Course Syllabus – Fall 2025
Fundamentals of Engineering Design (FED101)
Newark College of Engineering (NCE)
(Sections N01, N03, N05, N07, N09, N11, N33, N35, N37, H01, H03)

Course Description: Fundamentals of Engineering Design is a two-credit course that reviews the basic concepts of engineering and introduces tools used for the design and implementation of devices and systems. Teams of students work on open-ended engineering projects. Topics covered include an introduction to basic engineering design elements, processes, measurements, product, and project design and development, with hands-on experiments in multidisciplinary areas. 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.

Recommended Reading: Raymond B. Landis, *Studying Engineering: A Road Map to a Rewarding Career* (4th ed.). Discovery Press (ISBN-10: 0979348749, ISBN-13: 978-0979348747)

In addition to the above text, additional material will be made available in the form of handouts or will be uploaded on the Canvas course page. Students might also be asked to download a few articles and other reading material from the website of NJIT's Robert W. Van Houten Library.

Useful Information:

Research Tutorials: http://researchguides.njit.edu/tutorials
Communication: Thinking, Reading, Writing, Speaking: Tools for All Writers: http://researchguides.njit.edu/communication

FED101-NCE Instructional Team:

Overall Course Coordinator: Dr. Ashish Borgaonkar

Lab Coordinator: Mr. Patrick Thornton

Course Logistics Coordinator: Ms. Lucie Tchouassi

Common Lecture Instructors

Dr. Roni Barak Ventura (Sections N01, N03, N05, N33, N35, N37)
(Office: Fenster Hall 251; Phone: 973-642-4124; E-mail: roni.barakventura@njit.edu)
Ms. Lucie Tchouassi (Sections N07, N09, N11)
(Office: Fenster Hall 280; Phone: 973-596-2317; E-mail: lucie.thibeaud@njit.edu)
Dr. Ashish Borgaonkar (Sections H01, H03)
(Office: Fenster Hall 264; Phone: 973-596-3467; E-mail: ashish.borgaonkar@njit.edu)

Lab Instructors

Mr. Olumuyiwa Bamisaye (Sections N01, N03, N07, N09, N11, N33, N35, and N37)
(Office: Fenster Hall 292; Phone: 973-596-2314; E-mail: oob2@njit.edu)
Mr. Patrick Thornton (Section H01, H03, and N05)
(Office: Fenster Hall 268; Phone: 973-596-2668; E-mail: patrick.thornton@njit.edu)

Office Hours:
(Please refer to the Canvas course page for the most updated office hour schedule)

- Dr. Ashish Borgaonkar R 11:30 - 1:00 pm or by appointment
- Dr. Roni Barak Ventura F 12:00-1:00 pm or by appointment
- Mrs. Lucie Tchouassi T 11:00-12:30 pm, W 4:00-5:20 pm, and R 10:00-11:30 am, or by appointment
- Mr. Olumuyiwa Bamisaye T 1:00-2:00 pm and R 2:00-3:00 pm, or by appointment
- Mr. Patrick Thornton M 4:00-5:30 pm and F 3:00-4:00 pm, or by appointment

FED101-NCE Support Team

Student Engagement, Involvement, and Success: Dr. Miosotis Hernandez
(Office: Fenster Hall 254; Phone: 973-596-5373; E-mail: hernandm@njit.edu)

Library Liaison: Jill Lagerstrom (jl2339@njit.edu)

Lecture TAs:

- TBA

Laboratory TAs:

- TBA

Times and Venues:
NJIT Course Schedule
(Select FED from the left-hand side menu and scroll down to FED101-NCE)

Grading Policy:

Common lecture-related work	
Assignments and In-Class Activities	25%
Quizzes, Reports, Projects, and Presentations	25%
Total for common lecture-related work	**50%**
Lab-related work	
Lab assignments, homework	25%
Projects	25%
Total for lab-related work	**50%**

