Model Syllabus #1: Biology in Engineering

School: Louisiana State University
Professor: Dr. Marybeth Lima

Spring 2003 Syllabus

Credit hours: 2 (1 hour lecture, 3 hours lab per week)

Course designations: This is a service-learning course, and a communication intensive course

Course description: Effect of variability and constraints of biological systems on engineering problem solving and design; engineering units; engineering report writing; oral report presentation; laboratory demonstration of biological engineering analysis.

Objectives: After completing this course, you should be able to:

1. Define and discuss engineering and biological engineering.
2. Have a better appreciation of yourself and your learning process, including why you picked this major.
3. Understand in some depth the area of biological engineering in which you want to study in which you are interested.
4. Communicate effectively with your community partner(s) and your peers, and apply rudimentary techniques for working together and resolving conflicts that result in the most success.
5. Conceptualize the process of engineering design, including the following: what is engineering design, how does one approach a problem using the engineering method, impact of social and technical factors on design, evaluation methods in design, and effective communication in the design process.
6. Understand the significance of service-learning, and how it affects your strength as a person and an engineering student.
7. Understand the significance of communicating, and how it affects your strength as an engineer.

Course Texts:

- Donaldson, K. 2002. The Engineering Student Survival Guide (B.E.S.T. Series). McGraw-Hill, New York, NY. 216 pp.
- Gelb, M. 1998. How to Think like Leonardo Da Vinci: Seven steps to genius every day. Delacorte Press, New York, NY. 322 pp.
- Handbook for Public Playground Safety. U.S. Consumer Product Safety Commission, Publication #325, 43 pp. (provided free of charge)

Course approach. *This is a service-learning course.* Service-learning is defined as a credit-bearing, educational experience in which students participate in an organized service activity that meets identified community needs and reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility.

You will accomplish all of the learning objectives in this course by completing a service-learning project that concerns Biological Engineering and addresses a community need. This process is a mutual exchange of knowledge, information and service between the community (through community partners) and each of you.

This year, each section (Thursday and Friday lab sections) will be working in a groups of 3-4 students to design a playground. Each of these playgrounds will be designed by end of the semester, and will hopefully be constructed at some point in the future. Today we will discuss our approach, and will consult information on each community partner.

Overall approach:

Weeks 1-4

- Learn about engineering design and the engineering design method
- Learn about designing playgrounds
- Learn about your group members and create policies for decision making and management issues
- Information gathering on community partner and addressing community needs (meet with contact and community members, site visit)

Weeks 5-8

- Continue information gathering with community partners (second site visit, further discussions with community partners) and professional playground designers
- Generate preliminary designs
- Initial check on designs by instructor

Weeks 9-13

- Create and refine final design with input from instructor, community partners, and experts

Weeks 14-15

- Presentation of final design to panel consisting of community partners and playground design experts
- Instructor and community partners take all designs and suggestions from panel, and streamline them into one consolidated design that best addresses community needs

Subsequent to semester:

- Instructor (and interested students) presents streamlined design to community partners for further input, and a final design is agreed upon
- Fundraising for playground project is completed
- Construction will take place with community and student volunteers

Community Partners.

Section 1. Your community partners are the Old South Baton Rouge Community (centered at the Leo S. Butler Community Center) and Baton Rouge Green. You will be working with these groups to design a community park and playground using the SPARK model (www.sparkpark.com), in which school grounds are transformed into community parks. We will work with the community partners and the community to choose a location, and will then work with community members, including children, parents, and teachers at the school, to design the playground and park.

Section 2. Your community partner is the Louisiana School for the Deaf. The School for the Deaf has four playgrounds, an elementary school playground, a middle school playground, a high school playground, and a special needs playground. You will be involved with re-designing the special needs playground. Administrators at the School for the Deaf have chosen to tear down all existing equipment on the special needs playground and are in the process of starting over. You will be working with the children, parents, teachers, therapists, and administrators at the School to design a playground for children with special needs.

Grading policy:
Grades will be determined based on the following break down:

- Midterm exam — 20%
- Quizzes (2, plus lab attendance, 6.67% each) — 20%
- Student Portfolio (web page, journal and selected HW) — 20%

- Group design project — 20% (10% individual contribution, 10% group grade, grades determined in consultation with community partner)
- Final exam — 20%

A number of criteria are used for grading because each of us has strengths in different areas. My objective is for each of you to shine in this course; the different criteria for grading are provided with this notion in mind. In past years, there has been no curve in this class (that is, 89.5% and above is an A, 80-89.4% is a B, 70-79.4% is a C, 60-69.4% is a D, and <60% is an F); I expect the same situation to prevail this year.

