BIOMEDICAL ENGINEERING (BMED)

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BMED Courses

BMED 1101 Introduction to Biomedical Engineering (1 unit)
Term Typically Offered: F
Prerequisite: Biomedical Engineering major.

Introduction to the field of Biomedical Engineering, including products, companies, and career paths. Introduction to the BMED major, including curriculum, concentrations, and university services. Ethical considerations, teamwork, and interactions with industry and alumni. 1 seminar. Formery BMED 101.

BMED 2212 Introduction to Mechanical Design in Biomedical Engineering (3 units)
Term Typically Offered: F, SP
Prerequisite: Biomedical Engineering major.

General introduction to design concepts, tools, and methodologies in mechanical design in biomedical engineering. Problem-based learning and human-centered design methodologies to create a concept which solves real-world biomedical engineering problems. 2 lectures, 1 laboratory. Formerly BMED 212.

BMED 2270 Special Topics (1-3 units)
Term Typically Offered: F, SP
Prerequisite: Consent of instructor.

Directed group study of special topics. The Class Schedule will list topic selected. Repeatable up to 6 units. 1 to 3 lectures. Formerly BMED 270.

BMED 2310 Introduction to Electrical Design in Biomedical Engineering (2 units)
Term Typically Offered: F, SP
Corequisite: MATH 143 or MATH 1262; PHYS 143 or PHYS 1143; and BMED 2311. Recommended: CHEM 124 or CHEM 1120.

Application of fundamental conservation and accounting principles to electrical systems and charge transport in biomedical systems. Analysis of passive and active circuits (op-amps) in biomedical systems. 2 lectures. Replaced BMED 310.

BMED 2311 Introduction to Electrical Design in Biomedical Engineering Lab (1 unit)
Term Typically Offered: F, SP
Corequisite: MATH 143 or MATH 1262; and PHYS 143 or PHYS 1143. Recommended: CHEM 124 or CHEM 1120.

Application of fundamental conservation and accounting principles to electrical systems. Analysis of passive and active circuits (op-amps) in biomedical systems. Fundamentals of programming, data analysis, and acquisition of electrical signals. 1 laboratory.

BMED 2420 Principles and Applications of Biomaterials (4 units)
Term Typically Offered: F, SP
Prerequisite: CE 204 or ENGR 2211; BMED 212 or BMED 2212; and CHEM 124 or CHEM 1120.

Fundamentals of materials science applied to biomedical engineering testing and design. Properties of metals, polymers, ceramics, and composites. Biocompatibility, foreign body and immune responses, blood clotting, corrosion. Material characterization and selection. Medical devices, regenerative medicine. Government regulations, ethical issues. 3 lectures, 1 laboratory. Replaced BMED 420.

BMED 3000 Research Experience for Undergraduates (1 unit)
Term Typically Offered: F, SP, SU
CR/NC
Prerequisite: Consent of instructor.

Laboratory, field, or engineering education research experience. Development of research skills and techniques. Interested students consult with a faculty member prior to enrolling to clarify expectations and deliverables. Repeatable up to 8 units. Credit/No Credit grading only. Formerly BMED 300.

BMED 3102 Biomedical Engineering Professional Development (1 unit)
Term Typically Offered: F
Prerequisite: Junior standing.

In-depth review of biomedical engineering career pathways, professional communication, and professional networking. 1 seminar.

BMED 3330 Intermediate Biomedical Design (3 units)
Term Typically Offered: SP
Prerequisite: ME 212, ME 2212, or ENGR 2212; BMED 420 or BMED 2420; ME 328 or ME 3328; and STAT 312 or STAT 3210.

Design of biomedical devices and systems using various machine elements and components including gears, welded connections, prime movers. Decision modeling based on technical and economic feasibility. 2 lectures, 1 laboratory. Formerly BMED 330.

BMED 3355 Electrical Engineering Concepts for Biomedical Engineering (3 units)
Term Typically Offered: F
Prerequisite: BMED 310 or BMED 2310; and MATH 344 or MATH 3351.

Introduction to electrical engineering concepts for biomedical engineers. Continuation of circuit analysis. Steady state AC and phasor concepts. Application of Laplace Transform to transient circuits. Introduction to logic gates, combinational and sequential circuits, and microcontrollers. 2 lectures, 1 laboratory. Formerly BMED 355.

