BEGR. BIOENGINEERING

BEGR-401. APPLIED ENGINEERING ANALYSIS
Credits: 3 (Two hours of lecture and two hours of lab per week)
This course is a graduate level course whose focus is to present, illustrate and apply the calculus of single, multivariable and vector-valued functions to a variety of mechanical and electrical engineering and physics topics at an advanced level. Topics include ordinary differential equations, series solutions of ordinary differential equations and special functions, inner product spaces, vector analysis, operator algebra, matrix methods and eigenvalue problems, Fourier series and integrals, complex variables, Sturm-Liouville theory, transform methods and partial differential equations. (Cross-listed with [[ME-401]])

BEGR-408. BIOMEMS
Credits: 3 (Three hours of lecture and three hours of lab per week)
Fees: Lab Fee - $104
This course is about the basic foundations for the understanding of electrical, mechanical and chemical transducers in biomedical applications through learning fabrication, design and analysis. The course will have lectures to cover the theory and practical applications of imaging. Some of the lectures and assignments will be in our materials fabrication laboratories.

BEGR-409. INTRODUCTION TO BIOENGINEERING
Credits: 3 (Three hours of lecture per week)
Terms Offered: Fall
This course first covers some essential information of bioengineering and includes the required research ethics curriculum for the program. The course also samples the wide variety of bioengineering options for students who plan to enter one of the degree tracks. The beginning lectures briefly describe the scientific basis for bioengineering both from biological and engineering standpoints. Bioengineering faculty will then describe the bioengineering options in the particular engineering tracks and courses as well as the research conducted by faculty in the department. (Required for all students in Bioengineering)

BEGR-411. INTEGRATED PRODUCT DEVELOPMENT
Credits: 3 (Three hours of lecture per week)
Organizational issues and decision-making for capital investments in new technologies. The product development and commercialization process is traced from research and development and marketing activities through the implementation phase involving the manufacturing function. Term project is a commercialization plan for a new manufacturing technology. (Cross-listed with [[ME-411]]) (Required for all students in Bioengineering)

BEGR-415. 3-D MODELING IN HUMAN ANATOMY AND PHYSIOLOGY
Credits: 3 (Two hours of lecture and three hours of lab per week)
Fees: Lab Fee - $104
This is a one-semester course that will provide a foundation in Human Anatomy and Physiology for Graduate Engineering students in preparation for the design and evaluation of biomedical devices. Topics to be covered include: anatomical terminology; cell, tissue and organ structure; as well functional anatomy of muscles, joints, nervous, cardiovascular, respiratory, digestive, and urinary systems. Laboratory exercises will include 3D modeling of these systems and physiological recording of muscle contraction, action potentials, EEG, ECG, heat rate, pulse, and respiratory movements.

BEGR-421. BIOFLUIDICS AND MICROFLUIDICS
Credits: 3 (Three hours of lecture and three hours of lab per week)
Fees: Lab Fee - $104
Students learn how to mathematically and quantitatively describe fluid flow throughout organ systems and biomedical devices. Other topics covered include how flow correlates with diseases.

BEGR-424. MOLECULAR BIOLOGY
Credits: 3 (Three hours of lecture and three hours of lab per week)
Fees: Lab Fee - $104
An introduction to molecular biology and how it is studied. Topics covered include genome structure, transcription, translation, chromatin structure and its role in gene expression, and techniques for studying gene expression and for genetic engineering. The goal is to learn enough molecular biology to figure out how to identify target genes or combinations of genes and how they might be engineered to produce desired products or to engineer organisms with desired capabilities. (Cross-listed with [[BIO-324]])

BEGR-426. IMMUNOLOGY AND IMMUNOCHEMISTRY
Credits: 3 (Three hours of lecture and three hours of lab per week)
Fees: Lab Fee - $104
Immunology and Immunocchemistry provides an introduction to mammalian host defense. The molecular mechanisms that account for the antigen-antibody interaction are explored, as are ways in which this interaction influences the evolution of lymphocyte populations. Mechanisms of acquired immunity, including interactions among lymphocyte subpopulations, are discussed. Lymphocyte differentiation is addressed as a developmental problem, and defense against infection is approached as an integrated response. (Cross-listed with [[BIO-326]])
Bioengineering

**BEGR-599. THESIS/PROJECT**

**Credits:** 3-6 (Three to six credits of research, proposal writing, presentation, and thesis per week)

Students have the option of selecting up to six credit-hours of thesis or three credit-hours of project under guidance of a thesis/project advisor. The thesis will have a committee of three members; at least two members (including the advisor) must be Wilkes faculty members. The thesis/project should be presented in an open forum.