MASTER OF SCIENCE IN BIOINFORMATICS

Student Learning Outcomes

Students graduating from this program will:

- Identify and extract data necessary for a given research question.
- Use statistics to analyze and interpret data.
- Design a testable research question or hypothesis.
- Identify responsible conduct of research resources and develop strategies for protecting oneself from scientific misconduct.
- Communicate scientific outcomes.
- Describe common epidemiologic studies, test for causal associations, and evaluate potential noncausal associations. (Applicable only to Epidemiology and Biostatistics emphasis)

Program Description

The Department of Biomedical and Health Informatics at the School of Medicine, in cooperation with the School of Science and Engineering, offers the Master of Science in Bioinformatics degree. Students may complete the degree without an area of emphasis or may choose one of five emphasis areas (Clinical Research, Computational Bioinformatics, Genomic Bioinformatics, Individualized Informatics, or Epidemiology and Biostatistics).

The program is designed to prepare a new generation of informatics professionals who will have the necessary skills to work collaboratively for the advancement of health sciences. Graduates are expected to be effective team members who can contribute to education, research, and development in the fields of bioinformatics and/or clinical research. This degree program prepares students to assume a variety of professional informatics positions in translational research and development, institutional management, public policy, information systems, hospitals, private industry, or as members of a clinical research team. Students interested in pursuing a career involving independent conduct of research should enroll in the thesis/capstone track. A non-thesis track is available for students pursuing industry careers, where demonstration of specific skills and expertise are valued. Students completing the M.S. Bioinformatics degree may also choose to continue their education at advanced graduate levels.

Program Goals

1. Produce competent researchers at the interface of biomedical and health informatics and clinical research
2. Produce graduates able to establish partnerships with stakeholders and the community
3. Produce effective communicators
4. Produce ethical and responsible researchers

Degree Requirements

A minimum of 30 to 36 credit hours are required to earn the Master of Science in Bioinformatics degree (30 for non-thesis track and 36 for thesis/capstone track). Students must complete the program of study while maintaining a 3.0 or better grade point average. The total number of credit hours, required coursework, elective course work and Thesis or Capstone requirements vary based on the MS Bioinformatics emphasis area and final research experience selected by the student. These options are shown in the tables below.

	Individualized Informatics Emphasis	Computational Emphasis	Clinical Research Emphasis	Epidemiology and Biostatistics Emphasis	Genomics Emphasis
Required course hours	18	24	24	24	33
Elective course hours*	12	6	6	6	0
Research & Thesis hours*	6	6	6	6	6
Capstone option*	Yes	Yes	Yes	Yes	No
No Thesis Option*	Yes	Yes	Yes	Yes	Yes
Minimum Total hours	30 - 36	30 - 36	30 - 36	30 - 36	33 or 39

*Students may choose to complete either a 3 credit hour Capstone course with 3 additional elective credit hours, or no thesis, in place of Research and Thesis credit hours.

MSB Emphasis Options

1. Individualized Informatics: Gives students flexibility to complete a bioinformatics curriculum that best meets their academic and career goals.

2. Clinical Research: Emphasizes the creation and understanding of data generated by patient care and clinical studies and on the statistical methodology needed for clinical research and improved bedside care.

3. Computational Bioinformatics: Emphasizes the development and use of the next generation of bioinformatics tools and software.

4. Genomic Bioinformatics: Emphasizes the use of existing software for biological analysis and the analysis of a diverse set of biological data.

5. Epidemiology and Biostatistics: Emphasizes the knowledge and skills necessary to design, conduct and evaluate population health research.

The required coursework for each M.S. Bioinformatics option are listed below. Information about elective coursework can be obtained from program faculty. Please visit our Department Website (http://med.umkc.edu/msb/) to learn more about this program.