BMED 3360 Cellular Immunotherapy (3 units)
Term Typically Offered: F
Prerequisite: BIO 161 or BIO 1151; and one of the following: BMED 420, BMED 2420, MCRO 224, MCRO 2224, CHEM 312, or CHEM 2240.

Current cell and gene therapies that affect immune function. Fundamental aspects of immune responses and immune tolerance in cancer. Biological principles blended with medical advances, following evolution of cell therapy from hematopoietic stem cell transplantation to latest treatments. 2 lectures, 1 laboratory. Crosslisted as BIO/BMED 3360.

BMED 3362 Regenerative Medicine Therapies (3 units)
Term Typically Offered: TBD
Prerequisite: BMED/BIO 3360.

Emerging use of cell and gene therapy and tissue engineering to treat degenerative diseases and chronic injuries. Metabolic diseases, cardiovascular disease, neurodegenerative disease, musculoskeletal diseases and injuries. 2 lectures, 1 laboratory. Crosslisted as BIO/BMED 3362.

BMED 3410 Biomechanics (3 units)
Term Typically Offered: F, SP
Prerequisite: CE 204, ME 211, or ENGR 2211; and ENGR 2212, ME 212, or ME 2212.

Application of mechanics to understand the behavior of major tissues and organs at gross and microscopic levels. Bioelastic solids. Rigid body biomechanics. Biofluids. Basic mechanical properties of lungs, bone, cartilage, muscles, blood vessels, and other living tissues. 2 lectures, 1 laboratory. Formerly BMED 410.

BMED 3425 Biomedical Engineering Transport (4 units)
Term Typically Offered: F, SP
Prerequisite: ENGR 2212 or ME 212.

Physiological fluid mechanics, thermodynamics, convective mass transfer, and diffusion in tissue. Properties of blood. Exchange of fluids between capillary beds and tissue. Coupled diffusion and convection. Application of mass transfer coefficients. Rates of diffusion in various physiologic media. 3 lectures, 1 laboratory. Formerly BMED 425.

BMED 3430 Biomedical Modeling and Simulation (2 units)
Term Typically Offered: F, SP
Prerequisite: MATH 244 or MATH 2341.

Computational methods for anatomical modeling and boundary value problems for tissues and biomedical devices. Nonlinear biodynamics, heat flow, cardiac impulse propagation, anatomic modeling, and biomechanics. Course may be offered in classroom-based or online format. 1 lecture, 1 laboratory. Formerly BMED 430.

BMED 4400 Special Problems for Advanced Undergraduates (1-3 units)
Term Typically Offered: F, SP, SU
Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Repeatable up to 6 units. Formerly BMED 400.

BMED 4401 Biomedical Entrepreneurship (3 units)
Term Typically Offered: TBD
Prerequisite: Senior standing and engineering major.

Identification and evaluation of commercial opportunities in the healthcare industry. Methods necessary for rapid iteration and market validation of early-stage prototypes, with emphasis on issues critical to biomedical products, including intellectual property, FDA submission, funding sources, and business models. 3 lectures. Formerly BMED 401.

BMED 4404 Applied Finite Element Analysis (3 units)
Term Typically Offered: F, SP
Prerequisite: One of the following: BMED 410, BMED 3410, CE 352, CE 3352, ME 328, or ME 3328.

Finite element solutions to engineering elastostatic problems using commercial finite element code. Practical modeling assignments. 2 lectures, 1 laboratory. Crosslisted as BMED/CE/ME 4404. Formerly BMED/CE/ME 404.

BMED 4409 Interdisciplinary Projects in Biomechanics (3 units)
Term Typically Offered: SP
Prerequisite: One of the following: BMED 410, BMED 3410, KINE 403, KINE 4403, ME 212, or ME 2212.

Examination of human motion biomechanics. Experimental and analytical methods in motion analysis. Rigid body dynamics. Protocols for protection of human subjects in research. Hypothesis-driven research. Interdisciplinary teams. Proposal development. Written/oral communication to a scientific audience. 1 lecture, 2 activities. Crosslisted as BMED/KINE/ME 4409. Formerly BMED/KINE/ME 409.

BMED 4422 Medical Device Evaluation and FDA Regulatory Processes (3 units)
Term Typically Offered: TBD
Prerequisite: BMED 420 or BMED 2420.

