DEPARTMENT OF BIOMEDICAL ENGINEERING
INSTRUCTIONAL INCUBATOR
UNIVERSITY OF MICHIGAN

BME Course Summary

Introduction

1. Course Information

Course Name	*Biomedical System Prototyping Lab*
Institution	*Stanford University*
Course Number	**BIOE 123**
# credits	**4**
Meeting times	**Lecture, Mondays, 3-4:20 PM and Lab, Tuesdays and Thursdays, 1:30-5:20 PM**
Is this a required course?	**Yes**
Pre-requisites	**BIOE 41, Physical Biology of Macromolecules**
Target audience (e.g. 1st, 2nd year):	
Textbook	**Practical Electronics for Inventors by Scherz and Monk**
Course Website (if it exists)	

2. Course Description

In the space below, "paste" the description of the course. This can be the actual description listed in the syllabus from the course.

Biomedical Systems Prototyping Lab (BIOE123) is a fast-paced, team-based system engineering experience, in which teams of 2-3 students design and build a fermenter that meets a set of common requirements along with a set of unique team-determined requirements.
Students learn-by-doing hands-on skills in electronics and mechanical design and fabrication. Teams also develop process skills and an engineering mindset by aligning specifications with requirements, developing output metrics and measuring performance, and creating project proposals and plans.
The course culminates in demonstration of a fully functioning fermenter that meets the teams' self-determined metrics.

3. Course Learning Objectives

In the space below, "paste" the course learning objectives if explicitly stated.

Design, fabricate, integrate, and characterize practical electronic and mechanical hardware systems that meet clear requirements in the context of Bioengineering (i.e., build something that works)
Use prototyping tools, techniques, and instruments, including: CAD, 3D printing, laser cutting, microcontrollers, and oscilloscopes
Create quantitative system specifications and test measurement plans to demonstrate that a design meets user requirements
Communicate design elements, choices, specifications, and performance through design reviews and written reports
Collaborate as a team member on a complex system design project (e.g., a fermenter)

4. Fundamental Tools and Skills

In the space below, describe the fundamental tools and skills that are addressed in the class. For example, labvview, arduino's, the design process etc.

CAD, 3D printing, laser cutting, microcontrollers, oscilloscopes, Python, and Arduino

5. Exercises or Experiential Projects of Interest

Exercise/Project	Project Overview	Learning Activities and Assessments	Required Resources for Project Completion

1	Students make a fermenter.	**Learning Activities**
		• Students complete pre-labs and modules. The modules are as follows.
		  ○ Module 1: system design and mechanical parts
		  ○ Module 2: heating and mixing cell medium
		  ○ Module 3: measuring optical density and cell medium color
		  ○ Module 4: integration
		  ○ Module 5: new or improved fermenter feature
		
		Assessment
		• Students submit pre-labs and module reports.
		• Student submit a final report.
			See "4. Fundamental Tools and Skills."

6. Additional thoughts

If you have any other thoughts about this course, but have not been able to reflect it elsewhere in the document, please feel free to do so here.