Reedley College

Fall 2023
CSCI/ENGR-12
Digital Logic Design
Syllabus

Instructor: Simon Sultana, Ph.D.
Department: Computer Science/Engineering
E-mail: simon.sultana@reedleycollege.edu
Phone: (559) 638-0300 x3192
Response time: < 24 hours
Office Hours: Tues,Thurs 11am-12pm, 3pm-4pm (PHY-81), or by appt

Section Number: 51065/51059
Unit(s): 4
Dates: 8/7/2023 – 12/8/2023
Class Meeting: Tues 1-2:50pm, Thurs 1-3:20pm
Location: PHY-82

Prerequisites: MATH 3A – College Algebra for STEM

Course Description: This course introduces the fundamentals of designing digital computer hardware. The course covers: logic gates, binary number system, conversion between number systems, Boolean algebra, Karnaugh maps, combinational logic, digital logic design, flip-flops, programmable logic devices (PLDs), counters, registers, memories, state machines, designing combinational logic and state machines into PLDs, basic computer architecture, and hardware description programming. Lab assignments are design oriented.

We are able to offer this course via a two-way interactive format, meaning that students can join lecture meetings on campus or via Zoom. If you feel ill and don't want to miss lecture, this gives you the opportunity to still attend class. It is strongly recommended students attend labs in person (unless ill). Students are required to attend the exams (Tuesday, September 12; Tuesday, October 24; and Tuesday, December 5) on campus. Please let me know if you have any questions.

Course Goals and Student Learning Outcomes:
Upon completion of this course, students will be able to:
- Design combinational and sequential circuits using Boolean algebra.
- Design combinational and sequential circuits using Karnaugh Maps.
- Build binary memory using various types of latches and flip-flops.

Objectives:
In the process of completing this course, students will:
- Convert between decimal, binary, octal, and hexadecimal number systems.
- Perform two-level logic minimization using Boolean algebra and Karnaugh maps.
- Incorporate medium scale integrated circuits, such as decoders, encoders, and multiplexers, into circuit design.
- Design and analyze clocked sequential circuits.
- Apply latches and flip-flops in basic applications for data storage.
- Describe various types of memory parity and error correction algorithms.

Student Learning Outcomes are statements about what the discipline faculty hope you will be able to do at the end of the course. This is NOT a guarantee: the ultimate responsibility for whether you will be able to do these things lies with you, the student. In addition, the assessment of Student Learning

Outcomes is done by the department in order to evaluate the program as a whole, and not to evaluate individual faculty performance.

Required or Recommended Textbooks and Materials:
Textbooks:

Required: zyBooks, register and connect via Canvas before first meeting (cost: $64).
   A. Click on your zyBooks link in your learning management system
      (Do <u>not</u> go to the zyBooks website and create a new account)
   B. Subscribe

Learning Management System: CANVAS:

Canvas (https://scccd.instructure.com/) is used to post announcements, course information, programming assignments, and grade. You will submit your programming assignments on Canvas.
To log-in Reedley College CANVAS:
   Username: Your 7-digit student ID number.
   Password: If you have not previously changed your password, it is:

   First name initial (upper case) + *last name initial* (lowercase) + *date of birth* (mmddyy)
   Example: John Smith born on July 9th of 1988   Password = Js070988

Computer Lab:

Quartus Prime 15.1 and ModelSim-Altera 10.4b are used for this class. Software is provided in the lab.