WEEKLY COURSE SCHEDULE

Week	Type	Topics and Activities
1	Lecture	Course Introduction, Logistics, Learning Objectives, and Expectations The Engineering Design Process I
1	Lab	3D Visualization Lecture - Sketching Homework: Install CAD Software and take MAKE101 Form Arduino Groups
2	Lecture	Becoming the Best Engineering Student I The Engineering Design Process II Be the Engineer Activity I
2	Lab	Computer Aided Design 1 (Sketching, Extrude, Creating Datum Planes, Fully Defined Sketches, Hole Tool, Rounds) Arduino Project Introduction and Bottle Rocket Optional Project Introduction Assign MAKE 102 Training Assignment
3	Lecture	Becoming the Best Engineering Student II Be the Engineer Activity II
3	Lab	Computer Aided Design 2 (Design Intent, Changing Units, Setting Constraints and Relations) Project Brainstorm- AI-enabled: five ideas with detailed explanation
4	Lecture	MATLAB Onramp (BYOD) Be the Engineer Activity III
4	Lab	Computer Aided Design 3 (Revolve, Pattern, Datum Planes, Axis, 2D Sweep) Project Drawing - 1 idea fully sketched with detailed explanation
5	Lecture	Make 102 and Make 103
5	Lab	Computer Aided Design 4 (Assemblies and Assembly Drawings) Assign Arduino Project List all sensors and materials you think you need- with explanations and details Find or model sensor and project components in CAD
6	Lecture	Conducting Engineering Research I – Librarian presentation Engineering Research Milestone 1

6	Lab	Programming 1 (Flowcharts and Intro to C++) Submit a flowchart for the final project - Replace an in-class flowchart
7	Lecture	Engineering Practice: Engineering Careers Conducting Engineering Research II Engineering Research Milestone 2
7	Lab	Programming 2 (More of C++: Variables, I/O, Operations, Comparison, If and Else statements, For and While Loops) Skeleton of code for final project
8	Lecture	Engineering Documentation – Lab Notebooks, Reports, Data & Presentation, Record Keeping, Written Documentation and Reports, Formats, Standards, etc.
8	Lab	Programming 3 (Basic Electronic Components, TinkerCAD, and Serial Monitoring) Simplified TinkerCad model with skeleton code of the final project
9	Lecture	Ethics in Engineering
9	Lab	Programming 4 (Servo, Pushbutton, Read and Write Arduino Functions) Assembly and part files of Prototype Solidworks parts files of the project
10	Lecture	Engineering Practice: Sustainability and Inclusive Design Overview of Inclusive Design Individual Reflective Assignment Overview of the Engineering Product Analysis Group Presentation AI in inclusive design
10	Lab	Arduino Project Work Time #1
11	Lecture	Engineering Practice: Ethics, Inclusive Design, and DEIB Considerations in Engineering Overview of Inclusive Design Individual Reflective Assignment Overview of Engineering Product DEIB Analysis Group Presentation
11	Lab	Arduino Project Work Time #2
12	Lecture	Engineering Practice: Societal Impact Part I
12	Lab	Arduino Project Work Time #3

13	Lecture	Engineering Practice: Societal Impact Part II Active Learning Group Activity
13	Lab	Arduino Project Work Time #4
14	Lecture	Engineering Product DEIB Analysis Group Presentations
14	Lab	Arduino Project Work Time #5

Note: *The schedule and some of the content may change to accommodate the flow of the class, student feedback, availability of external presenters, and any unforeseen or extenuating circumstances. Students will be informed of all changes in advance and all changes to the syllabus and timetable will be discussed in class.*

Student Learning Outcomes:

By the end of the course, students will achieve the following outcomes (based on the 2022-2023 ABET Student Outcome criteria 1-7):

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 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.

