Course Syllabus

Course Information

EEDG/CE 6306.001
Application Specific Integrated Circuit (ASIC) design
Spring 2026

Time: Mondays and Wednesdays, 4:00-5:15 pm
Location: ECSN 2.126
Modality: Face-To-Face, In-Person

Professor Contact Information

Dr. Alice Wang
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Teaching Assistant Contact Information

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Office Hours:

I do not read e-Learning e-mails. Please use my UTD e-mail account above for any communications. If you are sending an e-mail, kindly start the subject line with the ***course number***.

Example:
To: alice.wang@utdallas.edu
Subject: EEDG/CE6306: What is a memory?

Course Pre-requisites, Co-requisites, and/or Other Restrictions

Prerequisites: (EE 3320 or CS4341) Digital Circuits. This course is designed for the first- or second-year graduate students. Attendants should have taken the undergraduate senior or graduate level courses in the area of VLSI design, VHDL and C language, and have the basic knowledge of VLSI CAD tools.

Having some experience with Verilog or VHDL is critical to success in this class. We will do a basic Verilog skills check in the first lecture.

Course Description

EEDG 6306, CE 6306 - Application Specific Integrated Circuits Design (3 semester credit hours) This course discusses the design of application specific integrated circuits (ASIC). Specific topics include: VLSI system design specification, ASIC circuit structures, synthesis, and implementation of an ASIC digital signal processing (DSP) chip.

Student Learning Objectives/Outcomes

Students will be working problems and employing methods, including but not limited to:

- CLO1: VLSI design flow
- CLO2: Custom and Semi-custom IC structures
- CLO3: Synthesis and CAD tools.
- CLO4: System specification development
- CLO5: Implementation of mini digital signal processing (DSP) chip

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Required Textbooks and Materials

- None

Suggested Textbook

- Modern ASIC Design", by Dian Zhou, ISBN 978-7-03-031766-7, Science Press, China, 2011.

Suggested Course Materials

- "Modern VLSI Design," by Wayne Wolf, Prentice Hall, ISBN 0-13-061970-1.
- "VLSI Design," by Michael Vai, CRC Press, ISBN 0-8493-1876-9.
- "Principles of CMOS VLSI Design," Neil H. E. Weste and Kamran Eshraghian, ISBN 0-201-53376-6.
- "Application-Specific Integrated Circuits," by Michael John Sebastian Smith, Addison-Wesley Publishing Company, ISBN 0-201-50022-1.
- "ASIC Design Implementation Process: A Complete Framework" by Khosrow Golshan, Springer, 2024, ISBN 978-3-031-58652-1
- "ASIC Design and Synthesis: RTL design using Verilog", by Vaibbhav Taraate, Springer, 2021, ISBN 978-981-33-4641-3

Assignments & Academic Calendar

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.

Lectures

L#	Date	Lecture	Due
L01	Wed, Jan 21	Introduction to ASIC design, Verilog skills check	
T01	Fri, Jan 23	Verilog and Modelsim Tutorial	
L02	Mon, Jan 26	Design Flows	HW#1 (Tues 1/27)
L03	Wed, Jan 28	ASIC specification	
T02	Fri, Jan 30	DC and Spyglass Lint Tutorial	
L03	Mon, Feb 2	ASIC specification	HW#2 (Tues 2/3)
L03	Wed, Feb 4	ASIC specification	
L03	Mon, Feb 9	ASIC specification	
L04	Wed, Feb 11	uArchitecture Design	HW#3 (Thurs 2/12)
L04	Mon, Feb 16	uArchitecture Design	
L04	Wed, Feb 18	uArchitecture Design	HW#4 (Thurs 2/19)
L05	Mon, Feb 23	Logic and Memory Design	
L05	Wed, Feb 25	Logic and Memory Design	
T03	Fri, Feb 27	Genus, LEC, CDC tutorial	
L06	Mon, Mar 2	Synthesis	HW#5 (Tues 3/3)
	Mar4 - Mar11	*No class - work on midterm project*	
	Mar16-Mar18	***Spring break - No class***	
	Mon, Mar 23	Midterm Presentations	Midterm (Sun 3/22)
	Wed, Mar 25	Midterm Presentations	
L06	Mon, Mar 30	DFT and production test	
L07	Wed, Apr 1	Physical Design	
T04	Fri, Apr 3	Innovus, DRC and LVS tutorial	
L07	Mon, Apr 6	Physical Design	HW#6 (Tues 4/7)
L07	Wed, Apr 8	Physical Design (Sign-off, STA, PV)	
L08	Mon, Apr 13	Special topics in PPAS optimization	HW#7 (Tues 4/14)
	Apr15-Apr29	*No class - work on final project*	
	Mon, May 4	Final presentations	Final (Sun 5/3)
	Wed, May 6	Final presentations	

