BIO 484, 486, 487, 489 Research in Biological Sciences
BIO 484 Research in Biology and Society
BIO 486 Research in Neurobiology and Physiology
BIO 487 Research in Molecular, Cellular, and Developmental Biology
BIO 489 Research in Ecology and Evolution

In these courses, the student works under the supervision of a faculty member in developing an individual project that makes use of the knowledge and techniques acquired in previous courses. The student prepares an appropriate report on the project. Any of the courses may be taken for more than two semesters, but no more than four credits of research may be used for biology major requirements. Limit of one topic per semester.

Prerequisites to BIO 484, 486, and 489: Written permission of instructor and departmental studies committee. Request for approval of the undergraduate studies committee must be submitted no later than two days prior to the last day of the add period as scheduled in the academic calendar.

Prerequisites to BIO 487: Permission of instructor and Department of Biochemistry and Cell Biology

BIO 488 Internship in Biological Sciences
May be repeated up to a limit of 12 credits. Not for biology major credit.

Prerequisites: BIO 201, 202, 203; CHE 132; permission of faculty sponsor and biology internship committee

BME Biomedical Engineering
BME 100 Introduction to Biomedical Engineering

An introduction to and overview of biomedical engineering. Selected topics review state-of-the-art bioengineering developments in solving medical problems as well as the identification of clinical and health problems and their engineering solutions. Includes the roles of biotechnology and biomedical engineers in supporting global human well-being.

3 credits

BME 201-H Biomedical Engineering and Society

How engineers interact with others in the development of solutions to societal problems, with emphasis on engineering problems arising in the biological realm. In-depth evaluations of both successful and unsuccessful technologies illuminate the role of biomedical engineers in supporting the well-being of urban and rural populations throughout the world, through developments in medical engineering, biotechnology, environmental engineering, and ergonomic design. Not for credit in addition to BME 100.

Prerequisite: One D.E.C. category E course

3 credits

BME 212 Laboratory Methods in Biomedical Engineering

Introduction to data collection and analysis in the context of biophysical measurements commonly used by biomedical engineers. Laboratory techniques, hypothesis testing, linear regression, and analysis of variance are introduced in an application-oriented manner. Data collection methods using various instruments, A/D boards, and PCs as well as LaView, a powerful data collection and computer package. Not for credit in addition to the discontinued BME 399.

Prerequisites: MAT 125 or 131 or 141; BME 100; BME major

3 credits

BME 300 Writing in Biomedical Engineering

See requirements for the major in Biomedical Engineering, upper-division writing requirement.

Prerequisites: WRT 102; U3 or U4 standing; BME major

Course: Any 300-level BME course

SU grading

BME 301 Bioelectricity

Theoretical concepts and experimental approaches used to characterize electric phenomena that arise in live cells and tissues. Topics include excitable membranes and action potential generation, cable theory, equivalent dipoles and volume conductor fields, bioelectric measurements, electrodes and electric stimulation of cells and tissues.

Prerequisites: ESE 271; ESG 111 (or CSE 130 or ESE 124 or MEC 111 or MEC 112); BIO 202 or 203

3 credits

BME 303 Engineering Methods in Biomechanics

Illuminates the principles of mechanics and dynamics that apply to living organisms, from cells to humans to sequoia trees. The behavior of organisms is examined to observe how they are constrained by the physical properties of biological materials. Locomotion strategies (or the lack thereof) are investigated for the forces and range of motions required and energy expenditures. Includes the relationship between form and function to illustrate how form dominates behavior. Presents the physiological effects of mechanical stresses on organs, pathways that develop from abnormal stress, and how biological growth and adaptation arise as a natural response to the mechanics of living.

Prerequisite: MEC 296

Pre- or Corequisite: BIO 202 or 203

3 credits

BME 304 Genetic Engineering

Introduction to production engineering with specific focus on the production of genetically engineered products. How cost, time, efficiency, and quality influence the selection of production techniques. Structure and function of DNA and the flow of genetic information to the role of self-lubrication, intracellular or interstitial viscosity, and protein-guided adhesion. Discusses current nanofabricated machines to perform the same tasks and considers the problems of lubrication, compliance, and adhesion. Self-assembly mechanisms of nanofabrication with emphasis on cutting-edge discovery to overcome current challenges associated with nanofabricated machines.

Prerequisites: CHE 132 and BME 305

Pre- or Corequisite: BIO 202 or 203

3 credits

BME 305 Biofluids

The fundamentals of heat transfer, mass transfer, and fluid mechanics in the context of physiological systems. Techniques for formulating and solving biofluid and mass transfer problems with emphasis on the special features and the different scales encountered in physiological systems, from the organ and the tissue level down to the molecular transport level.

Prerequisites: AMS 361 and MEC 262

Pre- or Corequisite: BIO 202 or 203

3 credits

BME 313 Virtual Bioinstrumentation

Basic concepts of biomedical instrumentation and medical devices with a focus on the virtual instrumentation in biomedical engineering using the latest computer technology. Topics include basic sensors in biomedical engineering, biological signal measurement, conditioning, digitizing, and analysis. Advanced applications of LabView, a graphics programming tool for virtual instrumentation. Helps students develop skills to build virtual instrumentation for laboratory research and prototyping medical devices.

