Advanced Digital Design – EENG484
https://coulston.github.io/Advanced-Digital-Design/index.html
Fall 2026

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Office: **BB 310E (Brown Hall)**
Office hours: **MWF 9:00 – 9:50**
Course Title: **Advanced Digital Design**
Course Meeting: Lecture MWF 9:00-9:50 310 East

Course Description: Explore hardware/software co-design by designing a data acquisition system in VHDL and interfacing it to a general purpose processor.

Textbook(s):
None, class notes will be provided through the term.

Course Objectives:
Design and build a data acquisition and control systems. In order to accomplish this, there are detailed objectives for specific topics:

1. Design and implement a complex, structured, synthesizable digital system that meets defined requirements.
2. Use contemporary software tools to debug a digital system design and verify that a digital system meets defined requirements.
3. Analyze and describe the timing, clock, and synchronization requirements for a given digital system.
4. Design and implement a digital system using a fully custom-built hardware solution, interfaced to a general-purpose processor.
5. Explore hardware/software co-design.

Homework: Homework is assigned from the course workbook available in Canvas and you will submit your answers in Gradescope. I will drop your lowest homework score from your final grade.

Office Hours: Given the large class sizes, office hours will get crowded. I may hold office hours in several different rooms concurrently to carry on conversations with different classes. When you are attending office hours remember you are in a professional space; please be considerate of the occupants in the adjacent offices, keep the hallways clear, and use your indoor voices.

Computers: We will be working with computers throughout this semester. Inevitably there will be problems that you will encounter. If a computer or its software is malfunctioning, then please report it. I want you to deal with HW/SW problems in a manner conducive to engineering students, deal with the lab staff in an objective and rational manner. The computer center staff works hard to keep our problems to a minimum. Establishing a positive relationship with them will help expedite solutions to any problems we may have. If there are major problems with the system during critical times, I will be made aware of them and will determine an appropriate course of action.

Topics Covered: See the main course web page for a timeline; changes may be made through the semester.

Labs: This class is designed so that the real learning will occur during lab. When a lab is assigned, lab sessions will be offered in place of lectures and held in Brown 305 with the instructor present to provide support. One or more teaching assistants will also offer support at times outside the class meeting time; these times will be posted on the class Canvas page.

Labs are not accepted late for any reason. You will be graded on what you have accomplished on the day the lab is due. Please, please start your work early. You are permitted, and highly encouraged, to work in teams of two.

The following table was provided by a former (strong) student as a rough guideline of how much time you should expect to spend on each of the labs. This is one person's experience; your milage may vary.

Lab 1	Enhanced PWM	3 hours
Lab 2	VGA to HDMI	12 hours
Lab 3	Acquire	12 hours
Lab 4	Acquire to Display	16 hours
Lab 5	Enhanced PWM with Zynq	6 hours
Lab 6	Acquire to HDMI with Zynq	16 hours

Your lab assignments will be evaluated using the rubric posted on Canvas. Your code will be evaluated on style and functionality.

- **Style** is a subjective measure which evaluates how effectively the solution was arrived at. The following are attributes which constitute good style practices.
  - Minimizing the amount of code (within reason).
  - Minimizing the amount of data storage (within reason).
  - Approach the problem in an obvious manner.
  - Breaking the problem into logical subcomponents.
  - Consistently use all upper-case letters for constants (#define's and constants).
  - Consistently use camel case for signals.
  - Consistently use camel case for entity names and the names of instanced. Any additional description of the entity or instance's name should be separated by an underline. For example, acquireToHdmi_datapath.
  - Using libraries to hold entity descriptions and constants.
  - Use named association of signal assignment in component instantiation, do not use positional association. Put one signal on each line and use open to declare unconnected signals.
- **Functionality** You will be asked to demonstrate that your program meets the functional requirements posted in the lab assignment.

Exams:
- Exams will be scheduled during the class meeting time,
- The academic integrity guidelines apply while you are taking the exam.

