The University of Jordan
School of Engineering
Department of Computer Engineering

Course:	Electronics and VLSI lab – 0917462 (1 Cr. – Core Course)
Catalog Data:	The Electronics and VLSI lab is an introductory lab that introduces the students to Diode analysis and characteristics, basic MOS logic circuits, MOS voltage transfer characteristics and operation analysis, design the schematic and the layout of basic logic gates and complex combinational logic functions, delay and power analysis and optimization of combinational logic circuits, schematic of the basic sequential components like latches and Flip Flops.
Prerequisites by Course:	0907461 Electronics and VLSI design
Prerequisites by Topic:	Students are assumed to have had sufficient knowledge in NMOS and PMOS transistors operation and digital circuit design using CMOS transistors
Textbook:	1- CMOS Digital Integrated Circuits Analysis and Design.(Kang and Leblebici) 2- CMOS VLSI Design, A Circuits And Systems Perspective.(Weste and Harris)
Course Website:	MS Teams
Schedule & Duration:	14 Weeks, 9 Lab sessions, 180 minutes each (including exams).
Minimum Student Material:	Text book, class handouts, some instructor keynotes, calculator and access to a personal computer and internet.
Minimum College Facilities:	Classroom with whiteboard and projection display facilities, library, and computational facilities.
Course Objectives:	The objectives of this lab are: 1. Introduce students to the design aspects of CMOS integrated circuits from device up to the register level. 2. Enable the students to use CAD tools to develop efficient circuit layouts and verify designs. Laboratory assignments include design, layout, extraction, and simulation for combinational and sequential circuits.
Course Outcomes and Relation to ABET Program Outcomes:	1. Design wide range of combinational and sequential logic blocks at the transistor level. The designed blocks should meet the delay and area constraints [2]. 2. Use CAD tools to develop efficient circuit schematics, layouts and verify designs [2,6].
Course Topics:	The lab includes ten experiments that cover the following topics: 1. CMOS transistors analysis 2. FinFET technology 3. Combinational circuit design at the schematic level 4. Combinational circuit design at the layout level 5. sequential circuit design at the schematic level 6. sequential circuit design at the layout level

Course Outline

Week	Experiment
26/2/2023	Syllabus distribution + Tools Setup
5/2/2023	CMOS transistors analysis using LTspice
12/3/2023	CMOS inverter Design and analysis (schematic + layout)
19/3/2023	Combinational Circuit Design (Basic gates) (schematic + layout)
26/3/2023	Combinational circuit design (Complex Functions)(schematic + layout)
2/4/2023	Combinational circuit design 1(pseudo NMOS, Dynamic Logic, Domino Logic)
9/4/2023	Sequential Circuits Design (Latches)
16/4/2023	***Midterm Exam (Practical)***
23/4/2023	Sequential Circuits Design (FFs)
30/4/2023	SRAM Memory Cells Design
7/5/2023	Open Lab
TBA	**Project Submission and Discussion**
TBA	**Final Exam**

Computer Usage: In addition to the PCs available at the lab the students are expected to use their own laptops to solve the labsheets and the project. The computers available in the lab will be used for the midterm and the final exams.

Attendance: Class attendance will be taken every class and the university's polices will be enforced in this regard.

Assessments:
Grading policy:

Labsheets	15%	
Midterm Exam	30%	Practical exam
Project	15%	
Final Exam	40%	

Instructors: Dr.Mohammad Abdel-Majeed (M.abdel-Majeed@ju.edu.jo)

Class Time and Location: Eng.Ola Jaloudy (O.Jaloudy@ju.edu.jo)

Program Outcomes (PO)

1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	an ability to communicate effectively with a range of audiences
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies