Syllabus for
BE 4332: Molecular Methods in Biological Engineering

Catalog Description of Course: (3 credit hours) Prereq: BIOL 2083, BE 2350 and credit or registration in BE4303. Fundamentals of the theory and applications of quantitative molecular techniques used in biological engineering research and design. Topics include absorbance, fluorescence, biophotonics, Enzyme-Linked Immunosorbent Assay (ELISA), chromatography, electrophoresis, recombinant DNA, polymerase chain reaction (PCR), microarrays, genetic therapies, lab-on-a-chip assays, and molecular computing.

Prerequisites: BIOL 2083 Biochemistry, BE 2350 Experimental Methods for Engineers, and credit or registration in BE 4303 Engineering Properties of Biological Materials.

Objectives:

1. To identify the fundamental aspects of molecular bioengineering techniques relevant for design in diagnosing, understanding and regulating biological systems.
2. To apply the principles of molecular methods in a design to sense, study or control a biological system
3. To analyze peer-reviewed current research articles in some of the course topic areas.
4. To report on a thorough analysis of a design involving a quantitative molecular application used in a research, biotechnology or healthcare setting.

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Office hours: TBA. Appointments can also be scheduled to students' preference via phone or email.

Text: No required text. Notes and electronic documents will be provided in class and on the course website. Students are encouraged to consult texts placed on hold in the library during the semester, browse highlighted e-books online (e.g. the PubMed Bookshelf), and perform their own searches for other relevant online material.

Material will be adapted from several texts, including:

Alberts, B., et al. (2002). Molecular Biology of the Cell, 4th edition. Garland Division of Taylor & Francis Publishing, Oxford, UK.

Aydin Tozeren, S. W. B. (2003). New Biology for Engineers and Computer Scientists. Upper Saddle River, NJ, Pearson - Prentice Hall.

Ballou, A. J. N. D. P. (1998). Fundamental Laboratory Approaches for Biochemistry and Biotechnology. Bethesda, MD, Fitzgerald Science Press.

Fung, Y. C. (2001). Introduction to Bioengineering. River Edge, NJ, World Scientific Publishing Co.

Prasad, P. N. (2003). Introduction to Biophotonics. Hoboken, NJ, Wiley-Interscience.

Criteria for determining grade:

Homework and Quizzes	25%
Exams	60%
Term Project	15%

Final course grade will be determined from the following scale:

A = (100 - 90)%, B = (89 - 80)%, C = (79 - 70)%, D = (69 - 60)%, F = (59 - 0)%.

Grading Criteria for Graduate Credit:

Graduate students wishing to receive graduate credit for this course will be required to perform an in-depth study of a particular molecular technique and present their findings to the class in the form of a graduate seminar oral presentation. This project will be graded and will serve as an additional grade in the "Exams" category of the overall course grade.

Academic Misconduct:

Academic Misconduct, as defined in the Code of Student Conduct, will not be tolerated in this course. It is my responsibility as the instructor to report such incidents to the Department of Judicial Affairs. It is your responsibility to understand the Code of Student Conduct and make sure your actions and perceived actions are not considered as misconduct. Ignorance of these rules will not be an adequate defense in such cases. Go to http://appl003.lsu.edu/slas/judicialaffairs.nsf/index for a copy of the current Code of Student Conduct.

Outline of Subject Matter for BE 4332:
Geometrical Optics
Interaction of Light with Matter
Absorbance
Fluorescence
Brief Review of Molecular Biology
Molecular Considerations of Recombinant Protein Production: Factor VIII Case Study
Chromatography
Column Design and Chromatogram Analysis
Electrophoresis and Blotting
Enzymatic Methods and Kinetics
Enzyme-Linked Immunosorbent Assay (ELISA) applications in Biosensing
DNA synthesis and PCR
Recombinant DNA Techniques for Biotechnology
Microarrays and Lab-on-a-chip Assays
Mammalian Cell Culture and Flow Cytometry Instrumentation
Gene and Antisense Therapies
Nucleic Acid-based Molecular Computing