

Biomedical Engineering Graduate Concentration – Fall 2016
Biomedical Imaging
Advisor: Xueding Wang, Ph.D.

BIOMEDICAL IMAGING:

BIOMEDE 516 Medical Imaging Systems (3) (I)

GENERAL (both courses are required):

BIOMEDE 500 Biomedical Engineering Seminar (1) (I,II)

BIOMEDE 550 Ethics and Enterprise (1) (I)

BIOMEDICAL RESEARCH AND DESIGN (select one – BIOMEDE 590 or BIOMEDE 599.002 and BIOMEDE 599.004):

BIOMEDE 590 Directed Research (2 - 3) (I,II,III)

BIOMEDE 599.002 Graduate BME Innovative Design Team (3) (I)

BIOMEDE 599.004 Graduate BME Innovative Design Team (4) (II)

NOTE: In order for BIOMEDE 599.002 and BIOMEDE 599.004 to count toward their degree in BME, students must register for these courses in both the fall and winter terms, and they must adhere to the following rules:

- a) this course can be counted as a SUGS, terminal MS, or MS/PhD student's 2 credit hour technical elective (fall term) and Biomedical Research and Design requirement (winter term),
- b) this course, taken in both terms, can be counted as a technical elective for a student that has already taken BIOMEDE 590,
- c) this course can be counted as PhD coursework providing that it has not already been counted as the student's Biomedical Research and Design requirement or technical elective in their MS program, and the student's advisor approves.

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)
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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:

The student must select the remaining credit hours needed to fulfill the minimum MS degree requirement of 30 credit hours from graduate level engineering. No more than 2 credit hours of seminar courses may be applied to the 30 credit hours needed to fulfill the MS degree requirement.

Sample Course Sequences:

For a student that has not had DSP:

Fall BIOMEDE 458, BIOMEDE 500, STATS 525, Technical Elective
Winter BIOMEDE 418, EECS 556, Mathematics
Fall BIOMEDE 516, BIOMEDE 519, BIOMEDE 550, BIOMEDE 590

For a student that has had DSP:

Fall BIOMEDE 458, BIOMEDE 500, BIOMEDE 516, STATS 525
Winter BIOMEDE 418, BIOMEDE 510, EECS 556, Mathematics
Fall BIOMEDE 519, BIOMEDE 550, BIOMEDE 590

Recommended Technical Electives:

BIOMEDE 417 Electrical Biophysics (4) (I)
BIOMEDE 418 Quantitative Cell Biology (4) (I,II)
BIOMEDE 552 Biomedical Optics (3)
EECS 453 Applied Matrix Algorithms for Signal Processing, Data Analysis, and Machine Learning (4) (I)
EECS 556 Image Processing (3) (II)
BIOMEDE 510 Medical Imaging Laboratory (3) (II) (Strongly recommended)

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.