HW#1	Verilog and Modelsim practice
HW#2	DC - practice synthesizing HW#1 code
HW#3	Traditional Convolution in C/C++/Python
HW#4	MSDAP algorithm in C/C++/Python
HW#5	MSDAP ALU microarchitecture, synthesis, simulation of RTL and gate netlist
Midterm	MSDAP top-level microarchitecture, single channel, LINT
HW#6	MSDAP two channel, synthesis, post-synthesis gatesims, LINT, CDC, LEC
HW#7	Integrate Memory Macros, Initial PnR, DRC and STA timing reports
Final	Tapeout: Final PnR, Post-PnR Gatesims, Sign-off (PV DRC, LVS, STA, LEC)

Grading Policy - Assignment Weight

Type	#
Homework	50%
Midterm project	20%
Final project	30%
Total	100%

Grading Scale

Score	Grade
93.0 - 100	A
90.0 - 92.9	A-
87.0 - 89.9	B+
83.0 - 89.9	B
80.0 - 82.9	B-
73.0 - 79.9	C
70.0 - 72.9	C-
60.0 - 69.9	D
Below 60.0	F

Course & Instructor Policies

Project

- Students are expected to implement a mini DSP chip for this semester using Verilog language.
- The project will be broken down into two parts (midterm project and final project).
- Assignments and Projects will be done in teams of 2. Only one team member will submit the project reports and both team members will get the same grade on the HW.
- If one of the team members has not contributed substantially to the assignment, leave their name off of the assignment and make a note in the report.
- There will be a midterm presentation and a final presentation.

Homework

- There are 7 homeworks due at various times during the semester. These homeworks will guide you along the progress of the project. Only one team member will submit the HW and both team members will get the same grade on the HW.

Late work

- If a situation occurs on campus, such as inclement weather, power outage, or network outage, or server problems, then assignments will be extended at the discretion of the instructor.
- Otherwise, no late assignment will be accepted.

Re-grade Policy

- After a grade is posted, students have one week to ask for a regrade. After one week, the grade stands.

Exams

- This class has no exams
- Because there is extensive Verilog coding in this class, Verilog coding is a prerequisite.

Course & Instructor Policies, continued

Inappropriate behavior is not acceptable.
This course is a lecture course at a branch of the University of Texas. The instructor does not care about the policies of previous courses, previous universities, or previous nations. The argument that a student's behavior was acceptable in another instructor's course or institution does not apply to the current course.

FORMAL NOTICE: No form of bias is permitted in this course, including the use of crude humor. Anyone harassing the instructor, grader, or fellow student with inappropriate comments will fail the course.

Comet Creed
This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

Cheating
Attempting to or succeeding in gaining an unfair advantage in the academic arena is an act of academic dishonesty. Plagiarism, Collusion, and Fabrication are three examples of cheating.

Plagiarism
"To submit to your instructor a paper or comparable assignment that is not truly the product of your own mind and skill is to commit plagiarism." The most obvious is quoting entire sections of a text or research paper and claiming it is original work. Be sure to cite your sources, and acknowledge the work of others, or learn how to paraphrase but do not forget to footnote.