M.S. Individualized Informatics Emphasis area

Code	Title	Credits
MEDB 5501	Applied Biostatistics I	3
MEDB 5502	Applied Biostatistics II	3
MEDB 5510	Clinical Research Methodology	3
MEDB 5561	Responsible Conduct of Research	3
At least 2 from the following:		**6**
MEDB 5520	Introduction to Medical Informatics	
or MEDB 5521	Clinical Bioinformatics	
or BIOLOGY 5525	Bioinformatics and Data Analysis	
or COMP-SCI 5566	Introduction to Bioinformatics	
Electives:		**12**
Research Experience Options (choose one of the following):		**0-6**
Thesis (6 hours)		
Capstone (3 hours and one additional elective course)		
No Thesis or Capstone		
Total Credits		**30-36**

Clinical Research Emphasis

Code	Title	Credits
MEDB 5501	Applied Biostatistics I	3
MEDB 5502	Applied Biostatistics II	3
MEDB 5510	Clinical Research Methodology	3
MEDB 5511	Principles and Applications of Epidemiology	3
MEDB 5512	Clinical Trials	3
MEDB 5513	Overview of Health Services Research	3
MEDB 5520	Introduction to Medical Informatics	3
MEDB 5561	Responsible Conduct of Research	3
Electives:		**6**
Research Experience Options (choose one of the following):		**0-6**
Thesis (6 hours)		
Capstone Course (3 hours and one additional elective course)		
No Thesis or Capstone		
Total Credits		**30-36**

Computational Emphasis

Code	Title	Credits
MEDB 5501	Applied Biostatistics I	3
MEDB 5502	Applied Biostatistics II	3
MEDB 5510	Clinical Research Methodology	3
MEDB 5520	Introduction to Medical Informatics	3
MEDB 5561	Responsible Conduct of Research	3
COMP-SCI 470	Introduction to Database Management Systems (or)	3
or COMP-SCI 371	Database Design, Implementation and Validation	

COMP-SCI 5565	Introduction to Statistical Learning	3
COMP-SCI 5566	Introduction to Bioinformatics	3
Electives:		**6**
Research Experience Options (choose one of the following):		**0-6**
Thesis (6 hours)		
Capstone (3 hours and one additional elective course)		
No Thesis or Capstone		
Total Credits		**30-36**

Epidemiology and Biostatistics Emphasis

Code	Title	Credits
MEDB 5510	Clinical Research Methodology	3
MEDB 5511	Principles and Applications of Epidemiology	3
MEDB 5535	Quantitative Aspects of Epidemiologic Research	3
MEDB 5501	Applied Biostatistics I	3
MEDB 5502	Applied Biostatistics II	3
MEDB 5561	Responsible Conduct of Research	3
Elective Courses (Epidemiology and Biostatistics):		6
MEDB 5503	Biostatistics III-Mixed-Effects Models	
MEDB 5573	Biostatistical Consulting Practicum	
MEDB 5514	Human Genome Epidemiology	
MEDB 5589	Special Topics	
MEDB 5505	Introduction to R	
MEDB 5507	Introduction to SAS	
MEDB 5508	Introduction to SQL	
Elective Coursework:		6
MEDB 5512	Clinical Trials	
MEDB 5513	Overview of Health Services Research	
MEDB 5525	Social Determinants of Health	
MEDB 5520	Introduction to Medical Informatics	
MEDB 5521	Clinical Bioinformatics	
MEDB 5540	Multidisciplinary Graduate Seminar	
MEDB 5550	Health Outcomes Seminar	
Research Experience Options (choose one of the following):		**0-6**
Thesis (6 hours)		
Capstone Course (3 hours and one additional elective course)		
No Thesis or Capstone		
Total Credits		**30-36**

Genomic Emphasis

Code	Title	Credits
MEDB 5501	Applied Biostatistics I	3
MEDB 5502	Applied Biostatistics II	3
MEDB 5510	Clinical Research Methodology	3
MEDB 5561	Responsible Conduct of Research	3
LS-CBB 5530	Cell and Molecular Biology I	3
LS-CBB 5520	Cell and Molecular Biology II	3
LS-MBB 5561	General Biochemistry I	3
LS-MBB 5562	General Biochemistry II	3
BIOLOGY 5519	Principles of Evolution	3
BIOLOGY 5525	Bioinformatics and Data Analysis	3
COMP-SCI 470	Introduction to Database Management Systems	3

or COMP-SCI 371	Database Design, Implementation and Validation	
Research Experience Options (choose one of the following):		**0-6**
Thesis (6 hours)		
No Thesis		
Total Credits		**33-39**

Admission Requirements

Please visit our Admissions Page (https://med.umkc.edu/msb/) to learn about our requirements.