

E&C-ENGR 401VL: Topics in Elec Engr & E&C-ENGR 5590VL: Special Topics in ECE

Instructor Information	
Department: Computer Science Electrical Engineering	
Instructor Name: Liaquat Ali and Sehtab Hossain	
Course Developer: Masud H. Chowdhury and Mostafizur Rahman	
Contact Information	Email: la5w7@mail.umkc.edu , shgf4@mail.umkc.edu
Class Meeting Time/Place: Tuesday 5:30PM-8:00PM	
Semester Offered: Spring 2018	
Instructor Office Hours and Office Location	Room 518. Timing Monday 1:00PM – 2:00PM Room 519. Timing Monday 9:00AM – 10:00AM
Catalog Information	
Subject/Curricular Designation	Electrical and Computer Engineering (ECE)
Catalog Number	E&C-ENGR 401VL and 5590VL
Course Title	Micro and Nano Electronics Design Project
Course Description	This course aims to provide a comprehensive project based training to the students about the complete design and manufacturing flow of integrated circuit (IC) based applications. In addition to disseminating the knowledge and information about the IC industry, the students will be taught necessary computer aided design (CAD) tools and techniques. Student will start from the concept development and project planning for a small microelectronic application. Then they will validate their concept at the behavior level using hardware description language (HDL) tool followed by logic level design and simulation. In the next step the student will implement the circuit and optimize the implemented circuit through layout, netlist extraction and circuit level simulation. The student will also perform device level simulation to investigate the prospects of different technology nodes. Finally, the student will generate masking and tape-out files to send their design for fabrication. If possible, the students design will be sent to MOSIS, which is an organization that manufactures integrated circuits for academic purpose free of
Credit Hours	3
Prerequisites/Co-Requisites	E&C-ENGR 442
Restrictions/Exclusions	None
Course Component (format)	Computer Simulation Lab
Course Instructional Mode	P (classroom based)
Course Information	
Required and Recommended Text Book	<ul style="list-style-type: none"> No Text Book is required. Lab manuals and the instructions for the CAD and simulation tools will be provided in the class.
Evaluation and Grading Criteria	Homework: 10% Demonstration of the Individual Labs: 35% Lab Assignment: 35% Final Exam: 20%
Grade Breakdown (the instructors may change the scale depending on the relative performance of the class as a whole)	A: 90% A-: 85% B+: 80% B: 75% B-: 70% C+: 65% C: 60% D: 50% F: Below 50%

List of Lab Experiments and Projects	<p>List of Assignments:</p> <ol style="list-style-type: none"> 1. Design XOR, OR and AND gate with Cadence schematic, symbol and layout 2. Design XOR, OR and AND gates with HSPICE 3. Design 1-bit Full adder with Cadence schematic, symbol and layout 4. Design 1-bit full adder with HSPICE 5. Design 4-bit Full adder with Cadence schematic, symbol and layout 6. Design 4-bit adder with HSPICE 7. Design XOR, AND gate with Sentaurus Device editor in 2D structure 8. Design XOR, AND gate with Sentaurus Device editor in 3D structure <p>Cadence Labs and Projects</p> <ol style="list-style-type: none"> 1. Tutorial 1: Cadence Configuration <ol style="list-style-type: none"> a. How to open/run cadence b. Cadence configuration for ami06 library c. How to unlock the files locked by software d. How to access cadence on laptop or computer other than lab 2. Tutorial 2: Cadence Schematic 3. Tutorial 3: Cadence Layout 4. Tutorial 4: Power and Frequency Calculation 5. Project1: AND, OR, XNOR, NAND gate 6. Project 2: D flip-flop 7. Project 3: 1-bit Full Adder 8. Project 4: 4-bit Full Adder <p>TCAD Labs and Projects</p> <ol style="list-style-type: none"> 1. TCAD access tutorial 2. Sentaurus Device Editor tutorial for 2D structure 3. Sentaurus Device Editor tutorial for 3D structure 4. Sentaurus Device tutorial for device characteristics analysis <p>HSPICE Labs and Projects</p> <ol style="list-style-type: none"> 1. HSPICE access tutorial 2. HSPICE mesh analysis tutorial 3. HSPICE I-V, C-V analysis tutorial 4. HSPICE plot analysis tutorial
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Student Learning Outcomes	<p>Through this course, students will be able to do the following.</p> <ol style="list-style-type: none"> 1 Explain the basic concepts related to complementary MOSFET (CMOS) based digital integrated circuits. 2 Describe the fundamental science behind the design and operation of integrated circuits for computing, microelectronics and similar semiconductor device based applications. 3 Use different techniques to design and analyze very large scale integrated (VLSI) circuits. 4 Optimize different performance metrics (speed, area, power consumption and signal integrity) of VLSI circuits. 5 Utilize college level mathematical skills and basic information related to semiconductor physics. Engineering students will be able to put the knowledge earned from freshmen and sophomore level mathematics and physics courses into practice. 6 Use computer aided design (CAD) tools used by the semiconductor industry. They will be able to conduct multiple small experiments with these CAD tools.
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Resources & Policy Statements

Academic Calendar: Students are encouraged to review important add, drop or withdraw dates:

<http://www.umkc.edu/registrar/acal.asp>

Academic Inquiry, Course Discussion and Privacy:

Faculty allowing recording - University of Missouri System Executive Order No. 38 lays out principles regarding the sanctity of classroom discussions at the university. The policy is described fully in [Section 200.015 of the Collected Rules and Regulations](#). In this class, students may make audio or video recordings of course activity unless specifically prohibited by the faculty member. However, the redistribution of any audio or video recordings of statements or comments from the course to individuals who are not students in the course is prohibited without the express permission of the faculty member and of any students who are recorded, including those recordings prepared by an instructor. Students found to have violated this policy are subject to discipline in accordance with provisions of Section 200.020 of the Collected Rules and Regulations of the University of Missouri pertaining to student conduct matters.

