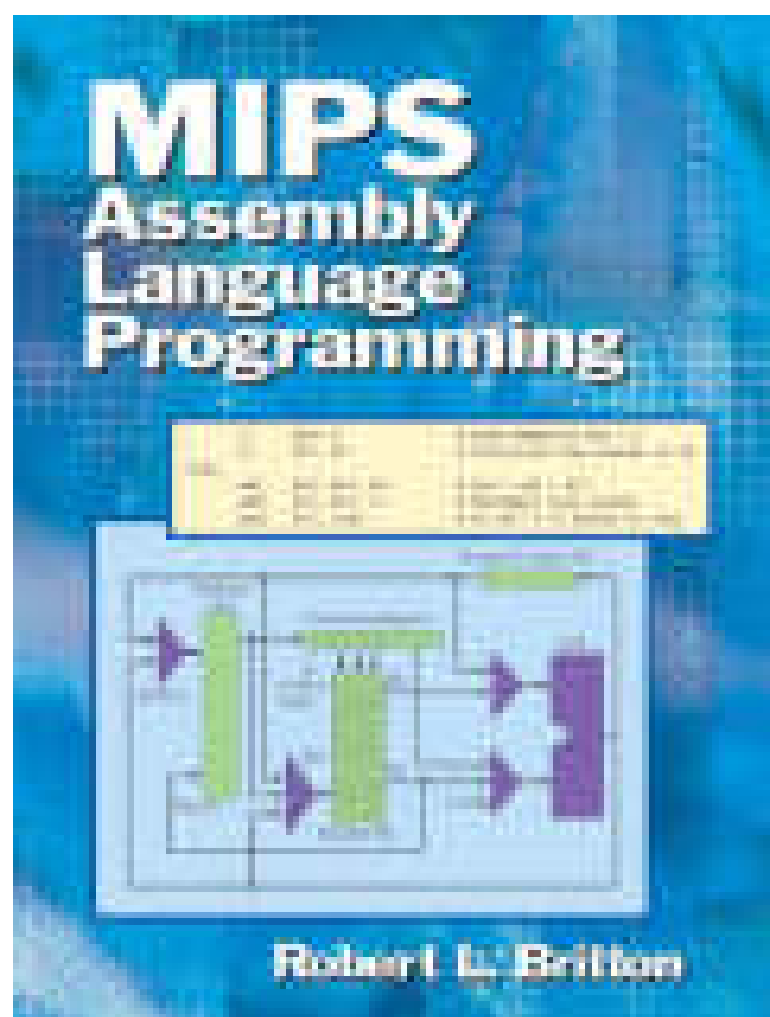


➔ Mano, Kime, and Martin (2016) *Logic and Computer Design Fundamentals*.

Prentice Hall

➔ 5th edition, older editions are OK too although page numbers are different

➔ Britton (2004) *MIPS Assembly Language Programming*. Pearson



- PDF versions might exist...
- Reserve copies in the library

Do the Assignments

- 6 (7) in total, one every couple weeks
- Don't put them off until the last minute
 - There may be more to it than you think
 - Labs / computing areas are always crowded before deadlines, servers are slow.
 - People (instructor, marker, LI) can give you more help when they're not busy
- Assignment 0: pass/fail, zero marks
 - practice submitting to urcourses
 - Due September 9 (yes, this friday) at 11:55 pm

Do the labs

- Learn by experience
- 12 labs in total
- Lab materials will also appear on exams and assignments

Section	Day	Time	Dates	Location
95	W	10:30 am-12:20 pm	09/07-12/06	CL 105
96	W	02:30 pm-04:20 pm	09/07-12/06	CL 105
97	T	10:30 am-12:20 pm	09/07-12/06	CL 105
98	R	10:30 am-12:20 pm	09/07-12/06	CL 105

