Biomedical Engineering Graduate Concentration – Fall 2016  
Medical Product Development  
Advisor: Jan Stegemann, Ph.D.

**MEDICAL PRODUCT DESIGN AND DEVELOPMENT (both courses are required):**  
BIOMEDE 599.002  Graduate BME Innovative Design Team (3) (I)  
BIOMEDE 599.004  Graduate BME Innovative Design Team (4) (II)

**GENERAL (both courses are required):**  
BIOMEDE 500  Biomedical Engineering Seminar (1) (I, II)  
BIOMEDE 550  Ethics and Enterprise (1) (I)

**MATHEMATICS (select one course):**  
MATH 450  Advanced Mathematics for Engineers I (4) (I,II,IIIb)  
MATH 454  Boundary Value Problems for Partial Differential Equations (3) (I,II,IIIa)  
MATH 462  Mathematical Models (3) (II)  
MATH 463  Mathematical Modeling in Biology (3) (I)  
MATH 471  Introduction to Numerical Methods (3) (I,II,IIIb)  
MATH 540  Mathematics of Biological Networks (3) (I)  
MATH 550  Introduction to Adaptive Systems (3) (I)  
MATH 555  Introduction to Functions of a Complex Variable with Applications (3) (I,II)  
MATH 556  Applied Functional Analysis (3) (I)  
MATH 557  Applied Asymptotic Analysis (3) (II)  
MATH 558  Applied Nonlinear Dynamics (3) (I)  
MATH 559  Topics in Applied Mathematics (3)  
MATH 561  Linear Programming I (3) (I,II)  
MATH 562  Continuous Optimization Methods (3) (II)  
MATH 563  Advanced Mathematical Methods in Biology (3) (II)  
MATH 564  Topics Math Biology (3)  
MATH 571  Numerical Linear Algebra (3) (I,II)  
MATH 572  Numerical Methods for Differential Equations (3) (II)  
MATH 651  Topics in Applied Mathematics I (3)  
MATH 656  Introduction to Partial and Differential Equations (3) (I)  
MATH 657  Nonlinear Partial Differential Equations (3)  
MATH 756  Advanced Topics in Partial Differential Equations (3)  
MECHENG 501  Math Methods in Mechanics (3) (II)  
MECHENG 564  Linear Systems Theory (4) (I)

**BIOINSTRUMENTATION (select one course):**  
BIOLCHEM 516  Intro Biochemistry Lab (3) (I)  
BIOMEDE 458  Biomedical Instrumentation and Design (4) (I, II)  
BIOMEDE 510  Medical Imaging Laboratory (3) (II)  
IOE 432  Industrial Engineering Instrumentation Methods (3) (I)  
MCDB 429  Cellular & Molecular Biology Lab (3) (II)

**STATISTICS (select one course):**  
BIOMEDE 503  Statistical Methods for Biomedical Engineering (3) (II)  
BIOSTAT 602  Biostatistical Inference (4) (II)  
BIOSTAT 650  Applied Statistics I: Linear Regression (4) (I)  
BIOSTAT 651  Applied Statistics II: Extensions for Linear Regression (3) (II)  
EECS 501  Probability and Random Processes (4) (I,II)  
IOE 461  Quality Engineering Principles and Analysis (3) (I)  
STATS 470  Introduction to the Design of Experiments (4) (I)  
STATS 500  Applied Statistics I (3) (I)  
STATS 525  Probability Theory (3) (I)

NOTE: BME graduate students can only take EECS 501 in the winter term.
LIFE SCIENCE (two courses are required – at least one course must be outside of the College of Engineering):

**Required:**

BIOMEDE 519  Quantitative Physiology (4) (I)

**Select one course:**

- ANAT 403  Human Anatomy (5) (I,II)
- ANAT 541  Mammalian Reproductive Physiology (4) (II)
- BIOLCHEM 451  Advanced Biochemistry I (4) (I)
- BIOLCHEM 515  Introductory Biochemistry (3) (I, II)
- BIOLCHEM 550  Macromolecular Structure and Function (3) (I)
- BIOPHYS 520  Methods of Biophysical Chemistry (3) (I)
- CANCBIO 553  Molecular Biology of Cancer (3) (I)
- CANCBIO 554  Cancer Pathogenesis and Treatment (3) (II)
- CDB 530  Cell Biology (3) (I)
- CDB 550  Histology (4) (II)
- CDB 581  Development Genetics (3) (I)
- CDB 583  Organogenesis: Stem Cells to Regenerative Biology (3) (II)
- KINESLGY 522  Clinical Neurophysiology and Neuroimaging (3)
- KINESLGY 545  Metabolic Responses to Exercise (3)
- MCDB 422  Brain Development, Plasticity, and Circuits (3) (I)
- MCDB 423  Introduction to Research in Cellular and Molecular Neurobiology (3) (I) (II)
- MCDB 427  Molecular Biology (4) (I) (II)
- MCDB 428  Cell Biology (4) (I) (II)
- MCDB 429  Cellular and Molecular Biology Laboratory (3) (II)
- MCDB 435  Intracellular Trafficking (3) (II)
- MICRBIOL 540  Human Immunology (3) (II)
- NEUROSCI 570  Human Neuroanatomy I (3) (I)
- NEUROSCI 601  Principles Neuro I (3) (I)
- NEUROSCI 602  Princ Neurosc II (3) (II)
- PATH 581  Tissue, Cellular and Molecular Disease (4) (II)
- PHYSIOL 592  Integrated Neuroscience (2-4) (II)

**TECHNICAL ELECTIVES (two courses required, and total credits for concentration must be at least 30)**

*Note:* Courses with 499/599 designation are in pilot phase and may not be offered in the term indicated. Check to ensure these classes are offered and fit in your schedule.

- BIOMEDE 499.002  Clinical Observation and Needs Finding (2) (IIIa)
- BIOMEDE 504  Cellular Biotechnology (3) (II)
- BIOMEDE 523  The Business of Biology (3) (I)
- BIOMEDE 587  Technology, Innovation, Law, and Regulation (2) (I)
- BIOMEDE 588  Global Quality Systems and Regulatory Innovation (2) (II)
- BIOMEDE 599.007  Regulatory Issues in Medical Device Design (3) (II)
- CHE 517  Biochemical Eng (3) (I)
- ENTR 599.008  IP Strategy (3) (I)
- ENTR 599.011  Technology-inspired Models for Success (3) (I)
- ENTR 599.014  Introduction to Innovation Careers (2) (I)
- ENTR 599.018  Interpersonal Relations (3) (I)
- ENTR 599.019  Business Math (1.5) (I)
- ENTR 599.020  Project Management (3) (I)
- ES 512  Business Basics for Graduate Engineers (3) (II)
- ES 720  Commercialization of Biomedicine (1.5) (II)
**KEY AND ADDITIONAL NOTES:**
Course Department and Number  Course Name (# of credits) (term offered)

Terms:  I - fall, II - winter, III - spring-summer, IIIa - spring half, IIIb - summer half

If a term is not listed after the course, please contact the department for course offering information.

Every effort is made to make sure that the course offering information listed on the concentration is correct. Students can also refer to the Schedule of Classes or the department for the current offering.