Topics:

A. Number Systems
B. Logic Gates
C. Boolean Algebra and Simplification
D. Combinational Logic Analysis
E. Functions of Combinational Logic
F. FPGA Programming
G. Verilog Programming
H. Programmable Logic Devices
I. Decoders and Multiplexers
J. Binary Adder
K. Latches, Flip-Flops, and Timers
L. Shift Registers
M. Counters

Tentative Schedule:

	Assignment Points	Date
Week 1: Number Systems & Operations	**41**	**8/7/2023**
Class 1:00pm		8/8/2023
zyBooks Participation Activities	8	8/11/2023
Class 1:00pm - lab		8/10/2023
Lab: POGIL - Bits and Numbers Part 1	15	8/13/2023
zyBooks Challenge Activities	6	8/13/2023
Schedule One-on-One	12	8/13/2023
Week 2: Number Systems & Codes	**26**	**8/14/2023**
Class 1:00pm		8/15/2023

zyBooks Participation Activities	7	8/17/2023
Class 1:00pm - lab		8/17/2023
Lab: POGIL - Bits and Numbers Part 1	15	8/20/2023
zyBooks Challenge Activities	4	8/20/2023
Week 3: Intro to Digital Systems & Logic Gates	**35**	**8/21/2023**
Class 1:00pm		8/22/2023
zyBooks Participation Activities	11	8/24/2023
Class 1:00pm - lab		8/24/2023
Lab: Basic Logic Gates	20	8/27/2023
zyBooks Challenge Activities	4	8/27/2023
Week 4: Combinational Logic	**34**	**8/28/2023**
Class 1:00pm		8/29/2023
zyBooks Participation Activities	10	8/31/2023
Class 1:00pm - lab		8/31/2023
Lab: Boolean Reduction & Combinational Logic	20	9/3/2023
zyBooks Challenge Activities	4	9/3/2023
Week 5: Intro to Verilog	**25**	**9/4/2023**
Class 1:00pm	0	9/5/2023
zyBooks Participation Activities	5	9/7/2023
Class 1:00pm - lab		9/7/2023
Lab: Verilog	20	9/10/2023
Week 6: Mini-Project 1 & Exam 1	**140**	**9/11/2023**
Exam #1 1pm - PHY 82	**100**	**9/12/2023**
Class 1:00pm - lab		9/14/2023
Mini-Project 1	40	9/17/2023
Week 7: More Logic Gates & Simplification	**40**	**9/18/2023**
Class 1:00pm		9/19/2023
zyBooks Participation Activities	11	9/21/2023
Class 1:00pm - lab		9/21/2023
Lab: More Logic Gates	20	9/24/2023
zyBooks Challenge Activities	9	9/24/2023
Week 8: Adders & Comparators	**33**	**9/25/2023**
Class 1:00pm		9/26/2023
zyBooks Participation Activities	9	9/28/2023
Class 1:00pm - lab		9/28/2023
Lab: Adders & Comparators	20	10/1/2023
zyBooks Challenge Activities	4	10/1/2023
Week 9: Error Detection/Correction & Parity	**20**	**10/2/2023**
Class 1:00pm		10/3/2023
Class 1:00pm - lab		10/5/2023
Lab: Parity	20	10/8/2023
Week 10: Encoders & Decoders	**29**	**10/9/2023**
Class 1:00pm		10/10/2023
zyBooks Participation Activities	6	10/12/2023