Collusion
Giving your work out to another source, even if its "Please let me see your code. I promise I will not copy.." is collusion. This includes email, securing cloud services such as BOX or GitHub, even just handing off a thumb drive. Sometimes this is deliberate…sometimes one student has stolen another's work. Sitting down together with different machines and talking and discussing and comparing output is not collusion. Handing off entire completed assignments is collusion.

Fabrication
Submitting a result for a grade, and it turns out the references do not exist. Or writing a program that generates an output without performing any algorithm. For example, turning in a computer program with nothing but output statements while ignoring all the inputs and configurations required by the project is fabrication.

A Fourth Form Of Cheating, Theft
Many students use software and servers such as GitHub and Google Drive to manage documents and programming code. ***It is the responsibility of the student to ensure that their accounts are secure***. If one student has accessed the account of another student ***with or without*** permission, then both students will be considered culpable. Why? The first student for taking the information, and the second student for being negligent.

Class Materials

The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course, however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class, or uploaded to other online environments except to implement an approved Office of Student Accessibility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Class Attendance

The University's attendance policy requirement is that individual faculty set their course attendance requirements. Regular and punctual class attendance is expected. Students who fail to attend class regularly are inviting scholastic difficulty. In some courses, instructors may have special attendance requirements; these should be made known to students during the first week of classes.

Class Participation

Regular class participation is expected. Students who fail to participate in class regularly are inviting scholastic difficulty. A portion of the grade for this course is directly tied to your participation in this class. It also includes engaging in group or other activities during class that solicit your feedback on homework assignments, readings, or materials covered in the lectures (and/or labs). Class participation is documented by faculty. Successful participation is defined as consistently adhering to University requirements, as presented in this syllabus. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Class Recordings

Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student Accessibility has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the class, or uploaded to other online environments except to implement an approved Office of Student Accessibility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

The lectures will not be recorded on a regular basis.

Communication

This course utilizes online tools for interaction and communication. Some external communication tools such as regular email and a web conferencing tool may also be used during the semester. For more details, please visit the Student eLearning Tutorials webpage for video demonstrations on eLearning tools.

Student emails and discussion board messages will be answered within 3 working days under normal circumstances. Regularly check the discussion board to post questions and get answers to your questions.

Technical Requirements

In addition to a confident level of computer and Internet literacy, certain minimum technical requirements must be met to enable a successful learning experience. Please review the important technical requirements on the Getting Started with eLearning webpage.

Course Access and Navigation

This course can be accessed using your UT Dallas NetID account on the eLearning website. Please see the course access and navigation section of the Getting Started with eLearning webpage for more information. To become familiar with the eLearning tool, please see the Student eLearning Tutorials webpage.

UT Dallas provides eLearning technical support 24 hours a day, 7 days a week. The eLearning Support Center includes a toll-free telephone number for immediate assistance (1-866-588-3192), email request service, and an online chat service.

Server Unavailability or Other Technical Difficulties

The University is committed to providing a reliable learning management system to all users. However, in the event of any unexpected server outage or any unusual technical difficulty which prevents students from completing a time sensitive assessment activity, the instructor will provide an appropriate accommodation based on the situation. Students should immediately report any problems to the instructor and also contact the online eLearning Help Desk. The instructor and the eLearning Help Desk will work with the student to resolve any issues at the earliest possible time.

Academic Support Resources

The information contained in the following link lists the University's academic support resources for all students.

Please see http://go.utdallas.edu/academic-support-resources.

UT Dallas Accommodation Policy

The University of Texas at Dallas is committed to providing reasonable accommodations for all persons with disabilities. The syllabus is available in alternate formats upon request. If you are seeking classroom accommodations under the Americans with Disabilities Act (2008), you are required to register with the Office of Student AccessAbility, located in the Administration Building, Suite 2.224. Their phone number is 972-883-2098, email: studentaccess@utdallas.edu and website is https://studentaccess.utdallas.edu. To receive academic accommodations for this class, please obtain the proper Office of Student AccessAbility letter of accommodation and meet with me at the beginning of the semester."

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please review the catalog sections regarding the credit/no credit or pass/fail grading option and withdrawal from class.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

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