

Physics 335, Spring Quarter 2012

Electric Circuits II

Reading Assignments

Week 1 Reading 26 - 30 March

Textbook section 8.01 (overview of digital vs. analog), section 8.02 (for now, browse only the paragraphs under “high & low”, pp472-3), section 8.03 (number codes, especially “hex” numbers for the homework), section 8.04 (gates & truth tables), section 8.05 (discrete circuits for gates, especially note fig 8.8 appears in the lab next week), section 8.10 (TTL & CMOS input and output characteristics), section 8.11 (“3-state” & open-collector outputs).

Week 2 Reading 2 – 6 April

We talked in class about the confusing situation regarding the different voltages for input “true” and “false” for TTL and CMOS logic; this is summarized in textbook p. 475 “logic levels”. Textbook section 8.12 (overview of logic identities). Glance at section 8.14 (the discussion of the Transmission Gate...this is very useful for digital control of analog signals). Section 8.16 (sequential logic...the whole section is going to be covered...except the subtlety of master-slave vs edge-triggered). Section 8.18 (combining gates and flip-flops. In Glancing at flip-flops, note how cumbersome it is to divide by a non-power-of-2).

Week 3 Reading 9 – 13 April

Tuesday is more detail on sequential logic. In particular, we’ll cover the “D-latch” and the “J/K flip flop” pages 508-510 in the text (including the divide-by-2 page 510) in the text. Thursday we’ll talk about “ripple” versus “synchronous” counters. We’ll then make a clumsy “divide-by-n” counter, where “n” isn’t always a power of 2; note how cumbersome it is to divide by a non-power-of-2).

Week 4 Reading 16-20 April

Textbook section 8.20 and 8-22 (“one-shots”; monostables): Read especially the introduction (p. 517) and 8.20. Glance at the discussion

of retriggerability; there's a question about retriggerability on the homework. In lecture we'll discuss the 74121 (fig. 8.64). Personally, I rarely use one-shots; I tend to instead make digital delays (see "general considerations" p. 521).

Week 5 Reading 23-27 April

The Tuesday lecture will finish up latches (section 8.24) and counters (8.25). We'll then continue from last Thursday's lecture on interfacing digital with analog systems, starting with the Digital to Analog Converter (DAC); textbook section 9.16: we'll wrap up the "R-2R" type as that's most common. We'll then discuss Analog to Digital Converters (ADCs), with focus on the "flash" and "successive approximation" types. ADC's of the "flash" and "half-flash" types are on the homework.

Week 6 Reading 30 April – 4 May

We're heading into the second half of the course, where the focus shifts to micro-controllers. Start by reading the textbook pp 673-678; this is an overview of computer architecture. Then read textbook section 10.02; this is an introduction to assembly language programming. You can continue reading the textbook, but it moves into programming the Motorola 68k microcomputers, which we won't be using. Now shift reading to the PIC 16F84A datasheet on the course web site: Try to get an overview of this microcontroller. Page 1 is an overview of the chip's architecture. Section 1.0 gives a more detailed chip architecture overview. Section 2 describes the data and program memories. The data memory also includes "special function registers"; in lecture and lab, we'll only be using the PORTB and TRISB registers to light LEDs.

Week 7 Reading 7-11 May

Note there's an exam on Thursday. Reading: Continue looking at the PIC 16F84A datasheet. Section 7 describes the operation codes ("op-codes" or instructions). Figure 7.1 describes how instructions are "assembled" into binary instructions for downloading into program memory. Table 7.2 is the relatively short list of PIC instructions, look it over. Except for the strange instructions like SLEEP and RETFIE, you should be able to make sense of what the instructions do.

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