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EE 4252/4152 Introduction to VLSI
Course Policies and Syllabus Fall 2026
Ingram School of Engineering
Texas State University

Course:

Lecture:	Tuesday	6:00PM–7:50PM
IGRM02107		
Lab:	Thursday	6:00PM
Online: zoom		

Lecturer: Dr. Mozammel Hossain

Office:	Ingram School of Engineering – IGRM 02103
Phone:	512-779-0101
Email:	mozammel@txstate.edu (jfg103@txstate.edu), hossain_mozammel@yahoo.com
Office Hours:	T 7:20PM–8:00PM in person (make appointment) and Virtual with appointment

Class Teaching Assistant: Adedayo Alaga

Office:	Ingram School of Engineering – TBD
Email:	aalaga@txstate.edu
Office Hours:	T 5:30-6:00 PM – online (make appointment)
	Th 5:30-6:00 PM – online (make appointment)

Course Description:

The course involves introduction to the design of Very Large Scale Integrated (VLSI) circuits based on integration of various disciplines such as MOS devices and processing technology, integrated electronic circuits, digital logic, design disciplines and tools, architectures and algorithms. Every student will be required to complete a chip-level design project in current CMOS technology based on this kind of integrated approach. The laboratory is a required part of this course. Homework, Labs and project will require an extensive use of Microwind Layout Editor, DSCH Schematic Editor, Xilinx Vivado, Espresso, Icarus Verilog, MULTISIM and PSPICE/LTSPICE/WinSpice/Opus Spice.

Prerequisites:
EE 2420 Digital Logic and EE 3350 Electronics I

Textbook:

- Neil Weste and David Harris, *CMOS VLSI Design- Circuits and Systems Perspective*, 4th edition, Addison-Wesley, 2010, ISBN-10:0321547748.

References:

- Ivan Sutherland, BobSproull, David Harris, Logical Effort Designing Fast Circuits, The Morgan Kaufmann Series in Computer Architecture and Design, 1st edition, ISBN-13: 978-1558605572.
- David Harris, Skew-Tolerant Circuit Design, The Morgan Kaufmann Series in Computer Architecture and Design, 1st edition, ISBN-13: 978-1558606364.
- Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, *Digital Integrated Circuits: A Design Perspective*, Prentice Hall/Pearson, 2003, 2nd edition, ISBN-10:0130909963.
- John P. Uyemura, *Introduction to VLSI Circuits and Systems*, Wiley, 2001, ISBN-10:0471127043.
- John P. Uyemura, *Chip Design for Submicron VLSI: CMOS Layout and Simulation*, Cengage Learning, 2005, ISBN-10:053446629X.
- John P. Uyemura, *CMOS Logic Circuit Design*, Springer, 1999, ISBN-10:0792384520.
- J. Baker,*CMOS Circuit Design, Layout, and Simulation*, 3rd Edition,2010,Wiley-IEEE Press, ISBN10:0470881321
- Andrei Vladimirescu, *The SPICE Book*, Wiley, 1994, ISBN-10: 0471609269.
- M. H. Rashid, *SPICE for Circuits and Electronics Using PSpice*, Prentice Hall, 1995, ISBN-10:0131246526.
- H. Moore, *MATLAB for Engineers, Prentice Hall*, 3rd Ed., 2012, ISBN-10:0132103257.

Course Objectives:
Upon completion of this course, the student will be able to understand and apply fundamental skills to learn:

- CMOS manufacturing process
- CMOS design methodology IC layout
- The Devices
- CMOS design methodology circuit simulation
- The wire
- The CMOS inverter
- Designing combinational logic gates
- Design methodology complex logic gates simulation
- Design methodology layout techniques for complex gates
- Designing sequential logic Circuits
- Design methodology characterizing logic and sequential cells
- Designing arithmetic building blocks
- Design methodology design verification
- Verilog HDL

Assessment of Student Learning: Assessment will be performed by the course instructor. The course grade will depend upon performance in the tests, homework/quizzes, laboratory exercises, and various assigned work. The final letter grade will be determined by the student's raw score as well as by the performance of the class (class average and standard deviation) as a whole. Additionally, attendance policies may have an impact on the letter grade.

