

## BIOMED E BIOELECTRICAL CONCENTRATION - F07

MS: 30 total credit hours minimum

Advisor: Zhen Xu, Ph.D. (zhenx@umich.edu)

### Bioelectrical:

BIOMED E 417 Electrical Biophysics (4) (II)<sup>1</sup>

### General:

BIOMED E 500 Biomedical Engineering Seminar (1) (I,II)

BIOMED E 550 Ethics and Enterprise (1) (I)

### Biomedical Research and Design (one course):

BIOMED E 450 Biomedical Design (4) (II) – for MS only students

BIOMED E 590 Directed Research (2) (I,II,III)

BIOMED E 599 - Section 001  
Graduate BME Innovative Design Team (2) (I) **AND**

BIOMED E 599 - Sections 004 and 005  
Graduate BME Innovative Design Team (4) (II)<sup>2</sup>

### Mathematics (one course):

BIOMED E 464 Inverse Problems (3) (II)

Math 462 Mathematical Models (3)<sup>3</sup>

Math 463 Math Modeling in Biology (3) (I)

Math 556 Methods of Applied Math I (3) (I)

Math 557 Methods of Applied Math II (3) (II)

Math 563 Advanced Mathematical Methods for the Biological Sciences (3) (II)

Math 571 Numerical Methods for Scientific Computing I (3) (I,II)

Math 572 Numerical Methods for Scientific Computing II (3) (II)

Math 651 Topics in Applied Mathematics I (3)<sup>3</sup>

Math 652 Topics in Applied Mathematics II (3)<sup>3</sup>

Math 656 Introduction to Partial Differential Equations (3)<sup>3</sup>

### Bioinstrumentation (one course):

BIOMED E 458 Biomedical Instrumentation and Design (4) (I, II)

### Statistics (one course)<sup>4</sup>:

EECS 501/Aero 552

Probability and Random Processes (4) (I)

Statistics 525/Math 525

Probability Theory (3) (I)

### Life Science (two courses):

*Required:*

BIOMED E 519 Quantitative Physiology (4) (I)

*And one of the following:*

Neurosci 570 Human Neuroanatomy (3) (II)

Neurosci 601 Principles Neuro I (4) (I)

Neurosci 602 Principles Neuro II (4) (II)

Neurosci 693/Phys 693

Cellular and Integrative Neurophysiology (4) (II)

Pharm 659

General and Systematic Pharmacology (3) (I)

BIOMED E 401 The Human Body (4) (I)

BIOMED E 418 Quantitative Cell Biology (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<sup>5</sup> engineering courses. This may include EECS 451 for students needing DSP. 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 Sequence:

**Fall** BIOMED E 458 (4), BIOMED E 500 (1), BIOMED E 501 (4)

**Winter** BIOMED E 418 (4), BIOMED E 590 (2), Adv Math

**Fall** BIOMED E 519 (4), BIOMED E 550 (1), Technical Elective (3 or 4)

### Recommended Technical Electives:

BIOMED E 510 Medical Imaging Laboratory (3) (II)

BIOMED E 516 Medical Imaging Systems (3) (I)

BIOMED E 599 - Section 001  
Neural Engineering (3) (II)

EECS 414 Introduction to MEMS (4) (I)

EECS 425 Integrated Microsystems Laboratory (4) (II)

EECS 451 Digital Signal Processing and Analysis (4) (I,II)

EECS 559 Advanced Signal Processing (3) (I)

<sup>1</sup> I - fall, II - winter, III - spring-summer, IIIa - spring half, IIb - summer half.

<sup>2</sup> In order for this course to count toward their degree in BME, students must register for this course in both the fall and winter terms, and they must adhere to the following rules:  
a) this course can be counted as a SGUS, 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 BIOMED E 450 or BIOMED E 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.

<sup>3</sup> Refer to the Mathematics Department for current offering.

<sup>4</sup> Stats 412: Not recommended.

<sup>5</sup> Please see Horace H. Rackham School of Graduate Studies guidelines.