MEDICAL BIOINFORMATICS (MEDB)

Courses

MEDB 5501 Biostatistics I Credits: 3
Introduction to statistical concepts and analytic methods as applied to health science. Course includes lectures and hands on computer laboratory.
Prerequisites: an advanced math course (i.e., Calculus, statistics).

MEDB 5502 Biostatistics II Credits: 3
The second course in the Biostatistics sequence for Master of Science in Bioinformatics; students gain knowledge and experience with advanced biostatistical methods.
Prerequisites: MEDB 5501.

MEDB 5503 Mixed-Effects Models Credits: 3
This course will cover the computational basis of mixed-effects models and how to apply these models to analyze data. Students will learn how to graph, investigate, and model data that are not independent and identically distributed, and how to evaluate model fit.
Prerequisites: completed courses: MEDB 5505 R-Introduction, MEDB 5501 Biostatistics I, MEDB 5502 Biostatistics II, or equivalents and Linear Algebra is preferred.

MEDB 5505 Introduction to R Credit: 1
Provides a working familiarity with R. No advanced programming or statistical analytic skills, other than the ability to create and modify text files are needed. Basic methods for data import, data management, simple graphics, and basic statistical analysis are introduced. Provides student with a firm foundation to address these areas in advanced statistics classes or in the student's research efforts, including thesis/dissertation research. A basic understanding of statistical terminology and a working familiarity with computer-based data files (e.g., Excel) is necessary. A basic understanding of the concepts of computer coding is recommended.

MEDB 5506 Introduction to SPSS Credit: 1
Session provides a working familiarity with SPSS. Students are not expected to have advanced programming or statistical analysis skills, other than the ability to create and modify text files. Basic methods for data import, data management, simple graphics, and basic statistical analysis are introduced. This class will not cover advanced statistical methods, but will provide the student with a firm foundation to address these areas in advanced statistics classes or in the student's research efforts, including thesis/dissertation research. A basic understanding of statistical terminology and a working familiarity with computer-based data files (e.g., Excel) is necessary.

MEDB 5507 Introduction to SAS Credit: 1
Session provides a working familiarity with SAS. Students are not expected to have advanced programming or statistical analysis skills, other than the ability to create and modify text files. Basic methods for data import, data management, simple graphics, and basic statistical analysis are introduced. This class will not cover advanced statistical methods, but will provide the student with a firm foundation to address these areas in advanced statistics classes or in the student's research efforts, including thesis/dissertation research. A basic understanding of statistical terminology and a working familiarity with computer-based data files (e.g., Excel) is necessary.

MEDB 5510 Clinical Research Methodology Credits: 3
This course trains the student to contribute to research design, planning, and implementation, and to manage and interpret health-related data. This course will provide a broad overview of clinical research in terms of definition, methodology, conduct and applications. The course will explore basic elements of clinical research including the hierarchy of clinical research design and the conduct of clinical research. Application of clinical research knowledge to specific medical practice issues will also be explored. Course topics include: conceiving the research question; study designs; questionnaire construction; research methodology; research ethics; human subjects requirements; the role of statistical analysis in clinical research; research proposal preparation; and research based on analysis of secondary data. Both classroom and online asynchronous sections offered.

MEDB 5511 Principles and Applications of Epidemiology Credits: 3
This course will provide an introductory overview of the principles of epidemiology and illustrate applications in specialized topic areas. Course lectures will introduce measures of effect used to study disease in human populations, epidemiological study designs, concepts of causal inference, and threats to study validity. Specialized lectures will demonstrate the application of these concepts in select health and disease conditions.

MEDB 5512 Clinical Trials Credits: 3
Clinical Trials explores the knowledge and skills required to conduct clinical trials, and implications of clinical trials on practice in medicine and allied health.

MEDB 5513 Overview of Health Services Research Credits: 3
Provides an overview of the U.S. health care and public health systems including issues about cost, access, and quality of health care. This course focuses on the role of research and information in the process of redesigning of health care delivery in the U.S. for the purpose of improving the value of health services.
Prerequisites: Completion of MEDB 5501 Biostatistics I and completion of MEDB 5510 Clinical Research Methodology or MEDB 5511 Principles and Applications of Epidemiology.
MEDB 5514 Human Genome Epidemiology Credits: 3
Designed for biological researchers and clinicians interested in studying common human diseases using state of the art genomics/genetics epidemiological approaches. Comprehensive introduction to concepts and methodologies of quantitative/statistical genetics, emerging technologies and analytical methods for genomic science, basic study design, utilization of software packages for analyses of genomic data, successful examples of using human genome epidemiology information to improve health, and ethical, legal and social issues in the design and conduct human genome epidemiology research.