Prerequisite: BME 212

3 credits

BME 335 Biomaterials: Manufacture, Properties, and Applications

The engineering characteristics of materials, including metals, ceramics, polymers, composites, coatings, and adhesives, that are used in the human body. Emphasizes the need of materials that are considered for implants to meet the material requirements specified for the device application (e.g., strength, modulus, fatigue and corrosion resistance, conductivity) and to be compatible with the biological environment (e.g., nontoxic, noncarcinogenic, resistant to blood clotting in the cardiovascular system). This course is offered as both ESM 353 and BME 353.

Prerequisite: ESG 332

3 credits

BME 381 Nanofabrication in Biomedical Applications

Theory and applications of nanofabrication. Reviews aspects of nanomachines in nature with special attention to the role of self-lubrication, intracellular or interstitial viscosity, and protein-guided adhesion. Discusses current nanofabricated machines to perform the same tasks and considers the problems of lubrication, compliance, and adhesion. Self-assembly mechanisms of nanofabrication with emphasis on cutting-edge discovery to overcome current challenges associated with nanofabricated machines.

Prerequisites: CHE 132 and BME 305

Pre- or Corequisite: BIO 202 or 203

3 credits

BME 404 Essentials of Tissue Engineering

Topics covered are developmental biology (nature’s tissue engineering), mechanisms of cell and cell-matrix interactions, biomaterial formulation, characterization of biomaterial properties, evaluation of cell interactions with biomaterials, principles of designing an engineered tissue. Considers manufacturing parameters such as time, rate, cost, efficiency, safety, and desired product quality as well as regulatory issues.

Prerequisites: BIO 202 or 203; CHE 152

3 credits

BME 420 Computational Biomechanics

Introduces the concepts of skeletal biology; mechanics of bone, ligament, and tendon; and linear and nonlinear properties of biological tissues. Principles of finite differences method (FDM) and finite elements method (FEM) to solve biological problems. Both FDM and FEM are applied to solve equations and problems in solid and porous media. Requires knowledge of Fortran or C programming.

Prerequisites: BME 305; BME 306; MEC 363

3 credits

BME 430 Engineering Approaches to Drug and Gene Delivery

Introduction to the application of engineering principles and biological considerations in designing drug delivery systems for medical use. The concept of biocompatibility and its implications in formulating controlled release devices are illustrated. Emphasis on the use of biodegradable materials to design drug delivery systems for site-specific applications.

Prerequisites: AMS 161 or MAT 132 or 142; BIO 202 or 203; BME 304

3 credits

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BME 440 Biomedical Engineering Design
Introduction to product development from the perspective of solving biomedical, biotechnological, environmental, and ergonomic problems. Teamwork in design, establishing customer needs, writing specifications, and legal and financial issues are covered in the context of design as a decision-based process. A semester-long team design project follows and provides the opportunity to apply concepts covered in class.  
Prerequisites: BME major; U4 standing; BME 301 and 305.  
3 credits

BME 441 Senior Design Project in Biomedical Engineering
Formulation of optimal design problems in biomedical and physiological settings. Introduces optimization techniques for engineering design and modeling for compact and rapid optimization of realistic biomedical engineering problems. Necessary conditions for constrained local optimum with special consideration for the constraints in which the product designed should function in terms of the settings (corporeal, ex-corporeal, biological, etc.) and the safety considerations involved which are unique to biomedical engineering. Students carry out the detailed design of projects chosen early in the semester. A final design report is required.  
Prerequisite: BME 440  
3 credits

BME 461 Linear Systems Analysis with Biomedical Applications
Fundamentals of the linear time series analyses framework for modeling and mining biological data. Applications range from cardiorespiratory; renal blood pressure, flow, and sequence; to gene expression data. Tools of data analysis include Laplace and Z transforms, convolution, correlation, Fourier transform, transfer function, coherence function, various filtering techniques, and time-invariant and time-variant spectral techniques.  
Prerequisites: BME 212 and 301  
3 credits

BME 475 Undergraduate Teaching Practicum
Students assist the faculty in teaching by conducting recitation or laboratory sections that supplement a lecture course. The student receives regular supervision by the faculty instructor. May be used as an open elective and repeated once.  
Prerequisites: BME major; U4 standing; a minimum g.p.a. of 3.00 in all Stony Brook courses and a grade of B or better in the course in which the student is to assist; or permission of the department  
3 credits

BME 481 Biosensors
A comprehensive introduction to the basic features of biosensors. Discusses types of most common biological agents (e.g. chromophores, fluorescence dyes) and the ways in which they can be connected to a variety of transducers to create complete biosensing systems. Focus on optical biosensors and systems (e.g. fluorescence spectroscopy, microscopy), and fiber-optically based biosensing techniques. New technologies such as molecular beacons, Q-dots, bioMEMs, confocal microscopy, and OCT will be referenced.  
Prerequisites: BIO 202 or 203; ESE 271  
3 credits

