Course Syllabus
ECE 320L – Theory of Digital Systems laboratory
Department of Electrical & Computer Engineering

1. Course Number and Name: ECE 320L – Theory of Digital System Laboratory
2. Credit Units/Contact Hours: 1/3
3. Course Coordinator: Nagi El Naga

4. Text, References & Software
   Software: Capture CIS by Cadence (Previously known as “PSPICE, by OrCAD MicroSim Corporation”) Electronics Workbench (Student Edition) - A CD included with the text.

5. Specific Course Information
   a. Course Description
      In this lab, the students should acquire practical experience designing, circuit wiring, testing and troubleshooting digital circuits. As a result of taking this course, students should be able to:
      1. Design, implement using (integrated circuits (ICs)), test and troubleshoot logical combinational circuits.
      2. Design, implement using (integrated circuits (ICs)), test and troubleshoot logical sequential circuits.
      3. Design, implement using (integrated circuits (ICs)), test and troubleshoot registers and register transfer micro-operations.

   b. Prerequisite by Topic
      Capture CIS by Cadence (Previously known as “PSPICE, by OrCAD MicroSim Corporation”) Electronics Workbench (Student Edition) - A CD included with the text.

   c. Required Course

6. Specific Goals for the Course
   a. Specific Outcomes of Instructions – After completing this course the students should be able to:
      1. Design, implement using (integrated circuits (ICs)), test and troubleshoot logical combinational circuits.
      2. Design, implement using (integrated circuits (ICs)), test and troubleshoot logical sequential circuits.
3. Design, implement using (integrated circuits (ICs)), test and troubleshoot registers and register transfer micro-operations.

b. Relationship to Student Outcomes
This supports the achievement of the following student outcomes:

a. An ability to apply knowledge of mathematics, science, and engineering to the analysis of electrical and computer engineering problems.
b. An ability to design and conduct scientific and engineering experiments, as well as to analyze and interpret data.
c. An ability to design systems which include hardware and/or software components within realistic constraints such as cost, manufacturability, safety and environmental concerns.
d. An ability to function in multidisciplinary teams.
e. An ability to identify, formulate, and solve electrical and computer engineering problems.
g. An ability to communicate effectively through written reports and oral presentations.
k. An ability to use modern engineering techniques for analysis and design.
m. An ability to analyze and design complex devices and/or systems containing hardware and/or software components.
n. Knowledge of mathematics including differential equations, linear algebra, complex variables and discrete math.

7. Topics Covered/Course Outline
1. Experiment #1: PB-503 PROTO-BOARD
2. Experiment #2: Constructing a Logic Probe
3. Experiment #3: Number Systems
4. Experiment #4: Logic Gates
5. Experiment #5: Boolean Laws and DeMorgan's Theorem
6. Experiment #6: Logic Circuit Simplification
7. Experiment #7: Adder and Magnitude Comparator
8. Experiment #8: Combinational Logic Using Multiplexers
9. Experiment #9: Combinational Logic Using Demultiplexers
10. Experiment #10: The D Latch and D Flip-Flop
11. Experiment #11: Asynchronous Counter
12. Experiment #12: Analysis of Synchronous Counters with Decoding
13. Experiment #13: Design of Synchronous Counters
14. Experiment #14: Shift Register Counters

Prepared by:
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