MEDB 5520 Intro-Medical Informatics Credits: 3
Introduction to concepts of medical informatics and overview of the use of computers and information technologies in health care.

MEDB 5521 Clinical Bioinformatics Credits: 3
Clinical bioinformatics will provide the foundation required for effective communication between computational, biological and clinical experts. This class uses a series of exercises to enable participants to independently perform gene and protein-based bioinformatics queries and analyses. Throughout the course, core biological principles are explained, as are the foundational technology and computational topics. Students will become proficient with public bioinformatics resources. This course will prepare students to apply the techniques to their research or participation in interdisciplinary clinical terms.

MEDB 5525 Social Determinants of Health Credits: 3
This course will describe how social, economic and political factors affect health. It will examine strategies to address social determinants of health to reduce health inequities. Students will explore how specific social determinants like socioeconomic status, race ethnicity, and lifestyle influence health, use a "life course" approach to look at different stages of life and the effect of social determinants on specific populations.

MEDB 5530 Independent Study I Credits: 1-3
Focused readings and/or special research project in an area selected by the graduate student in consultation with the advisor.

MEDB 5531 Independent Study II Credits: 1-3
Focused readings and/or special research projects in an area selected by the graduate student in consultation with the advisor.

MEDB 5535 Quantitative Aspects of Epidemiologic Research Credits: 3
This course offers students advanced training in the analysis of epidemiological data. Topics include application of common measures of frequency and association, confounding, effect modification, bias, misclassification, and sensitivity analysis in epidemiologic and clinical data sources. **Prerequisites:** MEDB 5501, MEDB 5502 and one of the following: MEDB 5510 or MEDB 5511

MEDB 5540 Multidisciplinary Graduate Seminar Credit: 1
This course will be a combination of discussion, presentations, and didactic presentations that will allow students and faculty to exchange information and explore current research across the disciplines that make up the bioinformatics degree program. The course is designed to help student develop critical skills for evaluating published research, designing research projects, and communicating research findings.

MEDB 5550 Health Outcomes Seminar Credit: 1
The course content is guided by a series of seminars presented by researchers who are actively engaged in health outcomes studies. It explores multiple topics that are unique relevant to clinical investigators. Faculty and peer discussion forums highlight key concepts and applications.

MEDB 5560 Medical Decision Making Credits: 3
This course will introduce the concept of medical decision making under uncertainty through an examination of disease probabilities and how they are altered by the characteristics of the diagnostic test being studies or used clinically. Decision trees will be introduced as a mechanism for communicating complex medical decisions and introductory level decision analysis will be presented. The measurement of patient values for alternative outcomes will be introduced as they pertain to direct payoff values as well as modifiers to cost payoffs.

MEDB 5561 Responsible Conduct of Research Credits: 3
An interdisciplinary course which covers principles and day-to-day practicalities of research ethics, information about regulatory requirements for conducting research including safety issues and the use of humans, animals and radioactive biohazardous materials; discuss current issues in the ethical aspects of research, such as scientists’ obligations with respect to public policy and advocacy.

MEDB 5589 Special Topics Credits: 1-3
An opportunity to explore in depth topics not included in usual course offerings. One or more topics will be announced in advance of registration.

MEDB 5591 Internship I Credits: 1-3
Opportunity to apply knowledge and skills in clinical, computational, or genomics research and gain insight into potential career options. Students develop appreciation for teamwork and commitment in professional environments. **Prerequisites:** MEDB 5501, MEDB 5502, MEDB 5510, MEDB 5513.

MEDB 5592 Internship II Credits: 1-3
Opportunity to apply knowledge and skills in clinical, computational, or genomics research and gain insight into potential career options. Students develop appreciation for teamwork and commitment in professional environments. Internship II is applicable to students who have previously completed 3 hours of internship. **Prerequisites:** MEDB 5501, MEDB 5502, MEDB 5510, MEDB 5513, MEDB 5591.
MEDB 5595 Capstone Experience Credits: 3
This course is designed for the non-thesis student to demonstrate that they have mastered key learning objectives expected of the graduating master's student in the Clinical Research emphasis area. After completion of the core courses in the Masters of Bioinformatics curriculum, students will apply their learning to developing, implementing and presenting results from a project that demonstrates integration of the knowledge, abilities and values emphasized in the degree program.

MEDB 5599 Research and Thesis Credits: 1-6
Research for thesis.

MEDB 5699 Dissertation Research Credits: 1-12
Research and dissertation preparation for IPhD degree students participating in Biomedical and Health Informatics co-discipline.

MEDB 5899 Required Graduate Enrollment Credit: 1