BME 499 Research in Biomedical Engineering
An independent research project with faculty supervision.  
Prerequisites: B average in all science courses; permission of instructor and department  
0-3 credits

BUS 110 Business in the 21st Century
Introduces students to major business thinkers and actors who have influenced today’s business practices. Explores contributions over the last century from Henry Ford to Bill Gates, showing how the Industrial Revolution became the Information Revolution. Provides knowledge of how businesses works and a perspective on its evolution into the next millennium while preparing the student for advanced business courses.  
3 credits

BUS 210 Financial Accounting
Introduction to basic accounting fundamentals. Includes the recording, summarization, and adjusting of financial transactions and the basic accounting cycle. Explores the preparation and presentation of the basic financial statements; income statement, retained earnings statement, balance sheet, and the statement of cash flows. Includes accounting principles and concepts, asset and liability valuation.  
Prerequisite: BUS 110  
3 credits

BUS 214 Managerial Accounting
A study of cost concepts, theories, and the implementation and evaluation of an accounting system as a source of information for decision making, planning, control, and evaluation of the organization by management. Includes cost-volume-profit analysis, overhead rates, budgeting and variance analysis, statement of cash flows and financial statement ratio analysis.  
Prerequisites: BUS 110 and 210; BUS major  
3 credits

BUS 249 Management Science
Emphasizes the development of mathematical models for solving management problems in business and the interpretation of computer-generated solutions. Topics include linear and integer programming, network, forecasting, decision analysis, and multi-criteria decision-making. Not for credit in addition to ECO 348.  
Prerequisites: BUS 110; AMS 102; MAT 122 or 123 or a score of level 4 or higher on the mathematics placement examination  
3 credits

BUS 290 Writing for Business Management
To meet the upper-division writing requirement for the BUS major, the student must complete a portfolio of written work consisting of three documents: his/her resume; a letter of application for a real job advertised in a newspaper or other medium; and a two-page memorandum describing the results of an analysis or similar issue appropriate to a business organization.  
Prerequisites: BUS major; U3 standing  
SU/grading

BUS 301 Corporate Communications
Examines the role of communications in the corporation using case studies. Topics include: corporate identity, image, reputation, advertising, media relations, employee communications, investor relations, government relations, crisis communications, leadership, and corporate reputation.  
Prerequisites: BUS major or minor; BUS 110  
3 credits

BUS 310 Intermediate Accounting
Expands upon the basic financial accounting framework and explores the theoretical and analytical applications of Generally Accepted Accounting Principles (GAAP) in a business environment. Emphasis on asset and liability valuation, external reporting issues dealing with the presentation and interpretation of financial data, and the measurement of operational performance. The student will gain an understanding of financial reporting criteria and the reliance placed upon financial information by management and external users.  
Prerequisites: BUS 110; BUS 214; BUS major  
3 credits

BUS 311 Federal Income Taxation
Introduces and explores fundamental income taxation concepts for corporations and partnerships. Basic federal tax rules of the Internal Revenue Code are examined and their interpretation and application in relation to tax reporting entities are discussed. Various tax forms will be prepared and/or analyzed along with tax planning and reporting considerations.  
Prerequisites: BUS 110; BUS 310; BUS major  
3 credits

BUS 312 Financial Statement Reporting and Analysis
A review of corporate annual reports and related footnote disclosures from the perspective of the various users of financial statements including management, investors, and creditors. The analysis and assessment of operational business performance, trends, and decision making through the use of financial statements are discussed. Specific review of the income statement, balance sheet, and statement of cash flows, financial ratios, budgeting forecasts, and analysis.  
Prerequisites: BUS 110; BUS 310; BUS major  
3 credits

BUS 340 Information Systems in Management
An introductory course in management information systems (MIS). Its objectives are to develop a basic understanding of the concepts and techniques needed in analyzing, designing, and managing these systems, and to explore the applications of computers and information technology to improve the efficiency and effectiveness of individuals, groups, and organizations.  
Prerequisites: BUS 110; AMS 102; MAT 122 or MAT 123; BUS major or minor or ESE major  
3 credits

BUS 343 Expert Systems in Business
Examines the technology of expert systems, with special attention to business applications, including manufacturing and service facilities. Included are the history of expert systems; issues in knowledge acquisition, implementation, and validation; actual applications in the world of business; and hands-on development of a simple expert system.  
Prerequisites: BUS 110; BUS 340; BUS or ESE major  
3 credits

BUS 344 Decision Support Systems
Focuses on the interrelationship between management information systems and management science. Students apply knowledge from these fields to develop a decision support system. They identify an appropriate business application, build the required information system, and implement the suitable management science methodology. At the end of the course, students demonstrate how their decision support system addresses the stated management problem and describe how their system works.  
Prerequisites: BUS 110, 240, 340; BUS or ESE or AMS major  
3 credits

BUS 346 Operations Management
Analysis and design of manufacturing and service systems. Topics include quality management, product and service design, process selection and capacity planning, design of work systems, inventory manage-