Student portfolio. Each of you will be developing a portfolio this semester. A portfolio is defined as *a purposeful collection of student work that tells the story of the student s efforts, progress or achievement in a given area.* Your purpose this semester is to learn about engineering, biological engineering, and yourself. Completing the assignments in this course will enable each of you to examine your motivations for choosing this major, and to learn more about biological engineering. This knowledge will help you to identify your personal and professional goals. Through portfolios, you will be documenting your path to a greater understanding of yourself and of this profession. You can use your portfolio for reference throughout your undergraduate career and beyond.

Investigators have established four levels of learning, which are as follows:

1. Information: student can define, repeat, list, name, label, memorize, recall and/or relate that information.
2. Knowledge: student shows an understanding and comprehension of the information gained in level (1), and can describe, explain, compare/contrast, identify, discuss and/or summarize it.
3. Application/Analysis: student can solve problems by applying knowledge in new situations, and can critically distinguish the logical components of other applications of that knowledge.
4. Wisdom: student can display professional judgment and the ability to synthesize, design, organize, plan, manage, teach and/or evaluate.

Investigators have also determined that approximately 85-90% of one s undergraduate education is spent in levels (1) and (2). My goal as an educator is to provide opportunities for students to participate in levels (3) and (4). Developing your portfolio is one way to accomplish this.

Your portfolio will consist of three parts:

1. a personal web page that you will develop as part of this class;
2. an engineering journal, which contains incidental or informal writing assignments that we will be doing throughout the semester; and
3. homework assignments.

Throughout the semester, you will have homework assignments, all of which will go into your portfolios. Obtain a notebook or binder immediately for your portfolio! In this way, you will be able to build the portfolio throughout the semester, instead of rushing to pull it together at the last minute. You will turn in your portfolios for comments from me at mid-semester.

Your final portfolio should contain the following:

1. A table of contents, including a description of the work done and the page on which it appears. An example is as follows:

2. A short introduction describing the purpose of your portfolio and what is contained in it; although this goes at the beginning of the portfolio, I suggest you write it at the end of the course.
3. All the work you did in whatever order you d like, as long as it makes sense and fits together
4. Reflection narratives: after certain exercises, you will be asked to write a short statement describing what you thought and felt about that specific exercise. This is to help you to identify how and why you thought the exercise was useful (or not) to you, to help me identify if the exercise is one worth keeping and/or refining for next year s students.

Your portfolio requires a concluding self-assessment narrative, in which you write about your overall experience in the course, and evaluate the use of service-learning in your quest to achieve the objectives of this course.

Feel free to include anything that you find of help to your own learning process. This portfolio is for you, not for me. Engineering journals will be graded on completeness only, and not on what you said, how you said it, or grammar. The purpose of the engineering journal is for you to record all your thoughts, feelings and actions during the course of this class; please keep it with you at all times. These notes can be invaluable for many reasons; they may tell the story of how you develop into an engineer! Also, you may have great ideas that you forget about later; this is one excellent way to keep track of them.

Homework assignments. Homework assignments are intended to help you understand material. I employ a resubmission process for homework because of this reason: if you mess it up the first time, instead of just getting the grade and continuing, re-submissions allow you to concentrate on the mistakes you make and to fix them.

Re-submissions will not be accepted for any grade higher than 80%, *except in special cases that I will designate.* You may re-submit an assignment for any grade lower than this, and your final grade for that assignment will be the average of the original grade and the final grade. You are not required to re-submit any assignment, but if you choose to, you must re-submit within one week of the assignment being returned to you in class. If you happen to miss class the day the assignment is returned, you are still responsible for re-submitting it one week from the date in which it was returned in class. Your submission must include a written explanation of what (specifically) you didn t understand, and why you understand it now.

Homework must be turned in on time to receive full credit. Assignments must be turned in by 4:30 p.m. the day they are due in order to be considered on time! Late assignments will receive 20% off for each day that they are late! No re-submissions will be accepted for assignments turned in late.

<u>Course policies:</u>

1. Turn off your cell phones before you come to class. If you have an emergency, place your cell phone on vibrate!

2. Although I expect each of you to attend all classes, arrive punctually and participate, your final grade for this course will not be based on these criteria (except for attendance at lab). However, if you attend class regularly and on time, and if you participate in class discussion, it could make the difference in getting the higher letter grade if you are on the borderline between two. If you miss class, you are responsible for finding out what you missed from your classmates!