Homework and Quizzes: Homework will be assigned on a regular schedule. Late homework (submission required within 7days of original date) will be graded on 70% scale (unless it is the result of an officially excused absence). There will be occasional quizzes during the semester. Missed quizzes will not be made up (unless this is the result of an officially excused absence).

Exams: There will be three exams (including final exam). These exams are scheduled as indicated in the course calendar. The final exam will be cumulative, but with an emphasis on the material covered since the second exam. Missed Exams will NOT be made up unless this is the result of an officially excused absence.

Labs: Laboratories are to be completed by the day they are assigned. Late lab report (submission required within 7days of original date) will be graded on 70% scale unless this is the result of an officially excused absence.

Grading for Class:

Quiz	10%
Homework	20%
Exam I	20%
Exam II	20%
Final Exam	30%
Total	100%

Grading for Lab:

Labs	60%
Final Project	40%
Total	100%
A 90% –	100%
B 80% –	89%
C 70% –	79%
D 60% –	69%
F 0% –	59%

Texas State University *Student Handbook* explains: Grade A represents exceptionally high achievement as a result of aptitude, effort, and intellectual initiative. Grade B represents a high achievement as a result of ability and effort. Grade C represents average achievement. Grade D represents the minimum passing grade. Grade F represents unsatisfactory performance and indicates failure in the course.

Contribution to the Professional Component: This course develops professional skills and abilities in mathematics (linear algebra / matrix analysis, complex-number arithmetic, and time-frequency relationships), constructive circuit design, and procedures for verifying electronic designs with complex test equipment & computer simulations.

Working Together: It is ok to work together on homework. However, when it comes time for you to write up the solutions, I expect you to do this on your own, and it would be best for your own understanding if you put aside your notes from the discussions with your classmates and wrote up the solutions entirely from scratch. Working together on exams is not allowed.

Calculator: Students may use a graphing calculator on exams and homework. Students may not use a computer and/or tablet on exams.

Absences: You are expected to attend every class. Please read the exam, Lab and homework late policies carefully. An absence due to illness or family emergency may be excused, provided that you can supply acceptable written evidence if required, and that you notify your instructor *ASAP*. Notification is almost always possible immediately

upon occurrence of an emergency. If you're too sick to telephone, you can get a friend to do it. Failure to make such timely notification may result in denial of your request.

Students with Disabilities: If you are a student with a disability who will require an accommodation(s) to participate in this course, please contact me as soon as possible. You will be asked to provide documentation from the Office of Disability Services. Failure to contact me in a timely manner may delay your accommodations. Also the Office of Distance and Extended Learning is committed to helping students with disabilities achieve their educational goals. Students who require special accommodations need to provide verification of their disability to the Office of Disability Services, Suite 5-5.1 LBJ Student Center, 512.245.3451.

Expectations: I expect that everyone will maintain a classroom conducive to learning. I like an informal atmosphere, but it must be orderly. Thus, everyone is expected to behave with basic politeness, civility, and respect for others. In particular, talking in class is ok if it's part of a class discussion or with me. Private communications are not, especially during quizzes and tests. Neither are reading extraneous materials, using electronic equipment, or sleeping. Please read the following Appendices from Student Handbook.

- Appendix A: Hazing Policy
- Appendix B: Disruptive Activities Policy
- Appendix C: Alcoholic Beverages Policy
- Appendix D: Racial Harassment, Sexual Harassment, and Denial of Civil Rights
- Appendix E: Posting on Campus Policy
- Appendix F: Solicitation Policy
- Appendix G: Computer and Network Use Policy. Appendix H
- Policy for Handling Sexual Assaults

Suggestions: Suggestions for improvement are welcome at any time. Any concern about the course should be brought first to my attention. Further recourse is available through the offices of the Department Adviser and the Dept Chair.