Course Objectives:

In addition to the aforementioned learning outcomes, the specific course objectives are:

1. Introduce first-year students to engineering design problems, offer them the opportunity to work on those problems, and stimulate interest in engineering (corresponding to ABET Student Learning Outcomes 1, 2, 3, 5, 6, 7).
2. Introduce students to commonly used engineering software and tools through active learning and hands-on exercises (corresponding to ABET Student Learning Outcomes 2, 5, 6, 7).
3. Empower students to make an informed decision about their major (corresponding to ABET Student Learning Outcomes 7).
4. Enable students to work in a team and work collaboratively on engineering problems (corresponding to ABET Student Learning Outcomes 1, 5).

5. Introduce students to the concept of "Engineering and the Law" and improve their understanding of ethical and professional responsibilities (corresponding to ABET Student Learning Outcomes 4).
6. Provide students with advice and tools to develop oral and written communication skills (corresponding to ABET Student Learning Outcomes 3).
7. Encourage students to embark on the path of engineering research (corresponding to ABET Student Learning Outcomes 3, 7)

Attendance Policy:

- Each student will be asked to sign/type his/her name on the attendance sheet or participate in an active learning activity for attendance.
- Requests to be excused need to be resolved via email before the class is held, with the exception of last-minute emergencies that must be reported via email as soon as feasible. Requests to leave class before the end of the assigned period need to be resolved before class starts.
- Each student will be excused to miss a maximum of TWO (2) classes/labs per semester with prior permission/valid reason. Each subsequent class missed will cost the student up to 5% of the overall grade. FIVE (5) or more missed classes/labs will result in an F grade.

Additional Notes:

Remember to cite your references when writing individual and group reports. References should allow unambiguous tracing of a source to the original publication. In each paper, essay, lab project, or report, use only one of the recommended styles consistently for all sources.

Recommended citation references are those of...
IEEE (available at http://www.ieee.org/documents/ieeecitationref.pdf);
APA (available at https://www.library.cornell.edu/research/citation/apa); and
MLA (available at http://elmo.academyart.edu/reference-help/tours_and_tutorials/MLA-Citations.pdf).

Each person will contribute to and be responsible for each group submission.
Even though work is stored on the lab server, students are encouraged to back up their work on a personal flash drive or compatible media. It is also recommended that students use the same machine in every class.

Diversity Statement:

It is our intention that students from all backgrounds and perspectives will be well served by this course and that the diversity that students bring to this class will be viewed as an asset. We welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic backgrounds, family education levels, abilities, and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming, and inclusive environment for every other member of the class. Your suggestions are encouraged and appreciated.

Honor Code and Behavior:

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*

Unless specified otherwise, cellular phones and other non-essential electronic devices must be turned off during class hours, or if you are expecting an emergency call, put it on vibrate. No headphones can be worn in class. Also, the class will begin on time. Calendar integrity is critical for attendance and for all assignments.

Don't be shy about asking questions during class, and don't be shy about answering questions, even if you are not sure about the answer. The only way you learn is by making mistakes and realizing how to avoid them.

Generative AI:

AI usage is generally not permitted in this course.

- The expectation of this course is for students to work through the course without assistance from any type of artificial intelligence to better develop their own skills in this content area. As such, artificial intelligence usage is generally not permitted throughout this course. However, like all technology, AI does have certain advantages. If you feel that any of your submissions (individual or group) will benefit from the use of one or more AI-based tools then you should feel free to reach out to your common lecture instructor, prior to using the AI tool, with a rationale for where and how you would like to use such a tool. Your instructor will give it serious consideration.
- It is important to note that AI or any other tools, even if occasionally allowed, should only be used as a reference and not to copy and paste paragraph texts from them. All such usage should also be clearly and appropriately cited.

Accessibility Resources and Services:

Office of Accessibility Resources and Services (OARS) offers long-term and temporary accommodations for undergraduate, graduate, and visiting students at NJIT. If you are in need of accommodations due to a disability, please contact OARS at 973-596-5417 or via email at oars@njit.edu. The office is located in Kupfrian Hall, Room 201.

For further information regarding self-identification, the submission of medical documentation, and support services provided, please visit the OARS website at https://www.njit.edu/accessibility/