Class 1:00pm - lab		10/12/2023
Lab: Encoders & Decoders	20	10/15/2023
zyBooks Challenge Activities	3	10/15/2023
Week 11: Multiplexers & Demultiplexers	**24**	**10/16/2023**
Class 1:00pm		10/17/2023
zyBooks Participation Activities	3	10/19/2023
Class 1:00pm - lab		10/19/2023
Lab: Multiplexers & Demultiplexers	20	10/22/2023
zyBooks Challenge Activities	1	10/22/2023
Week 12: Mini-Project 2 & Exam 2	**140**	**10/23/2023**
Exam #2 1pm - PHY 82	**100**	**10/24/2023**
Class 1:00pm - lab		10/26/2023
Mini-Project 2	40	10/28/2023
Week 13: Latches & Flip-Flops	**29**	**10/30/2023**
Class 1:00pm		10/31/2023
zyBooks Participation Activities	7	11/2/2023
Class 1:00pm - lab		11/2/2023
Lab: Latches & Flip-Flops	20	11/5/2023
zyBooks Challenge Activities	2	11/5/2023
Week 14: Counters & Timers	**23**	**11/6/2023**
Class 1:00pm		11/7/2023
zyBooks Participation Activities	3	11/9/2023
Class 1:00pm - lab		11/9/2023
Lab: Counters & Timers	20	11/12/2023
Week 15: Finite State Machines	**26**	**11/13/2023**
Class 1:00pm		11/14/2023
zyBooks Participation Activities	3	11/16/2023
Class 1:00pm - lab		11/16/2023
Lab: Pushbutton Debouncer & Garage Door Opener FSM	20	11/19/2023
zyBooks Challenge Activities	3	11/19/2023
Week 16: Shift Registers	**10**	**11/20/2023**
Class 1:00pm		11/21/2023
zyBooks Participation Activities	7	11/26/2023
No lab meeting this week - Happy Thanksgiving		**11/23/2023**
zyBooks Challenge Activities	3	11/26/2023
Lab: Shift Registers	20	12/1/2023
Week 17: ALU & Memory	**5**	**11/27/2023**
Class 1:00pm		11/28/2023
zyBooks Participation Activities	4	11/30/2023
Class 1:00pm - lab		12/3/2023
zyBooks Challenge Activities	1	12/3/2023
Week 18: Finals Week	**100**	**12/5/2023**
Exam #3 1pm - PHY 82	**100**	**12/5/2023**
Professionalism	20	
TOTAL	**800**	

Subject to Change:
This syllabus and schedule are subject to change. If you are absent from class meeting, it is your responsibility to check on any changes made while you were absent.

Evaluation:
Students will be evaluated on the basis of their performance on various assignments according to the following scale. The instructor reserves the right to adjust scores as it may be required throughout the semester.

Points in the course total 800 and are distributed as follows:

zyBooks Participation Activities	94
Lab Sets	270
zyBooks Challenge Activities	51
Exams	300
Mini-Projects	80
Professionalism/1:1	5

Final grade is assigned using following scale:

895-1000 points	A
795- 894 points	B
695- 794 points	C
595- 694 points	D
< 595 points	F

Attendance
Attendance for onsite and synchronous online meetings will be taken at beginning of each class. Students who leave before the end of class will be marked tardy. For synchronous online meetings you are expected to have your camera turned on and will have the best experience if you use earbuds/headphones. Please make sure to stay muted until you have a question or something to add so as to cut down on background noise.

Students will be dropped from the class if they fail to attend the first class session of the semester. During the semester up to final drop date, any student who missed two weeks of class meetings (cumulative) will be dropped from this class (i.e. 4 classes).

Make-up tests are limited to students who have planned with the instructor **prior** to the announced testing date or those students who have been excused by High School Attendance Office. Exam material is constructed from class discussions, assigned readings, guest lectures, video presentations, and special assignments. **Unless the student receives prior approval from the instructor, no make-up tests will be allowed.**

Grading Policy
zyBooks Participation Activities:
ZyBooks participation activities must be completed before announced due date (typically at start of class on Thursday for full credit, exception in the first two weeks). These activities allow you to actively engage each week's content. Points will be attributed according to the number of responses required and the percentage of the activities a student completes before class. Reference the following rubric:

Percentage Completed	Before Thursday Class Points Awarded	By End of Week Points Awarded
90%+	100% of points	90% of points
80%+	90% of points	80% of points
70%+	80% of points	70% of points
60%+	70% of points	60% of points
50%+	60% of points	50% of points
25%+	40% of points	30% of points
13%+	20% of points	10% of points

Lab Assignments/Class Activities:
Lab assignments are assigned before each lab session. A pre-lab is to be completed individually before the second weekly meeting. You can work in pairs or small groups and should usually be able to complete the lab assignment at end of the two-hour lab period. If groups need more time, the lab can be completed outside of the meeting time and are due by the end of the week. Turn in the lab assignment on LMS-Canvas. Submit your program (source code only, no executable file) and program input/output on LMS-Canvas.