Texas State Academic Honor Code (http://www.dos.txstate.edu/handbook/rules/honorcode.html): As members of a community dedicated to learning, inquiry and creation, the students, faculty and administration of our university live by the principles in this Honor Code. These principles require all members of this community to be conscientious, respectful and honest.

WE ARE CONSCIENTIOUS. We complete our work on time and make every effort to do it right. We come to class and meetings prepared and are willing to demonstrate it. We hold ourselves to doing what is required, embrace rigor, and shun mediocrity, special requests, and excuses.

Table 1: Tentative Course Schedule

Week	Date	Topic	Labs	Ch	Notes
1	Thu. 8/20	Class Logistics/ Syllabus Basic RC Circuits	Lab 1	Ch1	Introduction to LT Spice
2	Tue. 8/25	MOS Transistor & Logic Gates	N/A	Ch1	HW#1
2	Thu. 8/27	Lab: Logic Gates	Lab 2	Ch1	CMOS Gate Design in LT Spice
3	Tue. 9/01	MOS Transistor Theory	N/A	Ch1	HW#2
3	Thu. 9/03	Lab: Complex Logic Gates	Lab 3	Ch1	Complex CMOS Gate in LT Spice
4	Tue. 9/08	MOS Transistor Theory	N/A	Ch2	HW#3

4	Thu. 9/10	Lab: MUX & Decoder Design	Lab 4	Ch2	MUX & Decoder sch design
5	Tue. 9/15	CMOS Processing Technology	N/A	Ch2	HW#4
5	Thu. 9/17	Lab: Introduction to Layout	Lab 5	Ch2	Layout Design with Microwind
5	Tue. 9/22	Delay	N/A	Ch3	HW#5, **Quiz#1**
5	Thu. 9/24	Lab: Complex gate Layout	Lab 6	Ch3	Complex gate layout
6	Tue. 9/29	Delay	N/A	Ch4	HW#6
6	Thu. 10/01	Lab: Std Cell Layout	Lab 7	N/A	Std Cell Library for Project
7	Tue. 10/06	Power, MS Flip Flop	N/A	Ch4	**Exam I**, HW#7
7	Thu. 10/08	Lab: Std Cell Layout	Lab 7	N/A	Std Cell Library for Project
8	Tue. 10/13	Interconnect	N/A	Ch5	HW#8
8	Thu. 10/15	Project Kick-off: Full Adder	Project	N/A	Project
9	Tue. 10/20	Interconnect	N/A	Ch6	HW#9
9	Thu. 10/22	Project	Project	N/A	Project
10	Tue. 10/27	Combinational Circuit Design	N/A	Ch9	**Quiz#2,** HW#10
10	Thu. 10/29	Project	Project	N/A	Project
11	Tue. 11/03	Sequential Circuit Design	N/A	Ch9	HW#11
11	Thu. 11/05	Project	Project	N/A	Project
12	Tue. 11/10	Sequential Circuit Design	N/A	Ch10	HW#12
12	Thu. 11/12	Project	Project	N/A	Project
13	Tue. 11/17	Datapath Subsystems	N/A	Ch10	HW#13, **Exam 2**
13	Thu. 11/19	Project	Project	N/A	Project
14	Tue. 11/24	Array Subsystems		Ch11	HW14
14	Tue. 12/01	Project Presentation	Project	N/A	**Final Project**
15	Thu. 12/03	Reading Day			
16	Tue. 12/08	Final Exam 5:30PM – 7:30PM			**Final Exam (Cumulative)**

Honor Codebbb

All students are required to abide by the Texas State University honor code. The pledge for students states: Students at our University recognize that, to ensure honest conduct, more is need than an expectation of academic honesty, and we therefore adopt the practice of affixing the following pledge of honesty to the work we submit for evaluation:

I pledge to uphold the principles of honesty and responsibility at our University.

The complete honor code may be found at http://www.txstate.edu/effective/upps/upps-07-10-01.html under attachment I.