Overview of the path to market for medical devices, including nonclinical and clinical evaluation and FDA regulatory processes. Course covers bench, in vitro, and in vivo models, studies using Good Laboratory Practices (GLP), clinical trials, Quality System regulations, and FDA clearance and approval processes. 3 lectures. Formerly BMED 422.

BMED 4432 Microfluidics/MEMS Design (3 units)
Term Typically Offered: F
Prerequisite: One of the following: BMED 420, BMED 2420, MATE 210, MATE 1210, or MATE 1220; and ME 341 or ME 3341. Recommended: BMED 425 or BMED 3425.

Fundamental physics of microfluidic and microelectromechanical systems. Explore mechanics, electronics, heat transfer, photonics, fluid mechanics, and biological phenomena at micro/nanometer scale. Effect of scaling and fabrication techniques on design criteria. Investigate integration of science and engineering; applications in living systems. 3 lectures. Formerly BMED 432.

BMED 4433 Microfluidics/MEMS Design and Fabrication Laboratory (1 unit)
Term Typically Offered: F
Corequisite: BMED 432 or BMED 4432.

Fabrication and testing of microfluidic and micromechanical systems. Characterization of mixing, electrokinetic transport, and droplet fluidics. Fabrication using soft lithography, wet and dry etch techniques to form fluidic and sensing structures. World-to-chip interfacing. Metrology. 1 laboratory.

BMED 4434 Micro/Nano Fabrication (2 units)
Term Typically Offered: SP
Prerequisite: One of the following: BMED 420, BMED 2420, MATE 210, MATE 1210, MATE 1220, EE 306, or EE 3306.

Fabrication science and technology for creating micro and nano scale devices. Unit operations including oxidation, diffusion, ion implantation, etching, chemical and physical vapor deposition, and photolithography. Analyze process physics to design proper steps for electronic/photonic device fabrication. 2 lectures. Crosslisted as BMED/MATE/ME 4434. Formerly BMED 434/EE 423/MATE 430.

BMED 4435 Micro/Nano Fabrication Laboratory (1 unit)
Term Typically Offered: SP
Corequisite: BMED 434/EE 423/MATE 430 or BMED/MATE/ME 4434.

Application of basic operations involved in microfabrication: cleanroom protocol, oxidation, diffusion, photolithography, etching, and sputtering. Student teams explore process development through fabrication and testing of microscale silicon devices. 1 laboratory. Crosslisted as BMED/MATE/ME 4435. Formerly BMED 435/EE 473/MATE 435.

BMED 4440 Bioelectronics and Instrumentation (3 units)
Term Typically Offered: F, SP
Prerequisite: BMED 310; or BMED 2310 and BMED 2311.

Analog and digital circuits in bioinstrumentation. Biomedical signals in continuous and discrete systems. Sampling and digital signal processing. Potentiometric signals and amplifiers. Biopotentials and membrane potentials. Mechanical transducers and temperature sensors. Light-based instrumentation. Electrical safety. 2 lectures, 1 laboratory. Formerly BMED 440.

BMED 4445 Biopotential Instrumentation (3 units)
Term Typically Offered: SP
Prerequisite: BMED 440 or BMED 4440.

Principles of instrumentation used to detect surface biopotentials. Emphasis on circuit level design and laboratory implementation of systems to detect ECG, EMG and EEG signals. Practical experience with electronic instrumentation. System-level design project related to surface biopotential acquisition. 1 lecture, 2 laboratories. Formerly BMED 445.

BMED 4450 Contemporary Issues in Biomedical Engineering (3 units)
Term Typically Offered: F, SP
Prerequisite: Senior standing in Biomedical Engineering.

Current and evolving topics in biomedical engineering, including medical and industrial applications. Exploration of contemporary issues in biomedical engineering, including technical and societal implications. The Class Schedule will list subtitle selected. Repeatable up to 9 units. 3 lectures. Formerly BMED 450.

BMED 4460 Medical Physiology for Engineers (3 units)
Term Typically Offered: F, SP
Prerequisite: One of the following: BIO 231, BIO 2231, BIO 232, BIO 2232, or graduate standing.

Physiology for biomedical engineering students, with an emphasis on control systems and integration from cells to organism in the context of disease. Cellular control systems applied to the functions of muscle, neural, endocrine, circulatory, and digestive systems; regulation of metabolism. 2 lectures, 1 laboratory. Formerly BMED 460.

