Mechanics and Electronics

ID312 | Fall 2025

Monday/Wednesday 10:00-11:20 AM | MakerSpace
Professor Hye Yeon Nam (hye.nam@njit.edu)
Office Hours: after class by appointment

Overview:

This course introduces industrial design students to the creative and technical foundations of building interactive, intelligent products using Arduino microcontrollers, and IoT technology, and AI tools. Focusing on hands-on experimentation, students will learn how sensors, electronics, and machine-learning models can enhance user experience, enable responsive behaviors, and expand the possibilities of physical product design.

Throughout the course, students will work with mechanical and electrical components—sensors, actuators, motors, and microcontrollers—to prototype functional interactions. They will also explore how computers can interpret data, recognize patterns, and support adaptive product behavior, allowing designers to move beyond static objects to create dynamic, user-aware systems.

Topics include electronics basics, sensor input and output, data collection, rapid prototyping, embedded programming, physical computing, and integrating AI for image recognition or user interaction. Emphasis is placed on applying these tools to design problems, iterative prototyping, and bridging the gap between conceptual ideas and working physical models.

No prior experience in coding or electronics is required. By the end of the course, students will be equipped with the skills and confidence to incorporate intelligent systems into their product concepts, interactive installations, or advanced mechatronic design projects.

Schedule:

1| Sept 3	Introduction
2| Sept 8, 10	Electronics basics
3| Sept 15, 17	Electronics basics
4| Sept 22, 24	Paper circuits with input and output prototypes
5| Sept 29, Oct 1	**Due: Project 1 (Input and Output System)**
6|Oct 6, 8	Sensors
7| Oct 13, 15	LEDs and LED strips
8| Oct 20, 22	Fabrication using 3D Printers
9| Oct 27, 29	**Due: Project 2 (Lamp Design and Development)**
10| Nov 3, 5	Kinematics
11| Nov 10, 12	IoT and AI tool
12| Nov 17, 19	Fabrication using laser cutters
13| Nov 24, 26	Progress report
14| Dec 1, 3	Project development
15|Dec 8, 10	**Due: Final Project (IoT AI Machine)**

Project 1: Input and Output System (25%)
- 1-1 Planning and sketches (5%)
- 1-2 Paper circuit working prototypes (20%)

Project 2: Lamp Design and Development (30%)
- 2-1 Planning and sketches (5%)
- 2-2 Fabrication with 3D printing (5%)
- 2-3 Lamp design presentation and demo (20%)

Project 3: AI Machine (40%)
- 3-1 Planning and sketches (5%)
- 3-2 Fabrication with laser cutting or engraving (5%)
- 3-3 Fabrication with 3D printing (5%)
- 3-4 IoT AI Machine presentation and demo (25%)

Participation (5%)

University/College Rules:

Academic integrity and honesty are of paramount importance in this class. The NJIT "University Code on Academic Integrity" will be upheld and any violation can, and will be, brought to the immediate attention of the Dean of Students by either a faculty member or student.

Regular attendance is expected. When possible, please give advance notice of your absence. NJIT requires attendance for ALL students. After 3 recorded absences, your grade will be lowered by ONE (1) letter grade for each additional absence, if you are not carrying a medical, school or religious related excuse. This means that any student who would have received an "A" will now receive a "B", a "B+" reverts to a "C+", etc. No excuses will be accepted without a written note from the Dean or a doctor.

Students with particular needs and foreseen absences should present them to their instructor within the first week of class. Attendance for student athletes: No student athlete may miss any regularly scheduled classes for any practice activities. This means students can neither miss nor leave class early (or arrive late) to attend a practice. While student athletes may miss class when participating in intercollegiate competition, it is the responsibility of the student athlete to proactively inform the instructor well in advance to make appropriate arrangements to complete or make up any assignments or exams in a timely fashion.

Students with disabilities should see me at the start of the semester to discuss any needs.

The syllabus is an outline for the class, and subject to change. Students are required to regularly check changes of the syllabus.

"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"