Academic Dishonesty

Academic honesty is fundamental to the activities and principles of a university. Any effort to gain an advantage not given to all students is dishonest whether or not the effort is successful. The University regards academic dishonesty as an extremely serious matter, with serious consequences that range from probation to expulsion. If it is determined that a student has cheated on an exam, he or she will be given 0 on the exam or a failing grade in the course regardless of the students' performance beyond the act of academic dishonesty.

Students with Special Needs

Students with special needs (as documented by the Office of Disability Services) should identify themselves at the beginning of the term and let the instructor know so that appropriate accommodations can be arranged.

Texas State Mission and Shared Values

Mission

Texas State University is a doctoral-granting, student-centered institution dedicated to excellence and innovation in teaching, research, including creative expression, and service. The university strives to create new knowledge, to embrace a diversity of people and ideas, to foster cultural and economic development, and to prepare its graduates to participate fully and freely as citizens of Texas, the nation, and the world.

Shared Values

In pursuing our mission, we, the faculty, staff, and students of Texas State University, are guided by a shared collection of values:

- Teaching and learning based on research, student involvement, and the free exchange of ideas in a supportive environment.
- Research and creative activities that encompass the full range of academic disciplinesresearch with relevance, from the sciences to the arts, from the theoretical to the applied;
- The cultivation of character, integrity, honesty, civility, compassion, fairness, respect, and ethical behavior in all members of our university community;
- A diversity of people and ideas, a spirit of inclusiveness, a global perspective, and a sense of community as essential conditions for campus life;

- A commitment to service and leadership for the public good;
- Responsible stewardship of our resources and environment; and
- Continued reflection and evaluation to ensure that our strengths as a community always benefit those we serve.

Campus Health, Wellness, and Safety

- Reminder on 10 Guiding Principles for Health, Safety, and Wellness at Texas State, including requirement to wear a cloth face covering and perform a self-assessment each day before coming to campus.
  - Mask up
  - Make space
  - Wash up
  - Cover up
  - Clean up
  - Stay home
  - Check yourself
  - Optimize ventilation
  - Set boundaries
  - Request additional modifications
- Importance of the Bobcat Pledge, including the shared responsibility to practice healthy behaviors and follow the health and safety guidelines, which shows respect for others and helps prevent the spread of COVID-19 on campus and in the surrounding community.
- Link to the Student Roadmap. for more information on students return to campus.

Statement on Civility and Compliance in the Classroom

Civility in the classroom is very important for the educational process and it is everyone's responsibility. If you have questions about appropriate behavior in a particular class, please address them with your instructor first. Disciplinary procedures may be implemented for refusing to follow an instructor's directive, refusing to leave the classroom, not following the university's requirement to wear a cloth face covering, not complying with social distancing or sneeze and cough etiquette, and refusing to implement other health and safety measures as required by the university. Additionally, the instructor, in consultation with the department chair/school director, may refer the student to the Office of the Dean of Students for further disciplinary review. Such reviews may result in consequences ranging from warnings to sanctions from the university. For more information regarding conduct in the classroom, please review the following policies at AA/PPS 02.03.02, Section 03: Courteous and Civil Learning Environment, and Code of Student Conduct, number II, Responsibilities of Students, Section 02.02: Conduct Prohibited.

Additional Information on Academic Integrity and Student Conduct

- Code of Student Conduct
- The Honor Code

Emergency Management

In the event of an emergency, students, faculty, and staff should monitor the Safety and Emergency Communications web page. This page will be updated with the latest information available to the university, in addition to providing links to information concerning safety resources and emergency procedures. Faculty, staff, and students are encouraged to sign up for the TXState Alert system.

Sexual Misconduct Reporting (SB 212)

Effective January 2, 2020, state law (SB 212) requires all university employees, acting in the course and scope of employment, who witness or receive information concerning an incident of sexual misconduct involving an enrolled student or employee to report all relevant information known about the incident to the university's Title IX Coordinator or Deputy Title IX coordinator. According to SB 212, employees who knowingly fail to report or knowingly file a false report shall be terminated in accordance with university policy and The Texas State University System Rules and Regulations.