BMED 4465 Senior Project: Design I (2 units)
Term Typically Offered: F
Prerequisite: Senior standing; and BMED 410 or BMED 3410.

Engineering design methodology, design process, project planning, decision making, modeling, construction, and testing of an open-ended design project. Preparation of formal engineering reports. Statistical analysis. Governmental regulations. Bioethical issues. 2 laboratories. Formerly BMED 455.

BMED 4466 Senior Project: Design II (2 units)
Term Typically Offered: SP
Prerequisite: BMED 455 or BMED 4465.

Engineering design methodology, design process, project planning, decision making, modeling, construction, and testing of an open-ended design project. Preparation of formal engineering reports. Statistical analysis. Governmental regulations. Bioethical issues. 2 laboratories. Formerly BMED 456.

BMED 4470 Special Advanced Topics (1-3 units)
Term Typically Offered: F, SP
Prerequisite: Consent of instructor.

Directed group study of special topics for advanced students. The Class Schedule will list topic selected. Repeatable up to 6 units. 1 to 3 lectures. Formerly BMED 470.

BMED 4471 Special Advanced Laboratory (1-3 units)
Term Typically Offered: F, SP
Prerequisite: Consent of instructor.

Directed group laboratory study of special topics for advanced students. The Class Schedule will list topic selected. Repeatable up to 6 units. 1 to 3 laboratories. Formerly BMEd 471.

BMED 4480 Drug Discovery and Development (3 units)
Term Typically Offered: SP
Prerequisite: Junior standing in Biomedical Engineering major or Biological Sciences major; or graduate standing in MS in Biomedical Engineering or MS in Biological Sciences. Recommended: One of the following: BMED 460, BMED 4460, BIO 475, or BIO 4457.

Development process for drugs, biologics, and combination products. Drug discovery and development, preclinical research, clinical research, FDA review, and post-market safety monitoring. Economics, ethical considerations, and careers in drug development. 3 lectures. Formerly BMED 480.

BMED 4495 Cooperative Education Experience (1-12 units)
Term Typically Offered: F, SP, SU
CR/NC
Prerequisite: Sophomore standing and consent of instructor.

Work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive terms. A fully developed formal report and evaluation by work supervisor is required. Repeatable up to 24 units. Credit/No Credit grading only. Formerly BMED 495.

BMED 4499 Senior Thesis (3 units)
Term Typically Offered: F, SP, SU
Prerequisite: Senior standing and consent of instructor.

Selection and completion of senior thesis under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Thesis results presented in a formal report. Formerly BMED 459.

BMED 5500 Individual Study (1-3 units)
Term Typically Offered: F, SP, SU
Prerequisite: Graduate standing and consent of department chair.

Individual investigation, research, studies or surveys of selected problems. Advanced study planned and completed under the direction of faculty. Open to graduate students who have demonstrated the ability to do independent work. Repeatable up to 6 units. Formerly BMED 500.

BMED 5504 Finite Element Analysis of Continua (4 units)
Term Typically Offered: SP
Prerequisite: One of the following: BMED/CE/ME 404, BMED/CE/ME 4404, CE 501, CE 5502, AERO 431, or AERO 4431.

Finite element theory and application with a focus on numerical implementation. Strong and weak forms, variational theorems, displacement based methods, mixed methods, viscoelasticity and plasticity type formulations, augmented Lagrangian formulations, transient and modal analysis, and finite deformation. 3 lectures, 1 laboratory. Crosslisted as AERO/BMED/CE/ME 5504. Formerly CE/ME 504.

BMED 5505 Biomedical Signal Transduction and Data Acquisition (3 units)
Term Typically Offered: F
Prerequisite: BMED 440, BMED 4440, or graduate standing.

Physics of chemical, mechanical, electrical, thermal, and optical sensors relevant to biomedical engineering. Evaluation of transducer performance, figures of merit, and system design. Data/signal characteristics, acquisition, and storage. Sources of error. Implementation of transducer system relevant to graduate projects. 2 lectures, 1 laboratory. Formerly BMED 505.

BMED 5510 Principles of Tissue Engineering (3 units)
Term Typically Offered: F
Prerequisite: One of the following: ASCI 438, ASCI 4438, BIO 361, BIO 3352, BMED 460, BMED 4460, or graduate standing in Biomedical Engineering.

