The University of Jordan
School of Engineering
Electrical Engineering Department
2nd Semester – A.Y. 2023/2024

Course: Advanced Electronics Lab – 0903568 (2 Cr. – Required Course)

Instructor: Dr. Hani Jamleh
Office: E301, Telephone: 06/5355000 ext 22848, Email: h.jamleh@ju.edu.jo
Office Hours: Will be posted soon

Platform: Moodle (https://elearning.ju.edu.jo/)

Catalog description: Instrumentation amplifiers and active filters. Field-programmable gate array (FPGA). VLSI design and software development, Combinational and sequential circuits. Analogto-Digital and Digital-to-Analog converters. Digital signal processing and filters. Pulse Width Modulation. Power Electronics. DC-DC converters. Half-bridge and full-bridge inverters. Electronic PCB Manufacturing.

Prerequisites by course: EE 0903362 Digital Electronics (pre-requisite)

Prerequisites by topic: (pre-requisite)

Students are assumed to have a background in the following topics:
- Digital Logic Design.
- Simulation and Programming using C++ and any others.
- Basic Electronics analysis and design.

Textbook: Instructor handouts and lab. Experiments

References:

1. Microelectronic Circuits by Adel S. Sedra and Kenneth C. Smith, Oxford University
2. Electronic Devices and Circuit Theory by Robert L. Boylestad and Louis Nashelsky, 11th edition, Pearson, 2012.
3. Microelectronic Circuit Design by Richard C Jaeger and Travis Blalock, 5th edition, Pearson, 2015.
4. Electronics Fundamentals: A Systems Approach by by Thomas L. Floyd and David M. Buchla, 1st edition,Pearson, 2013.
5. Schaum's Outline of Electronic Devices and Circuits by Jimmie J. Cathey, McGrawHill Education, 2nd Edition, 2002.
6. Semiconductor Physics And Devices: Basic Principles by Donald A. Neamen, McGraw-Hill, 4th Edition, 2011.
7. The Art of Electronics by Paul Horowitz and Winfield Hill, Cambridge University Press, 3rd edition, 2015.

Schedule: On Campus [16 Weeks, 42 lectures (50 minutes each) including exams]

Course goals: Upon completion of this course, the student will be able to deep understand of advanced electronic systems and their practical applications. The course is designed to bridge the gap between theoretical knowledge and hands-on experience, enabling students to design, implement, and test complex circuits and systems. Through hands-on labs, students will design, implement, and test complex circuits, including amplifiers, filters, FPGA-based systems, and power electronics. The course also emphasizes the integration of modern tools like VLSI design software and PCB manufacturing, preparing students to address real-world engineering challenges.motor control. The student will be introduced to renewable energy systems' models and characteristics.

Course learning outcomes (CLO) and relation to ABET student outcomes (SO):

Upon successful completion of this course, a student will: [SO]

1. Be able to apply advanced knowledge of electronic circuits and systems to design and implement instrumentation amplifiers, active filters, and FPGA-based circuits. [1]

2. Be able to design and conduct experiments involving power electronics, DC-DC converters, and inverters, and interpret the data to draw valid engineering conclusions. [2]

3. Be able to identify, formulate, and solve complex engineering problems by applying principles of electronics, signal processing, and circuit design. [1, 2]

4. Be able to employ modern engineering tools such as VLSI design software and FPGA programming environments to simulate, design, and test electronic circuits effectively. [7]

5. Be able to integrate and apply advanced tools and techniques in the design and manufacturing of printed circuit boards (PCBs) for complex electronic systems. [1, 7]

Course topics: Hrs

1. Design an instrumentation amplifier for a specific application 3
2. Design, simulation, implementation and testing of an active filter circuit 3
3. Basic FPGA programming and configuration using VHDL/Verilog, and design a simple combinational circuit on FPGA 3
4. Design and simulate a basic VLSI circuit 3
5. Design a sequential circuit on FPGA 3
6. Design, interfacing and testing an application using ADC/DAC 3
7. Design and implement a PWM-controlled circuit and its applications in power electronic 3
8. Introduction to variable frequency drives. 3
9. Design, Simulation, and implementation of a DC-DC converter 3
10. Design, fabricate, and test a printed circuit board (PCB) for a selected circuit 3
11. Final Project 3
12. 13. 14.
15.

Ground rules: Attendance is required and highly encouraged. To that end, attendance will be taken every lecture. Eating and drinking are not allowed during class, and cell phones must be set to silent mode. All exams (including the final exam) should be considered cumulative. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes. Academic integrity must be maintained.

Assessment & grading policy: First Exam 0% Assignments 0% Midterm Exam 30% Projects 20% Final Exam 40% Lab Reports 10%

Quizzes	0%	Presentation	0%
		Total	100%

Last Revised: Feb 2024