WE ARE RESPECTFUL. We act civilly toward one another and we cooperate with each other. We will strive to create an environment in which people respect and listen to one another, speaking when appropriate, and permitting other people to participate and express their views.

WE ARE HONEST. We do our own work and are honest with one another in all matters. We understand how various acts of dishonesty, like plagiarizing, falsifying data, and giving or receiving assistance to which one is not entitled, conflict as much with academic achievement as with the values of honesty and integrity. **The Pledge for Students**

Students at our university recognize that, to ensure honest conduct, more is needed than an expectation of academic honesty, and we therefore adopt the practice of affixing the following pledge of honesty to the work we submit for evaluation:

I pledge to uphold the principles of honesty and responsibility at our university.

The Pledge for Faculty and Administration

Faculty at our university recognize that the students have rights when accused of academic dishonesty and will inform the accused of their rights of appeal laid out in the student handbook and inform of the process that will take place. The statement is as follows:

I recognize students' rights and pledge to uphold the principles of honesty and responsibility at our university.

Addressing Acts of Dishonesty

Students accused of dishonest conduct may have their cases heard by the faculty member. The student may also appeal the faculty member's decision to the Honor Code Council. Students and faculty will have the option of having an advocate present to insure their rights. Possible actions that may be taken range from exoneration to expulsion.

Academic Offenses

A. Academic work means the preparation of an essay, thesis, report, problem assignment or other projects which are to be submitted for purposes of grade determination.

B. Violation of the Honor Code includes, but is not limited to, cheating on an examination or other academic work, plagiarism, collusion and the abuse of resource materials. Cheating means engaging in any of the following activities:

   (a) Copying from another student's test paper, laboratory report, other report of computer files, datalisting or programs.

(b) Using, during a test, materials not authorized by person giving the test.

(c) Collaborating, without authorization, with another person during an examination or in preparing academic work.

(d) Knowingly, and without authorization, using, buying, selling, stealing, transporting, soliciting, copying, or possessing, in whole or in part, the content of an unadministered test.

(e) Substituting for another student or permitting another person to substitute for oneself in taking an examination or preparing academic work.

(f) Bribing another person to obtain an unadministered test or obtain information about an unadministered test.

(g) Purchasing, or otherwise acquiring and submitting as one's own work any research paper or other writing assignment prepared by an individual or firm. This section does not apply to the typing of the rough or final versions of an assignment by a professional typist.

C. Plagiarism means the appropriation of another's work and the unacknowledged incorporation of that work in one's own written work offered for credit.

D. Collusion means the unauthorized collaboration with another person in preparing written work offered for credit.

E. Abuse of resource materials means the mutilation, destruction, concealment, theft or alteration of mate-rials provided to assist students in the mastery of course materials.

Penalties for Academic Dishonesty Students who have been found responsible for committing academic dishonesty may be subject to:

A. Academic Penalties

(a) A requirement to perform additional academic work not required of other students in the course;

(b) A reduction to any level of the grade in the course, or on the examination or other academic work affected by violation of the Honor Code;

(c) A requirement to withdraw from the course with a grade of F or a W.

B. Disciplinary Penalties means any penalty that may be imposed in a student disciplinary matter pursuantto The Official Texas State Code of Student Conduct.

Procedures in Cases of Academic Dishonesty

A. *Initiation of Action:* When a member of the faculty reasonably suspects that a student under the faculty member's supervision has violated the Honor Code, the faculty member will follow these procedures. The faculty member's proceedings are informal and are not adversarial. The faculty member may consult with his or her chair regarding the matter.

B. *Faculty Disposition:* The faculty member will summon the student orally or in writing to a private, personal conference. At the meeting the faculty member will explain to the student both the suspected code violation and the evidence that supports the suspicion that the violation occurred. The faculty member may rely on documents and other written statements. If the faculty member relies on documents or written statements, the faculty member will provide the student with copies of such documents.

(a) The faculty member will give the student at least three calendar days to respond to the suspected code violation. The student may respond in writing or in person at a subsequent meeting with the faculty member, as determined by the student. The student may be represented by legal counsel at any meeting.

