FED 101-N21/N23: Fundamentals of Engineering Design for ECE Majors (1-2-2)
Fall 2024

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Office hours: Mondays and Wednesdays 1:00-2:15, ECEC 315, or by appointment
Meeting times: Thursdays 2:30-5:20, CKB 217 (lecture), FMH 316/318 (lab)

Textbook: *Laboratory Manual and Supplementary Notes: FED 101 – Freshman Engineering Design, Electrical and Computer Engineering Module*, by John D. Carpinelli, Mohammed Feknous, and Marek Sosnowski (available via the ECE Department Laboratory web page at http://ecelabs.njit.edu)

Description: Teams of students work on open-ended engineering projects. Sections are offered to represent an introduction to real-world engineering design problems in a specific engineering discipline. Topics covered include introduction to basic engineering design elements, processes, measurements, product and project design and development, with hands-on experiments in a specific major area. Students also learn to use engineering tools for computer-aided design and simulation. Technical writing and oral presentation along with project management skills are emphasized. Students are required to take an FED section corresponding to their declared major. Undecided students will be placed in FED sections which best correspond to their interests according to space availability.

Course Outcomes: Students will be able to:

1) describe engineering in general and electrical and computer engineering in particular, and describe the steps in the engineering design process,
2) demonstrate basic handling capabilities of simple circuits containing resistors, diodes, and transistors,
3) analyze and design basic digital circuits, culminating in a more complex project,
4) build, analyze and design Arduino-based circuits around sensors and peripherals,
5) research and present a contemporary technological topic in electrical or computer engineering,
6) work in teams to complete a design project, enhancing skills in leadership and contribution to a team throughout the process.

Student Outcomes:

1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics (CLOs 2, 3, 4,5).
2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs (CLOs 2, 3, 4).

3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (CLOs 2, 3, 4).
4. An ability to communicate effectively with a range of audiences (CLOs 5, 6)
5. 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 (CLO 5, 6)
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately. (CLOs 3, 4, 5)
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty. (CLOs 3, 4, 5, 6).

Computer assisted design and course specific software:

Multisim, Matlab, Arduino Programming Language

Course Schedule:

Week	*Topic*	*Chapter*	*Experiment*
1	Introduction	1	N/A
2	Electricity, Charge, Current, Resistance, Series and Parallel Resistance	2	1
3	Variable Resistors, Kirchoff's Laws, Multisim, Matlab	2,3	2*
4	Transistors and Diodes, Quiz #1	4	3*
5	*How Things Work*	5	
6	Digital Logic, More Complex Combinatorial Digital Logic	6	5*
7	Digital Sequential Logic, Quiz #2	6	6*
8-9	Arduino-based Circuits	7	7*
10	*Engineering Design Process.* Introduction to Project Quiz #3	8	
11-13	Project	8	
14	Presentations by student teams		

*** Report written by each team is required for these experiments**

Grading Policy:		
	3 quizzes@10%	30%
	Laboratory reports and notebook*	35%
	How Things Work**	10%
	Project and final report**	25%

**individual effort will be considered in grading of these items. Team work is vital to success.

<u>Attendance is strictly required – three absences may result in failing the course.</u>

Test Requirements:

All test dates and times are listed in the course calendar on Canvas, and will be given in person during regular class meeting times. All tests are closed book and closed notes. Students may use calculators that do not have wireless communication capabilities (i.e. no cell phone calculators).

Academic Integrity:

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

Generative AI:

The use of generative AI systems (ChatGPT, Gemini, etc.) is prohibited in this course. Any exceptions to this policy will be announced in class.