BE 2352: Quantitative Biology in Engineering
Fall 2016 Syllabus

Instructor: Subramaniam Sathivel, Ph.D.
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Office hours: AFTER lecture on Wednesday and AFTER lab on Monday and Tuesday. Other times are available - email to schedule appointment.

Credit hours: 3 (2 hours lecture, 3 hours lab)

Meeting Schedule:

Lecture: Monday and Wednesday 10:30 - 11:20, **145 Coates Hall**

Lab: Monday 1:30 - 4:20, (Section 1). Location dependent on material covered includes: 0213 Tureaud Hall, Food Processing Pilot Plant Ingram Hall, and 205, 209, and 213 H.D. Wilson Laboratory

Lab: Tuesday 1:30 - 4:20, (Section 2). Location dependent on material covered includes: 0213 Tureaud Hall, Food Processing Pilot Plant Ingram Hall, and 205, 209, and 213 H.D. Wilson Laboratory

Final exam: December 6th at 7:30 -9:30 am (Confirmation of date, time and location at later date)

Course description: Characterization of biological phenomena in engineering design; relationships among parameters using linear and non-linear statistical expressions; case studies of engineering design solutions.

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

1. Understand the role of statistics in science and engineering
2. Successfully perform statistical analysis on problems in biological engineering
3. Successfully perform engineering economical analysis on engineering problems
4. Correctly answer at least 75% of FE style statistics problems
5. Correctly answer at least 75% of FE style engineering economics problems
6. Successfully execute a fifteen-minute technical presentation
7. Write a satisfactory technical report

Accreditation: The Accreditation Board of Engineering and Technology (ABET) has established criteria through which engineering programs, including this one, are accredited. When you complete the Biological Engineering curriculum at LSU, you should be proficient in the objectives listed below. This course is intended to help you develop some of the skills encompassed in these so-called "a through k objectives." The objectives that this course will concentrate on are bolded below.

(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
(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 and societal context
(i) a recognition of the need for, 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

Course Texts:

Lindeburg, M. 2006. FE Review Manual (FERM2), 2nd Edition, PPI Publications, Belmont, CA, 872 pages.

Highly recommended but not required study book on statistics

Gonick, L. and Smith, W. 1993. The Cartoon Guide to Statistics. HarperPerrenial, New York, NY. 232 pp.

Reference Books:

Mendenhall, W. 1994. Introduction to Probability and Statistics. Duxbury Press.

FE Review Manual, Professional Publications, Inc. Belmont, CA (Recent years).

Course policies:

PLEASE DON'T TALK ON CELL PHONES, TEXT YOUR PALS, SURF THE INTERNET, READ THE NEWSPAPER, HAVE SIDE CONVERSATIONS WITH FRIENDS, ARRIVE LATE, LEAVE EARLY ETC.

If you miss class, you are responsible for and finding out what you missed from your classmates! If you miss labs, it is your responsibility to MAKE UP THE LAB. Do not simply take data from your classmates. If you know in advance that you're going to miss class, let me know and I'll make arrangements to let you know what you're going to miss.

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. 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 if you have questions on this matter; it is better to find out all the information you need upfront, 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 an instructor at LSU, it is my responsibility to uphold academic integrity, and the reputation of this university. I take this responsibility very seriously.

Although I expect each of you to attend all lectures, arrive punctually and participate, your final grade for this course will not be based on these criteria. 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.

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

Exam 1	17.5%
Exam 2	17.5%
Quizzes (2 total, plus labs):	15%
Oral Presentation and report:	15%
Homework:	20%
Final exam	15%

All assignments must be turned in on time to receive full credit. Assignments must be turned in by the beginning of class on the day they are due in order to be considered on time! There will be a 20% deduction in credit given for assignment for each day that it is late (only business days, ie, Monday through Friday, count as late days).

Grade will be based as follows:
A+: 97-100%; A: 96-90%; A-: 88-89%;
B+: 85-87%; B: 84-80%; B-: 78-79%;
C+: 75-77%; C: 74-70%; C-: 68-69%;
D+: 65-67%; D: 64-60%; D-: 58-59%;
F: below 57%.

The definition for the letter grades:
A (A+, A, and A-) indicates distinguished mastery of the course materials
B (B+, B, and B-) indicates good mastery of the course materials
C (C+, C, and C-) indicates acceptable mastery of the course materials
D (D+, D, and D-) indicates minimally acceptable achievement

Oral presentation and report:

You will plan and execute a 15 minute presentation in which you will be teaching to your audience. This audience will consist of your peers and will be held during the laboratory section of the course (there are approximately 30 students per section). Your talk will be on some area of biological engineering in which you are interested. Start thinking about a topic now; further explanation of this project and sign up sheets will be forthcoming shortly. You will submit a

technical report on your presentation topic; it is due one week after your presentation. Late submissions will receive the same deductions as late homeworks.

If you miss your oral presentation on the day in which you are supposed to deliver it, there will be an automatic 15% reduction from your presentation grade.

Topical outline for BE 2352

I. *Overview of this course, and why it is important to biological engineering*

II. *Quantification of biological properties using statistics (~5 weeks)*

- Measures of central tendency and dispersion
- Probability
- Distributions
- Confidence Intervals
- Hypothesis testing
- Experimental design

In studying statistics, you will also be exposed to FE style problems in your textbook

III. Engineering Economic Analysis (~7 weeks)

- Time value of money
- Cash flows
- Interest rates
- Engineering econ problems
    - Decision making: you have a material you're trying to choose, or a part, or a machine. Compare which is most economical given present cost, maintenance costs, etc.
    - Replacement/retirement analysis (when should you replace or retire a product?)
    - Rate of return problem (to find percentage return on an investment)
    - Break even point on an investment
    - Loan repayment (how long will it take)
    - Economic life analysis (life cycle costs)
    - Benefit/cost analysis (do the benefits outweigh the costs)

IV. *Mathematical models for quantifying biological systems (2-3 weeks)*

A. Kinetics

- Applicability to biological systems
- Types of reactions
- Modeling reaction kinetics
- Case studies involving kinetics