(b) If the student fails to respond in the time that the faculty member provides, the faculty member may proceed to determine the matter as provided below.

(c) The faculty member, after considering the evidence and the student's response, will determine whether the student violated the Honor Code and will notify the student of his or her determination and of any academic penalty assessed. The faculty member will also advise the student that the student may accept or reject either the faculty member's determination or any academic penalty.

a. If the faculty member is not convinced that the student violated the Honor Code, the matter will end.

b. If the faculty member is convinced that the student violated the Honor Code, the faculty member may assess an academic penalty as defined in Section 2.04.

c. In addition to an academic penalty, a faculty member may recommend additional disciplinary action.

(d) On the Honor Code Review Form, the faculty member shall:

a. note his or her determination and any academic penalty;

b. note any additional disciplinary penalty recommended;

c. give the student an opportunity to indicate the student's acceptance or rejection of the faculty member's determination;

d. sign and date the form; and

e. deliver the form to the Coordinator of Student Justice with copies to the student and faculty member's dean.

C. *Convening the Honor Code Council:* The dean of the college will convene the Honor Code Council if (1) the faculty member recommends an additional disciplinary penalty; (2) the student rejects the faculty member's determination; or (3) the student has a record of a previous violation of the Honor Code.

(a) When the Honor Code Council convenes, it will give the student notice of the reported code violation notice of the evidence that it has to support that violation, and an opportunity to respond, according to these procedures.

Reviewing Academic Penalties. When the Honor Code Council reviews an academic penalty, it will ask the faculty member to submit, in writing, the documentation and evidence that supports the suspected offense, as well as any mitigating evidence. The Council will then provide the student with a copy of the faculty member's materials and an opportunity to respond to those materials within a reasonable time determined by the Council. The Council may request additional written materials from either party. The Council will consider all material submitted and make its recommendation as provided below.

Reviewing Disciplinary Recommendations. When reviewing a recommendation for a disciplinary penalty, the Council will follow the applicable procedures for hearings in Section 03.05 of the Code of Student Conduct. These procedures include notice to the student of the charges and evidence of an Honor Code violation and an opportunity to respond to the charges and evidence at a hearing.

Reviewing Cases Involving Both Academic Penalties and Disciplinary Recommendations. When reviewing cases that involve both an academic penalty and a recommendation for a disciplinary penalty, the Council will review the academic penalty under the procedures in subsection ¨a¨ above and will review the disciplinary recommendation under the procedures in subsection "b¨ above

(b) After conducting its review, the Council will submit its findings and recommendations to the dean of the college where the alleged violation occurred. The dean will make a determination as to whether the student violated the Honor Code and, if so, as to whether to impose any academic or disciplinary penalty on the student.

a. If the dean is not convinced that the student violated the Honor Code, the matter will end and the dean will remit the student's work to the faculty member for evaluation and grade assignment with supervision from the dean or the dean's representative.

b. If the dean is convinced that the student violated the Honor Code, the dean may assess an academic penalty, a disciplinary penalty, or both.

D. *Appeal:* Within five days of receiving the dean's written decision, the student may appeal in writing to the Provost and Vice President for Student Affairs. As provided in the Rules and Regulations of the Board of Regents, Texas State University System (Chapter VI, Section 5.36), the Provost will hear appeals of academic decisions and the Vice President for Student Affairs will hear appeals of disciplinary decisions. The Provost and Vice President for Student Affairs will render their decisions on the appeals within a reasonable time and will inform all parties,

including the student and the faculty member, of their decisions. To appeal, the student should send written appeals to both officials. In both cases, grounds for appeal are limited to allegations that:

(a) Proper due process procedures were not followed. However, deviance from prescribed procedures will not necessarily invalidate a decision or proceeding unless they caused significant prejudice to the student;

(b) The penalties assessed are not commensurate with the code violation committed; or

(c) The university has violated a right guaranteed the student by the Constitution or laws of the United States or the state of Texas.