**BIOMEDICAL INFORMATICS (BMIN)**

**BMIN 501 Introduction to Biomedical and Health Informatics**
This course is designed to provide a survey of the major topic areas in medical informatics, especially as they apply to clinical research. Through a series of lectures and demonstrations, students will learn about topics such as databases, natural language, clinical information systems, networks, artificial intelligence and machine learning applications, decision support, imaging and graphics, and the use of computers in education.

Taught by: Holmes  
Course usually offered in fall term  
Activity: Lecture  
1.0 Course Unit

**BMIN 502 Databases in Biomedical Research**
This course is intended to provide in-depth, practical exposure to the design, implementation, and use of databases in biomedical research, and to provide students with the skills needed to design and conduct a research project using primary and secondary data. Topics to be covered include: database architectures, data normalization, database implementation, client-server databases, concurrency, validation, Structured-Query Language (SQL) programming, reporting, maintenance, and security. All examples will use problems or data from biomedical domains. MySQL will be used as the database platform for the course, although the principles apply generally to biomedical research and other relational databases.

Taught by: Holmes  
Course usually offered in spring term  
Activity: Lecture  
1.0 Course Unit

**BMIN 503 Data Science for Biomedical Informatics**
In this course, we will use R and other freely available software to learn fundamental data science applied to a range of biomedical informatics topics, including those making use of health and genomic data. After completing this course, students will be able to retrieve and clean data, perform exploratory analyses, build models to answer scientific questions, and present visually appealing results to accompany data analyses; be familiar with various biomedical data types and resources related to them; and know how to create reproducible and easily shareable results with R and github. Prerequisite: Familiarity with basic statistical (e.g., EPID 526, 527 or other first-year graduate level stats course) concepts is expected, as this course will not cover basic concepts in depth.

Taught by: Himes  
Course usually offered in fall term  
Also Offered As: EPID 600  
Activity: Lecture  
1.0 Course Unit

**BMIN 504 Topics in Biom/Hlth Info**
Also Offered As: EPID 602  
Activity: Lecture  
1.0 Course Unit

**BMIN 505 Precision Medicine and Health Policy**
Through a series of lectures, readings and response papers, students will learn about topics such as medical ethics, unintended consequences of medicine/research, genetics, genetic interpretation, hospital performance, and informatic methods to assess these factors. The informatics topics covered in this course include: decision support, genetic database, clinical interpretation of genetics, detection of bias in EMRs, detection of bias in guidelines, methods to ameliorate bias, mapping clinical guidelines to computable standards, performance assessment, machine learning, and artificial intelligence applications in this space.

Taught by: Boland  
Course usually offered in fall term  
Activity: Lecture  
1.0 Course Unit

**BMIN 506 Standards and Clinical Terminologies**
This survey course is designed to provide an overview of health information standards and clinical terminologies. Through a series of lectures, demonstrations, and hands-on exercises, students will learn about topics such as standards, interoperability, data modeling, vocabularies, and health information exchange.

Taught by: Michael Padula  
Course usually offered in fall term  
Activity: Lecture  
0.5 Course Units

**BMIN 507 Human Factors**
Course usually offered in fall term  
Activity: Lecture  
0.5 Course Units

**BMIN 509 Telehealth and mHealth Systems and Applications**
This course is designed to develop intelligent consumers, managers, and researchers of telehealth and mHealth systems through guided exploration into the components of such systems. The course is designed to introduce many of the challenges facing designers and managers of telehealth/ mHealth and remote health care delivery networks. The spectrum of activity ranging from research into implications of system design for applications that bridge geographic distance to the development of practical applications is considered in both historical context and in case studies. The current status and future trends of this emerging domain are reviewed.

Taught by: Demiris, George  
Also Offered As: NURS 529  
Activity: Lecture  
1.0 Course Unit

**BMIN 520 Ai I: Intro To Ai**
Course usually offered in spring term  
Activity: Lecture  
1.0 Course Unit
Biomedical Informatics (BMIN)

BMIN 521 AI III: Advanced Methods and Health Applications in Machine Learning
Machine learning studies how computers learn from data and has enormous potential to impact biomedical research and applications. This course will cover fundamental topics in machine learning with an application focus on biomedical informatics. Specifically, the course will cover -supervised learning methods such as linear regression, logistic regression, nearest neighbors, support vector machines, decision trees and random forests; -unsupervised learning topics such as clustering, dimensionality reduction and association rules; -neural networks and deep learning methods for supervised or unsupervised learning tasks; and -the applications of these machine learning techniques to various biomedical informatics problems via analyzing imaging, biomarker, electronic health record, clinical and /or other biomedical data. The precise topics may vary from year to year based on student interest and developments in the field.
Taught by: Li Shen, PhD
Course usually offered in fall term
Activity: Lecture
1.0 Course Unit

BMIN 522 AI II: Introduction to Machine Learning and Health Language Processing
The growing volume of unstructured health-related data presents unparalleled challenges and opportunities for informaticians that seek to mine the rich information hidden in plain sight - clinical records, social media, published literature, all sources designed for human eyes, but not necessarily for automatic processing. In this class, we will survey the most recent natural language processing methods used for information extraction, taking a 'hands-on' approach at how they are currently applied in the biomedical domain. Emphasis will be placed on lexical and syntactic methods, as well as covering different approaches to classification for content discovery - including deep learning and unsupervised approaches.
Taught by: Graciela Gonzalez-Hernandez, PhD
Course usually offered in spring term
Activity: Lecture
1.0 Course Unit

BMIN 523 Informatics Prec Med
Course usually offered in spring term
Activity: Lecture
1.0 Course Unit

BMIN 525 Intro To Python Prog
Course usually offered in fall term
Activity: Lecture
1.0 Course Unit

BMIN 990 Capstone
With mentorship from their Capstone Advisor, students will develop and present the results of a clinical informatics project relevant to their interests. During this semester-long course, students will attend a weekly seminar in which they develop, propose, implement, and present their capstone project. Students meet with regularly with their Capstone Advisor, who is also invited to attend the seminars. The seminar affords both students and advisors the opportunity for cross-fertilization of ideas and skills, and ultimately the honing of projects to a high level of value for the students and the clinical environments in which they conduct their projects.
Taught by: Holmes, John H
Activity: Independent Study
1.0 Course Unit