Course Description and Learning Outcomes:
This course has no prerequisites. No prior experience is required. You will learn to use
standard digital components to solve practical problems. The laboratory experience is a very
important part of the course; you will probably spend half of your time designing and
building actual circuits. Lecture topics include Boolean logic and algebra, flip-flops and
latches, digital counters, binary numbering systems, and BASIC Stamp microcontrollers.

Times and Places:
Lectures: in ISC 115 (old Greene), Tue and Thu 1:00–2:00pm
Labs: in ISC 215 (old Greene), Mon 3:00–5:00pm
Final: in ISC 115 (old Greene), Thu, May 9, 12:00–3:00pm
Office hours: Mon 1:30–3:00pm, Wed 2:30–4:00, Fri 1:30–2:30
I am also available at other times; see the schedule on my web site. Just stop by
my office, or to ensure that I’ll be there contact me by phone or email.

Required Materials:
Textbook: Bebop to the Boolean Boogie, by Maxfield
Laptop Computer: Required for some laboratories. Provided software requires Windows OS.
Software: Digital Works will be necessary for some homework assignments. BASIC Stamp
Editor will be necessary for several labs. Both are freeware, available from the course
web page. Both require a Windows OS, and have no known Macintosh equivalent.
Lab Manual: To be downloaded from the course web site each week.
Lab Materials: All necessary electronics will be furnished by the physics department as
needed. This equipment may not be taken out of the lab. If you want to work outside of
the lab, you are free to purchase your own equipment.
Lab Binder: A small three-ring binder and paper are recommended for the lab.

Required coursework (with fraction of final course grade):
15% Homework: due Fri at 5:00pm, with some weeks skipped later in the semester
2% Quizzes: a few, announced in advance
38% Exams: two during the semester and a final exam
15% Laboratory Exercises: one each of the first six weeks
30% Laboratory Projects: three multi-week projects, of progressively greater weight

Exam Schedule:
Exam 1: Tue, Feb. 26 in class
Exam 2: Tue, Apr. 9 in class
Final Exam: Thu, May 9 12:00 – 3:00pm

Computer Based Homework:
Homework will be administered through CAPA, the “Computer Assisted Personalized
Approach” system. You can access this either from the course’s main web page or
directly at <http://capa.geneseo.edu/>. Type-able answers will be entered via a web
browser. Questions requiring drawing, etc, will be presented online, but handed in using an appropriate format.
Note that if there is a system-wide problem with the network, due dates may be extended. However, individual computer difficulties will not be accepted as excuses for non-completion of assignments; the public computing resources at Geneseo are sufficient.

**General Comments:**
If you need to return materials to me outside of class, your best option is to bring it to my office. Slide it under my door if I’m not in.
If you must miss a test for a college-sanctioned reason, contact me before the exam. If you miss a test due to an emergency, contact me as soon as possible and with documentation. Absences that don’t fall into the above categories will result in a zero for the missed work!
SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional or learning disabilities. Students should consult with the Office of Disability Services (Tabitha Buggie-Hunt, 105D Erwin, tbuggieh@geneseo.edu) and their individual faculty regarding any needed accommodations as early as possible in the semester. Further information is available at <http://disability.geneseo.edu/>.