Lab	Week of	Contents
1	Sept. 13	Introduction to LogicWorks 5
2	Sept. 20	Combinational Circuits
3	Sept. 27	Introduction to VHDL in LogicWorks 5
4	Oct. 4	Adders and Subtractors
5	Oct. 11	Sequential Design
6	Oct. 18	Sequential Adders & Subtractors
7	Oct. 25	Multiplier Circuit
8	Nov. 1	Part One: Introduction to SPIM (with basic I/O) Part Two: Arithmetic Operations and Debugging
9	Nov. 8	SPIM Control Flow Structures: Looping and Selection Control Structures
10	Nov. 15	SPIM Addressing Modes and Arrays
11	Nov. 22	SPIM Procedure Calls
12	Nov. 29	Run MIPS on Real Hardware: Counting Vowels

Exam Preparation

- Review the assigned readings and class notes
- Find alternative readings
- Review the assignments and midterm
- Review the software and labs
- Have questions for the instructor, marker, and LI
- Get together with your fellow students.
- ***Practice solving problems***

Midterm / Final Exam policy

- No aids of any kind allowed
 - No calculators, phones, watches etc
- If you require any special aid or disability aid:
 - it must be approved by the instructor before the exam.
 - you must bring proof of approval to the exam.
- You ***must*** show your student ID to write the exam.

* Midterm and Final Exam Dates *

- Midterm exam (75 minutes):
 - Wednesday, October 19
 - Regular class time, in this room.
- Final exam (3 h):
 - Wednesday, December 21, 9:00 am - noon
 - Probably in this room, but I'll confirm

Marks

- Labs: 12 @ $1 \frac{2}{3} \% = 20\%$
- Class Assignments: 6 @ $3 \frac{1}{3} \% = 20\%$
- Midterm: 20%
- Final Exam: 40%
- $\pm 5\%$ discretionary
 - in-class discussion, online forums, profiles etc. and general attitude

Marks

- To pass the course, you must:
 - Obtain a passing grade on the final exam, and
 - Obtain an overall passing grade.
 - If you pass the course material but fail the final exam, or if you do not write the final exam, you will receive a grade of NP for the course.
- Highly recommended:
 - complete all labs and assignments

Marking problems

- Must be reported *within two weeks*.
- If you disagree with the marking:
 - Contact the marker first.
 - If still unresolved, contact me.
- It is your responsibility to verify that marks have been recorded properly.

Online content

- urcourses:
<https://urcourses.uregina.ca/course/view.php?id=384>
- All course info will be available there
 - Syllabus, notes, announcements, discussion forum, due dates, assignments, marks, some sample solutions
- You must consult it regularly
- You will submit all assignments through urcourses

Assignments available today

- A0, as indicated
- Assignment 1 is also available today
 - Due Friday, September 16
 - Small, some looking ahead may be required
- Download the assignment from urcourses
 - Upload solutions by 11:55 PM on the due date
- Subsequent assignments will be larger

Assignment Tips & Hints

- Don't cheat. Think together, work apart
 - Check U of R policies: academic discipline.
- Submit the assignment on time (Friday at 11:55 pm)
 - No late assignments will be accepted.
- Read, understand and answer the questions being asked
- Use clear English. Use a drawing program for diagrams. Submit code as a separate text file.
Comment your code
- Submit as PDF, DOC(x) or RTF.

Assignment Tips & Hints (2)

- Typical marking categories:
 - Quality
 - ▶ Is the solution elegant and efficient, using material and tools covered in the course?
 - Correctness
 - ▶ Is the solution correct, does it behave accurately for given test cases?
 - Documentation
 - ▶ What is your development process? Have you justified your design choices?

Cheating and Plagiarism

- Submitting someone else's work as if it were your own
 - including internet content
 - exam, assignment, lab or anything else
- Allowing your work to be copied
- Submitting the same work for two courses
 - Unless specifically allowed by both instructors
- ***All instances will be reported to the Dean and added to your permanent record***
- Penalties range from 0 on the assignment/exam/lab to much, much worse.

Some Miscellaneous Stuff

- Be gentle with the marker and L.I. - they don't have unlimited time (unlike instructors)
- Cell Phone Policy
 - If it rings audibly in class, I get to answer it.
- Laptop Policy
 - ok for class-related content, otherwise I'll display what you were doing to the entire class.
 - ▶ avoid facebook, pokemon go, reddit, questionable content...

Ask questions in class!

- If no-one asks, I assume I have explained everything perfectly.
- If you have a question, others probably have the same question.
- These lectures seem clear to me. If they are not clear to you, let me know.