Fundamental building blocks of tissue engineering including cell source and isolation, scaffold selection and modification, bioreactor design and tissue cultivation, and patient implantation. Applications of tissue engineering for creating skin, bladder, blood vessels, and other tissues. Key hands-on lab techniques. 2 lectures, 1 laboratory. Formerly BMED 510.

BMED 5511 Advanced Cell Culture Techniques (1 unit)
Term Typically Offered: SP
Prerequisite: Specialization in Regenerative Medicine for the MS in Biological Sciences; Specialization in Regenerative Medicine for the MS in Biomedical Engineering; or the Animal Science Specialization for the MS in Agriculture.

Process development of unit operations involved in cell production. Donor-to-donor variability, manual vs automated isolations, activation and proliferation, and scale-up culture conditions. 1 laboratory. Crosslisted as BIO/BMED 5511.

BMED 5515 Biomedical Imaging (3 units)
Term Typically Offered: SP
Prerequisite: Graduate standing.

Fundamental principles and applications of microscopy modalities in biomedical engineering. Basic light microscopy, fluorescence microscopy, confocal and multiphoton microscopy, optical coherence tomography, scanning electron microscopy, and advanced microscopy techniques. 1 lecture, 2 laboratories. Formerly BMED 515.

BMED 5520 Modeling of Biomedical Systems (3 units)
Term Typically Offered: F
Prerequisite: Graduate standing.

Analytic and computational representation of biomedical systems with applications in physiology and medicine. Emphasis on biomedical engineering systems, applications, and system modeling including the use of modern tools. Serves as a foundation for biomedical engineering graduate electives and research projects. 2 lectures, 1 laboratory. Formerly BMED 520.

BMED 5525 Skeletal Tissue Mechanics (3 units)
Term Typically Offered: TBD
Prerequisite: CE 204 or ENGR 2211, and BMED 460 or BMED 4460; or graduate standing.

Mechanical properties of various tissues in the musculoskeletal system. Relationship of these properties to anatomic and histologic structures. Changes in these properties caused by aging, disease, overuse, and disuse. Tissues covered include bone, cartilage and synovial fluid, ligament, and tendon. 3 lectures. Formerly BMED 525.

BMED 5530 Advanced Issues in Biomaterials (3 units)
Term Typically Offered: TBD
Prerequisite: One of the following: BIO 161, BIO 1151, BIO 213, or BIO 2213, and one of the following: BMED 420, BMED 2420, MATE 210, or MATE 1220, and BMED 460 or BMED 4460; or graduate standing. Recommended: STAT 312 or STAT 3210.

Structure-function relationships for materials in contact with biological systems. Interactions of materials implanted in the body. Histological and hematological considerations including foreign body responses, inflammation, carcinogenicity, thrombosis, hemolysis, immunogenic and toxic properties. Microbial interaction with material surfaces, degradation. Course may be offered in classroom-based or online format. 3 lectures. Formerly BMED/MATE 530.

BMED 5535 Bioseparations and Clinical Diagnostics (3 units)
Term Typically Offered: TBD
Prerequisite: BMED 425 or BMED 3425, and ME 341 or ME 3341; or graduate standing.

Physicochemical hydrodynamics and microfluidic bioseparations, which includes electrokinetics, colloid science and suspension mechanics in the context of Clinical Diagnostic Systems. Applying bio-separation design parameters, theoretical and numerical models. 2 lectures, 1 activity. Formerly BMED 535.

BMED 5550 Current and Evolving Topics in Biomedical Engineering (3 units)
Term Typically Offered: F, SP
Prerequisite: Graduate standing in Biomedical Engineering.

Current topics in biomedical engineering, including medical and industrial applications. Exploration of detailed technical treatment of contemporary issues in biomedical engineering, and examination of technical and societal implications of these subjects. The Class Schedule will list subtitle selected. Repeatable up to 9 units. 3 lectures. Formerly BMED 550.

BMED 5555 Introduction to Computational Neuroscience (3 units)
Term Typically Offered: SP
Prerequisite: BMED 440, BMED 4440, or graduate standing in Biomedical Engineering.

Biophysical basis of the Hodgkin-Huxley active membrane model. Equivalent circuit-based approaches to modeling Hodgkin-Huxley neurons. Review issues in computational neural science, including neural recruitment studies and decomposition of compound evoked potentials for orthogonal and non-orthogonal component functions. 3 lectures. Formerly BMED 555.

