NJIT Department of Biomedical Engineering

FED 101 Fundamentals of Engineering Design

Instructor: Dr. Lisa Simone (simone@njit.edu), 608 Fenster Hall, x2982
Class Hours: Wednesdays 11:30 am – 2:25 pm, Fenster 640/636
Office Hours: Dr. Simone: Thursday 10:30-12:00 or by appointment
Syllabus Version: 3

Teaching Assistants:

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TEXT:

LEGO Software Powertools, Claque, Agullo and Hassing
ISBN: 1931836760

ROBOLOB Reference Guide 1.2, available for free download from
http://130.64.87.22/robolabatceeo/Resources/documentation/default.asp

COURSE DESCRIPTION:

Corequisite: HSS 099 or HSS 101 and Math 103 or Math 104 or Math 111.
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.

LEARNING OUTCOMES:

Course Goals:
By the end of the course you should be able to do the following:

1. **The design process**: Understand basic engineering design elements, processes and measurements, and the basic product and project design and development process.
2. **Hands-on Project**: Get hands-on experience working on an engineering design project. Learn basic project management skills
3. **Engineering Tools**: Learn engineering tools for computer-aided design and simulation
4. **Effective Communications**: Gain experience with technical writing and oral presentations
5. **Work in Multi-disciplinary teams:** Learn to work and communicate effectively with peers on multi-disciplinary teams to attain a common goal.

COURSE OUTLINE:

Class	Date	Topic	Deliverables
1	9/6	Introduction to Engineering Design Selection of teams and specific projects	
2	9/13	Robot Surgery in Today's Practice Introduction of the design process HW review of surgical procedures Inventory	
3	9/20	Engineering Communication	
4	9/27	Presentations – Surgical Procedures.	Powerpoint Presentation (3-5 min)
5	10/4	Design Studio Engineering Communication	
6	10/11	Design Studio	
7	10/18	Design Studio	
8	10/25	Progress Reports on Design Projects	Powerpoint Presentation
9	11/1	Design Studio	
10	11/8	Design Studio	
11	11/15	Design Studio	
12	11/29	Design Studio	
13	12/6	Final Project Presentation	Powerpoint Presentation (5-7 min), Demonstration, ML Cad drawings
14	12/13	Design Wrap-Up, Inventory	

***The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course outline and schedule.**

Project Ideas in Robotic Surgery

- Surgical removal of the eye of a potato
- Reattach the amputated tip of a hot dog
- Implant a new joint between two arthritic sausages
- Remove and replace a disk between a stack of Oreo cookies
- Perform a seedectomy
- Amniocentesis on a pair of jelly doughnuts
- Arthroscopic surgery on a hollow chocolate Easter bunny
- Resection on a gummy worm
- Angioplasty on a cheese-filled Ziti and installation of a stent

GRADING:

- 50% - Project and Presentations
  - Robolab program
  - Group Input and Class Input
  - Instructor/TA Input
- 50% - Attendance/Participation/Teamwork

Final Deliverables

- Robolab program (if appropriate)
- ML CAD Final Assembly Drawings – due Class #13 – no exceptions.
- Final Powerpoint Presentation

Administrative Details

Attendance is mandatory. Failure to attend class regularly will result in a failing grade.
All absences must be pre-approved – Inform TA in advance. No exceptions for class periods #2 and #14 – attendance mandatory.

Honor Code Violations/Disruptive Behavior:

NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. In the cases the Honor Code violations are detected, the punishments range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT with notations on students' permanent record. Avoid situations where honorable behavior could be misinterpreted.

No eating or drinking is allowed at the lectures, recitations, workshops, and laboratories.
Cellular phones must be turned off during the class hours.

FED 101: Learning Outcome Summary

Outcome # 1. Students will understand the basic engineering design process and elements		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
All design phases are discussed in lectures, with examples. The studio class format allows presentation with the ability to put the lecture topics immediately to practice.	A,C,E,H,I,J,K	In-class demonstrations and presentations are graded.
Outcome # 2. Students will select and complete a hands-on engineering design project		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
Short lectures with examples will introduce project planning needed to complete the projects and foresee problems. Regular feedback during the studio laboratory challenges the students to apply engineering processes in real time.	A,C,D,E,F,G,H,I,J,K	In-class assessments, presentations are graded.
Outcome # 3. Students will have the ability to use engineering tools for computer-aided design and simulation.		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
Background into engineering tools and instruction in the use of CAD tools is provided during the studio laboratories. Students will use these applications throughout their project development.	A,C,E,H,I,K	In class assessments, final project demonstration and documentation.
Outcome # 4. Students will learn effective written and oral communication skills		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
Teams must convey oral status during each class period, with more formal presentations periodically during the term.	D,F,G,I,K	Oral and written presentations are graded.
Outcome # 5. Students will learn to work and communicate effectively with peers on multi-disciplinary teams.		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
Student projects will be conducted by teams of approximately 3 students. Each team member is expected to participate in the development of problem-solving strategies and to assume a specific role in accomplishing the team's goals.	A,B,C,D,E,G,K	Homework, oral and written presentations, and performance review are graded.

ABET Outcomes expected of graduates of BME BS program by the time that they graduate:

(A) an ability to apply knowledge of mathematics, science, and engineering
(B) an ability to design and conduct experiments, as well as to analyze and interpret data
(C) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(D) an ability to function on multi-disciplinary teams
(E) an ability to identify, formulate, and solve engineering problems
(F) an understanding of professional and ethical responsibility
(G) an ability to communicate effectively
(H) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(I) a recognition of the need for, and an ability to engage in life-long learning
(J) a knowledge of contemporary issues
(K) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
(L) an understanding of biology and physiology
(M) the capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve problems at the interface of engineering and biology
(N) an ability to make measurements on and interpret data from living systems
(O) an ability to address problems associated with the interaction between living and non-living materials and systems