Campus Safety: Inclement weather, mass notification, and emergency response guide:

<http://www.umkc.edu/umkcalert/>

Counseling and Health Services Available at UMKC: UMKC students may experience many challenges in their lives while attending college – stress, depression, suicidality, trauma, relationship issues, health concerns, etc. As your professor I care about your success and well-being, and want to make you aware of some helpful resources on campus. The UMKC Counseling Center (www.umkc.edu/counselingcenter), located at 4825 Troost in Room 206, offers a wide range of supportive services to students. Appointments can be made by calling 816.235.1635. UMKC Student Health and Wellness (<http://info.umkc.edu/studenthealth/>), located at 4825 Troost in Room 115, offers a full range of health care and promotion services. Appointments can be scheduled online or by calling 816.235.6133. The MindBody Connection (www.umkc.edu/mindbody) is located in the Atterbury Student Success Center in Room 112 and offers a variety of stress-reduction services.

Disability Support Services: To obtain disability related accommodations and/or auxiliary aids, students with disabilities must contact the Office of Services for Students with Disabilities (OSSD) as soon as possible. To contact OSSD, call (816) 235-5696. Once verified, OSSD will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. For more information go to: <http://www.umkc.edu/disability/>

English Proficiency Statement: Students who encounter difficulty in their courses because of the English proficiency of their instructors should speak directly with their instructors. If additional assistance is needed, students may contact the UMKC Help Line at 816-235-2222 for assistance.

Grade Appeal Policy: Students are responsible for meeting the standards of academic performance established for each course in which they are enrolled. The establishment of the criteria for grades and the evaluation of student academic performance are the responsibilities of the instructor.

The [University grade appeal procedure](#) is available only for the review of allegedly capricious grading and not for review of the instructor's evaluation of the student's academic performance. Capricious grading, as that term is used here, comprises any of the following:

- The assignment of a grade to a particular student on some basis other than the performance in the course;
- The assignment of a grade to a particular student according to more exacting or demanding standards than were applied to other students in the course; (Note: Additional or different grading criteria may be applied to graduate students enrolled for graduate credit in 300- and 400-level courses.)
- The assignment of a grade by a substantial departure from the instructor's previously announced standards.

Discrimination Grievance Procedures for Students: Discrimination Grievance Procedures for Students can be found here: http://www.umsystem.edu/ums/rules/collected_rules/grievance/ch390/grievance_390.010

Statement of Human Rights: The Board of Curators and UMKC are committed to the policy of equal opportunity, regardless of race, color, religion, sex, sexual orientation, national origin, age, disability and status as a Vietnam era

veteran. Commitment to the policy is mentored by the [Division of Diversity, Access & Equity](#), but it is the responsibility of the entire university community to provide equal opportunity through relevant practices, initiatives and programs.

Title IX: Under the University of Missouri's Title IX policy, discrimination, violence and harassment based on sex, gender, and gender identity are subject to the same kinds of accountability and support applied to offenses based on other protected characteristics such as race, color, ethnic or national origin, sexual orientation, religion, age, ancestry, disability, military status, and veteran status. If you or someone you know has been harassed or assaulted, you can find the appropriate resources by visiting UMKC's Title IX Office webpage (<http://info.umkc.edu/title9/>) or contacting UMKC's Title IX Coordinator, Mikah K. Thompson (816.235.6910 or thompsonmikah@umkc.edu). Additionally, you can file a complaint using UMKC's online discrimination complaint form, which is located at <http://info.umkc.edu/title9/reporting/report-online/>.

While most UMKC employees are required to report any known or suspected violation of Title IX, students may seek confidential guidance from the following campus locations:

UMKC Counseling Service	UMKC Counseling Service	Student Health and Wellness
Volker Campus 4825 Troost Ave, Suite 206 Kansas City, MO 64110 Phone – (816) 235-1635	Health Sciences Campus Health Sciences Building 1418 2464 Charlotte Kansas City, MO 64108 Phone – (816) 235-1635 (open Tuesdays, 1-5pm)	4825 Troost Ave., Suite 115 Kansas City, MO 64110 Phone - (816) 235-6133

UMKC Connect: Important information is available to undergraduate students in UMKC Connect accessed through Blackboard. Throughout the term, students may receive emails regarding course grades or academic performance. Students are expected to address information posted in a timely fashion. This information may be shared with the student's Success Network made up his or her academic advisor(s) and other campus resources so that UMKC may fully support the student's success.

These policies are subject to change at any time by the instructor in the event of extenuating circumstances. Proposals for changes to the course syllabus and exam dates will be considered, but only within the first two weeks of the semester.

Prepared by: Masud Chowdhury

Prepared on: January 3, 2018