**Expected Schedule**
Order of lecture topics may be adjusted as we proceed. The exam dates are firm.

<table>
<thead>
<tr>
<th>Week of...</th>
<th>Monday Lab</th>
<th>Tuesday Lecture</th>
<th>Thursday Lecture</th>
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<tbody>
<tr>
<td>Jan 21</td>
<td>MLK Day</td>
<td>Analog vs. Digital; Voltage, Resistors, and LEDs; Digital Switch; TTL</td>
<td>Logic Gates; Truth Tables; Timing Diagrams; Boolean Expressions</td>
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<td>Jan 28</td>
<td>Lab 1: Tools and Chips</td>
<td>NAND &amp; NOR; Sum of Products; Boolean Simplification; DeMorgan’s Theorems</td>
<td>Designing logic circuits; Unsigned Binary Numbers</td>
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<td>Feb 4</td>
<td>Lab 2: NANDs, ‘Counting’</td>
<td>Karnaugh Maps; XOR &amp; XNOR</td>
<td>MUXes; MUX Expansion</td>
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<td>Feb 11</td>
<td>Lab 3: Multiplexers, 2-Way Motor</td>
<td>Active High/Low; Decoders; 7-Segment Displays; Latches; Debouncing</td>
<td>Transparent Latch; Triggering; Flip-Flops; Counting</td>
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<tr>
<td>Feb 18</td>
<td>Lab 4: Flip-flops, 7-Segment Displays</td>
<td>Clock Signals; BASIC Stamp concepts</td>
<td>Quiz 1</td>
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<td>Feb 25</td>
<td>Lab 5: Decade Counters</td>
<td>Exam 1</td>
<td>BASIC Stamp Commands</td>
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<tr>
<td>Mar 4</td>
<td>Lab 6: BASIC Stamp Basics</td>
<td>Current &amp; Resistors; Ohm’s Law; Unit Loads</td>
<td>Capacitors; BASIC Stamp Techniques; Presetting FFs</td>
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<tr>
<td>Mar 11</td>
<td>Lab A: Stamp circuit</td>
<td>Quiz 2; LEDs</td>
<td>Frequency Division; MOD Counters</td>
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<td>Mar 18</td>
<td>SPRING BREAK</td>
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<td>Mar 25</td>
<td>Lab A due</td>
<td>Input Sequences; Synchronization; Switching</td>
<td>Shift Registers; Series &amp; Parallel</td>
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<td>Apr 1</td>
<td>Lab B: Shuttle Launch</td>
<td>Rings; Menu Selectors; Schmidt clock</td>
<td>555 Oscillator</td>
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<td>Apr 8</td>
<td>Lab B</td>
<td>Exam 2</td>
<td>Low &amp; High Pass Filters; Two’s Complement Numbers</td>
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<td>Apr 15</td>
<td>Lab B due</td>
<td>GREAT Day</td>
<td>Adding Circuits</td>
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<td>Apr 22</td>
<td>Lab C: Student’s Choice</td>
<td>Multiplying Circuit; Fixed point</td>
<td>Edge Detectors; FF Internals; Transistors</td>
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<td>Apr 29</td>
<td>Lab C</td>
<td>NAND Internals; Chip Series</td>
<td>Analog to Digital Conversion; Aliasing</td>
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<tr>
<td>May 6</td>
<td>Lab C due</td>
<td>Electronics Manufacturing</td>
<td>Final Exam, 12:00–3:00</td>
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Homework Rules

These rules exist for my convenience in grading. Violating them will affect your grade.

For assignments requiring submission of files:
1) The file name must have the format lastname_assign#.xxx (e.g., mclean_3.dwm). Your full name must appear as text at the top of the submitted file.
2) When multiple questions call for the same file format (e.g., multiple Digital Works circuits), include all answers in a single file. Each answer must be clearly separated from the others and labeled with the question number.

For assignments requiring submission of paper:
3) Use 8½ × 11 inch paper. The paper edges must be straight (e.g., no spiral ring paper).
4) Use only one side of each sheet.
5) Put your name and the assignment number on the top of the first page (e.g., “Assignment #3”). Clearly indicate each question number.
6) Problems must be presented in the same order as on the assignment.
7) Work must progress down the page. Solutions should not be horizontally adjacent.
8) Use words and/or pictures when needed to clarify your method of solution.
9) Along with “answers”, you must provide an indication of what it is an answer to. Isolated answers are meaningless. For example, if the problem is to convert 27₁₀ to base 2, then simply writing “11011” is inadequate. At a minimum, you need to write “27₁₀=11011₂”.
10) Staple all your sheets together. No substitutions are permitted.
11) As in the real world, your goal on any assignment is to communicate the problem and solution to me such that I can focus on the work, with minimal attention to the presentation.

Recommended:
12) Use a pencil. Students using pens historically get lower homework credit, because assignments become illegible as mistakes do not get erased. Students using a word processor historically get much lower credit, because they usually leave out intermediate steps.

Laboratory

Scoring
- 150pts Completion of weekly lab exercises 1–6 (values increase with time)
- 80pts Timely progress towards and completion of project A
- 100pts Timely progress towards and completion of project B
- 120pts Timely progress towards and completion of project C

Requirements
Lab instructions will be available on the course web site at least 5 days prior to lab. These should be read and understood before coming to lab each week. If you have any questions on the material, be prepared to ask them at the beginning of lab. If you prepare a schematic solution before lab, you should be able to complete the single-week lab exercises during the scheduled laboratory period.

- All work must be completed individually.
- Completion of all labs is a requirement of the course. Failure to do so will result in a grade of E for the course.
- In the event that you do not complete a lab within the lab period, you will have to do the work outside of class time. However, labs MUST be completed and graded before noon of the day of the following lab period.