Mechanical and Industrial Engineering Department
FED101 Fundamentals of Engineering Design **2 Credits**

FED-101
COURSE OUTLINE

Instructor: Dr. Xiaoming Mu Office: 220 MEC
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Office Hours: Friday 2:30 to 4:00 PM & by appointment

Reference Textbook:

1. FUNDAMENTALS OF GRAPHICS COMMUNICATION by Gary R. Bertoline, Eric N. Wiebe et al. ISBN: 978-0-07-352263-0 (0-07-352263-5); 8th Edition, McGraw Hill 2010.

Course Description:

- Study technical graphics and the computer as a technical drawing tool;
- Introduction to projections and multi-view drawings and visualization;
- Discuss geometry commonly used in engineering design graphics and orthographic projections;
- Dimensioning techniques, tolerance, and introduction to auxiliary and sectional views;
- Apply the Computer-Aided Design software program Solidworks to various solid modeling problems.
- Fundamentals of theoretical design principles
- Design of a mechanical system as a part of the final project. The specific objectives of the final project include: proposal preparation, the establishment of design objectives and constraints, building CAD models for the parts and assemblies, construction, testing, and evaluation of proof of concept/prototypes, and preparation of a written and oral final report.

Grading Scheme:

Class & Lab Exercises	10/20 points each	300 points
Modeling Assignments	50 points each	700 points
Design challenges	100 points each	200 points
Design Labs	30 points each	300 points
Project-based deliverables and milestones	1000 points	1000 points
Total		**2500 points**

Grading Scale:

A	B+	B	C+	C	D
90-100	85-89.9	80-84.9	75-79.9	70-74.9	60-69.9

Course Policies:

1. Attending class, completing assignments on time, and keeping up with the class material are essential for success in this course and college in general. Generally, late or missed assignments **will not** be accepted after 1 week except for legitimate **(pre-approved when possible)** reasons as determined by the instructor. **The method of handling late or missed work is determined by the instructor.**
2. Students are required to bring headphones to the class to access video learning modules during the modeling Labs.
3. **ANY FORM OF CHEATING ON ASSIGNMENTS OR EXAMS WILL RESULT IN AN "F" FOR THE COURSE**.
4. The student who compromised and the student who allowed it will **BOTH** be awarded the **SAME** penalty.
5. NJIT honor code will be used for all situations that involve cheating, copying, misrepresentation of student work, and misrepresentation of student information and any violations will be brought to the immediate attention of the Dean of Students (visit http://www.njit.edu/academics/honorcode.php.)
6. **Attending progress meetings scheduled throughout the semester is mandatory**
7. All class exercises, lab exercises, and assignments must include the submission of an electronic file. The file must be submitted by the due date via **Canvas**. The files must be named **jdoe_class_ex_XX**.sldprt, or **jdoe_assignment_XX**.sldprt (or another appropriate file extension that is correct for the type of assignment).XX represents the exercise or assignment number.
8. Students may not have missed more than a total of five weekly assignments to pass the course. A missing assignment can be submitted late for completion credit but will be given a grade of zero. **ONCE THREE ASSIGNMENTS ARE MISSING, ALL ASSIGNMENTS AND EXERCISES MUST BE COMPLETED TO PASS THE COURSE.**
9. **If a student misses or receives a zero for five weekly assignments, the grade for the class is F.**
10. Students are recommended to get a Vernier caliper.
11. The student must contact the Office of Accessibility Resources and Services (OARS) for special allowances and accommodations associated with disabilities.
12. For any modifications or deviations from the syllabus throughout the course of the semester, the instructor will consult with students, and the students must agree to.
13. Taking the Mid Term Exam is mandatory to receive a final grade in the course.

14. Reasonably equal Team Participation in Team Projects is required for a grade.
15. **The students have to conduct all the manufacturing activities for the project in the NJIT Makerspace for safety-related issues. No exceptions.**

Diversity Statement

It is my 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. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic backgrounds, family education levels, ability – 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.

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"

Administration of Exams

- Exams will be administered using either a combination of Respondus + Lockdown Browser and Webex or through ProctorU Review+.
- Students need to have access to a laptop to be able to take the exam using the above-mentioned tools.
- NJIT honor code will be strictly adhered to, any violations will be processed through the office of Dean of Students.

NJIT Makerspace

As a part of this course, students are required to complete the training in the following Makerspace courses:

- Make 101 - Introduction to the Makerspace (This course introduces users to the policies and safety procedures of the space and provides basic training for simple hand tools)
- Make 103 - Introduction to 3D Printing (Briefly covers the basics of 3D printing, including basic maintenance and operation, model preparation and slicing, starting, monitoring, and removing a print)

Tentative Syllabus

Week	Topic
1	Policies, Introduction to Solidworks, Definitions, Basic Skills Orthographic and Multiview projection, six principal views Solidworks modeling Lab
2	Datums, Holes, Sketching tools, Sketching constraints, Extruding, References, Constraints Make-101/103 Training
3	Datums, Extrude, Constraints, History Tree, Project Tool, Rounds and Fillets Modifying an existing sketch. Additive manufacturing, Slicing, Using Ultimaker Cura, 3D Printing **Design Lab - Design and Prototyping Assignment** **Apply the CAD modeling skills covered in class to develop a CAD model for the assigned design problem. Manufacture a prototype for the 3D CAD model of the design developed using the 3D printers in the NJIT Makerspace. Apply the principles of additive manufacturing covered in class.**
4	Datums, Relations, Sketching tools, Constraints, Patterns, History Tree **Design Lab – Background research** **Work with your design team to apply the theoretical principles of design research to your final project topic.**
5	Datums, Sketching, Revolve, Patterns, Relations Engineering design process. Physical and Functional decomposition **Design Lab – Functional and Physical Decomposition** **Develop a functional decomposition of the device you are working on in your final project with your design team. Complete the design template and submit the report.**
6	Sketching, Patterns, Mirror, Lettering, Assembly modeling Intellectual property in engineering design **Design Lab – Reverse Engineering**
7	Blends, Assembly modeling Preliminary design, Designer's notebook **Design Lab – Apply the principles covered in class and develop conceptual design ideas for your final project design problem with your team.**
8	2D Sweeps, Shell, Rib Fundamentals of 3D Printing **Design Lab – Project Scheduling**

	Apply the principles covered in class and develop a detailed design project schedule for the design, prototype manufacturing, and testing activities that come under the scope of the project.
9	Helical Sweeps, Sweep-Blends, 3D Sweeps **Design Lab - CAD Modeling - Project parts, Patents in Engineering Design**
10	Assembly modeling Building prototypes and testing **Design Lab - CAD Modeling - Project parts continued** **Manufacturing Lab – Creation of detailed plans for manufacturing processes like 3D printing, laser cutting, woodworking, water jet machining, etc., required for manufacturing the components and assemblies for the final design project. Makerspace equipment will be used for all manufacturing activities.**
11	Assembly modeling, Rendering Technical Communication - Engineering design report writing **Manufacturing Lab – Manufacturing the components and assemblies for the final design project in the NJIT makerspace**
12	Multi-View Drawings, Section Views, & Dimensioning Technical Communication - Oral Presentation **Design Lab - Engineering drawing – Students are provided with physical components in class, and they apply the theoretical principles learned in the lecture to sketch orthographic views for these components** **Manufacturing Lab – Manufacturing the components and assemblies for the final design project in the NJIT makerspace. Testing and Iteration.**
13	Multi-View Drawings, Section Views, & Dimensioning **Technical presentation and report writing: Present the term-long design and prototyping results to a wide range of audience.** **Final Project Due**
14	**Final Exam**