   I will be taking attendance in lab this semester! The percentage of labs that you attend will be one of your quiz grades! For example, if you attend 13 of 15 lab sessions, then your attendance grade is 13/15*100 = 87%. This grade represents one quiz grade (of four total). If you miss labs, it is your responsibility to MAKE UP THE LAB. Do not copy data from your classmates.

If you know you're going to miss class in advance, let me know and I'll make arrangements to let you know what you're going to miss.

3. Cheating and plagiarism will not be tolerated! I check work carefully, and will report any student I suspect of academic misconduct to the Dean of Students, Dr. Jim Welles. It is okay to work together on homework assignments but it is NOT okay to COPY someone s work (or to allow someone to copy yours). Check with me or the Code of Student Conduct Code of Student Conduct if you have questions on this matter; it is better to find out all the information you need up front, vs. asking for forgiveness later! The reporting process would be agonizing for all of us, but I will do it if I have to. As a faculty member of LSU, it is my responsibility to uphold academic integrity, and the reputation of this university. I take this responsibility very seriously.

4. Group work. A significant portion of what you learn in this course will be accomplished in a group setting. Your grade for the group design project is worth a significant portion of your grade for this course, and will be determined by me with input from you, your community partners, and other members in your group, each of whom will complete a confidential evaluation of all group members (this evaluation will be determined by all of us at the beginning of the semester). If you do not participate and attend meetings, your grade may suffer as a result! A sample grading rubric created by last year s class is included below:
    a. Good citizen and group member (attitude, respectfulness, listening, communication skills): 25%
    b. Attendance at meetings (in and out of class, with community partners, etc.): 25%
    c. Dependability (did what needed to be done in a timely manner): 25%
    d. Contribution to design project (quality of work, quantity of work): 25%

BE 1252 Biology in Engineering: day-to-day syllabus plan
Note: this plan is subject to change

Thurs., 1/23 Former BE 1252 design projects

Fri., 1/24 Development of definitions: engineering, biological engineering, and service-learning

Tues., 1/28 What is biological engineering?

Thurs., 1/30 K-B personality sorter

Fri., 1/31 Areas of emphasis in Biological Engineering

Tues., 2/4 Analysis of the K-B personality sorter, working in groups

Thurs., 2/6 Introduction to the class design problem

Fri., 2/7 Designation of design project groups

Tues., 2/11 Presentation of specific design project information

Thurs., 2/13 Presentation of specific design project information

Fri., 2/14 (playgrounds, CPSC and ASTM design standards)

Tues, 2/18 Review, Quiz 1

Thurs., 2/20 Visit #1 with design clients: what do they want in a design?

Fri., 2/21 initial sketching, outlining of designs

Tues., 2/25 Creativity and the design process

Thurs., 2/27 Observation lab (critiquing existing designs)

Fri., 2/28 Creativity and the design process

Tues., 3/4 No class, Mardi Gras holiday

Thurs., 3/6 Field Trip: observation for your design project

Fri., 3/7 In-class time: generate preliminary designs

Tues., 3/11 review for midterm exam

Thurs., 3/13 Midterm exam

Tues., 3/18 Engineering units and elementary engineering analysis

Fri., 3/21 Visit #2 with your design clients, present your preliminary designs, get feedback for final changes

Tues., 3/25 Engineering units and elementary engineering analysis

Fri., 3/28 evaluation and assessment of designs, work on finalizing your group s design

Tues., 4/1 Quiz 2: engineering units and elementary engineering analysis

Thurs., 4/3 Final report specifications and calculations, the bidding process

Fri., 4/4 Generate finalized designs

Tues., 4/7 Guest speaker: Biological Engineering

Thurs., 4/10 The importance of communication in engineering design, speaking tips

Fri., 4/11 Using word processing and spreadsheet programs

Tues., 4/15 Spring Break
Thurs., 4/17 Spring Break

Tues., 4/22 The implementation phase of streamlined engineering designs

Thurs., 4/24 Guest speaker, Biological Engineering

Fri., 4/25 Float time (to finish designs or anything else we didn't get to)

Tues., 4/29 History of engineering and perspectives on design

Thurs., 5/1 Formal presentation of your design to the community partner and community

Tues., 5/6 Re-cap: biological engineering, design, and you

Thurs., 5/8 Review for final, end of class party