Makeup Exams: Makeup exams can be arranged. Prior arrangements are appreciated but if some major emergency should arise and you cannot make it to an exam it is your responsibility to:

- Contact me by email (coulston@mines.edu)
- Makeup exams must be taken within 5 business days otherwise you will receive a score of 0.

Please show me the same respect as you would like me to show you in complying with these guidelines.

Homework: Throughout the term I will administrate homework to test your understanding of material presented during lecture. Your lowest homework will be dropped from your final grade. No late homework will be accepted.

Grades: The grade you earn in this class will be based on the following distribution of points:

Exam 1	20%
Lab 01	5%
Lab 02	10%
Lab 03	15%
Lab 04	15%
Lab 05	5%
Lab 06	20%
Homework	10%

Grade	Upper	Lower
A	100	93+
A-	93-	90+
B+	90-	87+
B	87-	83+
B-	83-	80+
C+	80-	77+
C	77-	73+
C-	73-	70+
D+	70-	63+
D	67-	63+
D-	63-	60+
F	60-	0.0

Academic Integrity: The Colorado School of Mines affirms the principle that all individuals associated with the Mines academic community have a responsibility for establishing, maintaining and fostering an understanding and appreciation for academic integrity. In broad terms, this implies protecting the environment of mutual trust within which scholarly exchange occurs, supporting the ability of the faculty to fairly and effectively evaluate every student's academic achievements, and giving credence to the university's educational mission, its scholarly objectives and the substance of the degrees it awards. The protection of academic integrity requires there to be clear and consistent standards, as well as confrontation and sanctions when individuals violate those standards. The Colorado School of Mines desires an environment free of any and all forms of academic misconduct and expects students to act with integrity at all times. Academic misconduct is the intentional act of fraud, in which an individual seeks to claim credit for the work and efforts of another without authorization, or uses unauthorized materials or fabricated information in any academic exercise. Student Academic Misconduct arises when a student violates the principle of academic integrity. Such behavior erodes mutual trust, distorts the fair evaluation of academic achievements, violates the ethical code of behavior upon which education and scholarship rest, and undermines the credibility of the university. Because of the serious institutional and individual ramifications, student misconduct arising from violations of academic integrity is not tolerated at Mines. If a student is found to have engaged in such misconduct sanctions such as change of a grade, loss of institutional privileges, or academic suspension or dismissal may be imposed. For this course, the following rules should be followed.

- Copying of solutions without understanding them is not allowed; if a student copies a solution and cannot explain it adequately this is considered academic dishonesty.
- During quizzes and exams, students must do 100 percent of the work on their own.
- The nominal penalty for academic dishonesty is an 'F' in the course.

Disability Support Statement:
The Colorado School of Mines is committed to ensuring the full participation of all students in its programs, including students with disabilities. If you are registered with Disability Support Services (DSS) and I have received your letter of accommodation, please contact me at your earliest convenience so we can discuss your needs in this course. For questions or other inquiries regarding disabilities, I encourage you to visit disabilities.mines.edu for more information.

Absenteeism (from Undergraduate Bulletin)

Class attendance is required of all undergraduates unless the student has an official excused absence. Excused absences are granted for three general reasons:

1. Student is a varsity athlete and is representing the school in a varsity athletics activity.
2. Student is representing the school in an authorized activity related to a club or academic endeavor (academic competitions, student professional society conferences, club sport competition, program-sponsored competitions, etc.)
3. Student has a documented personal reason (illness, injury, jury duty, life-threatening illness or death in the immediate family, military service, etc.).

Students who miss academic work (including but not limited to exams, homework, and labs) for one of the reasons listed above may be issued an excused absence. If an excused absence is received, the student must be given the opportunity to make up the missed work in a reasonable period of time without penalty. While the student is not responsible for actually issuing the excused absence, the student is responsible for making sure documentation is submitted appropriately and for contacting his/her faculty member(s) to initiate arrangements for making up any missed work.