BMED 5560 Cell Transplantation and Biotherapeutics (1 unit)
Term Typically Offered: SP
Prerequisite: One of the following: ASCI 438, ASCI 4438, BIO 361, BIO 3352, BMED 460, BMED 4460, or graduate standing.

Etiology and patho-physiology for various forms of disease, such as inflammatory, autoimmune, and monogenic diseases, as well as cell and gene therapies for these conditions. 1 lecture. Formerly BMED 560.

BMED 5561 Cell Transplantation and Biotherapeutics Laboratory (2 units)
Term Typically Offered: SP
Prerequisite: One of the following: One of the following: ASCI 438, ASCI 4438, BIO 361, BIO 3352, BMED 460, or BMED 4460, and STAT 218, STAT 1110, STAT 312, or STAT 3210; or graduate standing.

Procedures include rodent handling, anesthesia, surgical disease modeling, biotherapy delivery, and visualizing/measuring therapeutic efficacy. Additional focus on experimental design, data collection, and analysis. 2 laboratories. Formerly BMED 561.

BMED 5563 Biomedical Engineering Graduate Seminar (1 unit)
Term Typically Offered: F, SP
Prerequisite: Graduate standing.

Topics of interest to biomedical engineering graduate students. A forum to share information about research and emerging fields, and to discuss topics of interest with professionals, academics, and other graduate students. The Class Schedule will list subtitle selected. Repeatable up to 2 units. 1 seminar. Formerly BMED 563.

BMED 5570 Special Advanced Topics (1-3 units)
Term Typically Offered: F, SP
Prerequisite: Graduate standing and consent of instructor.

Directed group study of special topics for graduate students. The Class Schedule will list topic selected. Repeatable up to 6 units. 1 to 3 lectures. Formerly BMED 570.

BMED 5571 Special Advanced Laboratory (1-2 units)
Term Typically Offered: F, SP
Prerequisite: Graduate standing and consent of instructor.

Directed group laboratory study of special topics for advanced students. The Class Schedule will list topic selected. Repeatable up to 6 units. 1 to 2 laboratories. Formerly BMED 471.

BMED 5583 Research and Professional Development for Regenerative Medicine Students (2 units)
Term Typically Offered: SP
Prerequisite: Graduate standing in the Specialization in Regenerative Medicine for the MS in Biological Sciences; or Specialization in Regenerative Medicine for the MS in Biomedical Engineering; or the Animal Science Specialization for the MS in Agriculture.

Independent research experience and professional development in biological or biomedical research. Proposal writing and literature review, experimental design, implementation and troubleshooting, data visualization and analysis, oral and poster presentations, and workplace issues. 1 seminar and supervised work. Crosslisted as ASCI/BIO/BMED 5583. Formerly ASCI/BIO/BMED 583.

BMED 5591 Project Seminar I (1 unit)
Term Typically Offered: F
Prerequisite: Graduate standing in Biomedical Engineering. Corequisite: BMED 598 or BMED 5598.

Team selection of an applied design or testing project typical of biomedical fields of employment or applied research. Project management skills including budgeting, timelines, resource management, and professional communication. Formulation of literature review and project schedule. 1 seminar. Formerly BMED 591.

BMED 5592 Project Seminar II (1 unit)
Term Typically Offered: SP
Prerequisite: BMED 591 or BMED 5591. Corequisite: BMED 598 or BMED 5598.

Continuation of a two part project seminar sequence. Completion of project by a team which is typical of biomedical fields of employment or applied research. Project management skills including budgeting, timelines, resource management, and professional communication. Completion of literature review. 1 seminar. Formerly BMED 592.

BMED 5598 Project (1-3 units)
Term Typically Offered: F, SP, SU
Prerequisite: Graduate standing and consent of instructor.

Individual or group, research or design experience, with faculty approval and guidance, generally with additional guidance from external project sponsor. Deliverables include a report and presentation that satisfy the culminating experience for a master's degree. Repeatable up to 6 units. Crosslisted as ASCI/BIO/BMED 5598. Formerly ASCI/BIO/BMED 593.

BMED 5599 Thesis (1-6 units)
Term Typically Offered: F, SP, SU
Prerequisite: Graduate standing and consent of instructor.

Selection by individual, with faculty guidance and approval, of topic for independent research or investigation resulting in a thesis to be used to satisfy the culminating experience for a Master's degree. Repeatable up to 6 units. Formerly BMED 599.