Programming Project:
There will be additional mini-projects that will be completed outside the class sessions. The project will be announced in class.

Exams:
Exams will be administered during class time in weeks 6 (covers weeks 1-5), 12 (covers weeks 7-11), and 18 (cumulative, with emphasis on weeks 13-18). Exams will cover material as indicated. A late test can only be arranged if you have an excuse verified and request **before** the exam is administered.

Late Policy
Homework is to be submitted electronically in Canvas and all work must be shown for partial credit.
Work will not be accepted after week 17.

College Policies:
Cheating & Plagiarism, see Cheating and Plagiarism under Campus Policies:

Cheating and plagiarism is prohibited in the class. Incidents of cheating and plagiarism will result a failing grade on the particular assignment in question. Please see Student Conduct Standards at https://www.reedleycollege.edu/about/about-us/policies-and-procedures/student%20conduct%20standards.html for more information about academic integrity.

Each student is expected to assist in the overall environment of the classroom making it conducive to learning. Code created by external sources can be utilized with permission from the instructor and 1) must be properly documented so as not to plagiarize the work of others and 2) must not make up more than 10% of the actual code (exclusive of documentation) of the project.

It is expected each student will do his/her own work unless otherwise instructed. This course involves both individual work and collaborative work. It is your responsibility to understand the guidelines that apply to each kind of work, and to be clear about which assignments are individual assignments and which are collaborative.

Activities not designated as cooperative assignments in this course are to be done individually. Individual work is to be carried out entirely and solely by an individual. Take extreme precautions that your individual work is not viewed by other students. This includes deleting all your computer files from

public workstations when you are finished, retaining private permissions on your files, and not letting other students use your personal computer where you store your coursework.

In addition, the work you submit must be entirely your original creation. Using solutions from any other source is forbidden; in particular, using solutions (either instructors' or other students') from previous offerings of this or other courses is not allowed. Using solutions found on the Internet or getting help from online forums is not allowed.

Assignments which appear to be the result of a "group effort", or appear to have been copied from another student, will be considered plagiarized. Violations of this policy will be reported as violation of academic integrity per college policy.

In-class activities are designated as pair or team activities. Students will be assigned a partner or will self-assign to complete these activities. Be sure to use these collaborative activities as a chance to master the skills, as there will be quizzes in which each person must perform the skills individually.

Accommodations for Students with Disabilities
If you have a verified need for an academic accommodation or materials in alternate media (i.e., Braille, large print, electronic text, etc.) per the Americans with Disabilities Act (ADA) or Section 504 of the Rehabilitation Act, please contact the Reedley College Disabled Students Programs & Services (DSP&S) Department at (559) 638-0332. You can find more information at https://www.reedleycollege.edu/student-services/disabled-student-programs-and-services/index.html.

Reedley College is committed to creating accessible learning environments consistent with federal and state law. To obtain academic adjustments or auxiliary aids, students must be registered with the DSP&S office on campus. DSP&S can be reached at (559) 638-3332. If you are already registered with the DSP&S office, please provide your Notice of Accommodation form as soon as possible.

Important College Dates Fall 2023

Class begin	Monday	08/07/2023
Last day to drop a full-term class for a full refund	Friday	08/18/2023
Last day to register	Friday	08/25/2023
Last day to drop this class to avoid a "W" in person	Friday	08/25/2023
Last day to drop this class to avoid a "W" online	Sunday	08/27/2023
Last date to drop this class	Friday	10/06/2023
No classes, campus is closed		
Veterans Day	Monday	11/10/2023
Thanksgiving Day	Thurs-Friday	11/23-24/2023
Final Exam	Tuesday	12/05/2023