Biomedical Informatics, Biostatistics and Medical Epidemiology (BBME)

BBME 4001: Topics in Informatics
Organized study of selected topics. Subjects will vary from semester to semester. May be repeated for credit with departmental consent.

Credit Hours: 3
Prerequisites: department consent

BBME 4420: Fundamentals of Bioinformatics
(cross-leveled with BBME 7420). The purpose of this course is to provide perspective on the fundamentals of exploration of biological knowledge using computers. As technologies such as microarray, sequencing, and biomarkers become more pervasive, they are impacting not only the development of science, but also domains such as health care, nutrition, and ethics. This course provides a description of fundamental bioinformatics concepts such as sequencing, proteomics, metabolomics, and biological pathways, and illustrates them with short informatics experiments. Mainly online resources will be used, so no programming is necessary. Also, the course includes a short primer of molecular biology, so background in molecular biology is not required.

Credit Hours: 3
Prerequisites: Departmental consent required

BBME 4430: Introduction to Health Informatics
(cross-leveled with BBME 7430). Introduction to the use of clinical information systems in healthcare. Topics include clinical data, standards, electronic medical records, computerized provider order entry, decision support, telemedicine, and consumer applications.

Credit Hours: 3
Prerequisites: departmental consent

BBME 4440: Health Information Technology
(cross-leveled with BBME 7440). In this course, the student will learn 1) The Python programming language and how to use it for biomedical applications 2) the SQL database language and how to design and operate a database, and 3) HTML and javascript languages and how to design a web application. Applications will be healthcare focused.

Credit Hours: 3
Prerequisites: Departmental consent required

BBME 6938: Biomedical Informatics
Students will participate in 10-two hour lecture-discussion sessions over the 2-week period. These sessions will cover current and future developments in biomedical informatics. Selected topics include: electronic health records; public health informatics; imaging; practice management systems; information exchanges; data standards; privacy and security; consumer informatics; mobile technology; search engines; telehealth; bioinformatics databases; next generation sequencing; regulatory pathways; emerging trends.

Credit Hours: 2
Prerequisites: Successful completion of the first two years of medical school

---

BBME 7001: Topics in Informatics
Organized study of selected topics. Subjects will vary from semester to semester. May be repeated for credit with departmental consent.

Credit Hours: 3

BBME 7410: Introduction to the US Health Care System for Biomedical Informatics
This is a survey course about the American health system, meant to provide a conceptual foundation for students to think critically about the US health system and to build upon in their future related courses. It includes concepts and language in health care, public health, and personal health and provides an understanding of how these domains of health interrelate. Particular focus is given to health care delivery, including how health care services are organized, delivered, paid for, and measured. Selected key, forward-looking issues are covered. The roles of management, leadership, and physicians are highlighted. A resource bank and regular flow of good information sources is developed. Business writing skills are emphasized.

Credit Hours: 3

BBME 7420: Fundamentals of Bioinformatics
(cross-leveled with BBME 4420). The purpose of this course is to provide perspective on the fundamentals of exploration of biological knowledge using computers. As technologies such as microarray, sequencing, and biomarkers become more pervasive, they are impacting not only the development of science, but also domains such as health care, nutrition, and ethics. This course provides a description of fundamental bioinformatics concepts such as sequencing, proteomics, metabolomics, and biological pathways, and illustrates them with short informatics experiments. Mainly online resources will be used, so no programming is necessary. Also, the course includes a short primer of molecular biology, so background in molecular biology is not required.

Credit Hours: 3
Prerequisites: Open to undergraduates with dual enrollment

BBME 7430: Introduction to Health Informatics
(cross-leveled with BBME 4430). This course examines clinical, research, and administrative applications of information systems in health services delivery. Provides an introduction to important topics

in biomedical informatics, including clinical data (collection, storage, management), electronic medical record systems, decision support systems, computerized order entry, telemedicine, and consumer applications.

Credit Hours: 3
Prerequisites: departmental consent

BBME 7440: Health Information Technology
(cross-leveled with BBME 4440). In this course, the student will learn 1) The Python programming language and how to use it for biomedical applications 2) the SQL database language and how to design and operate a database, and 3) HTML and javascript languages and how to design a web application. Applications will be healthcare focused.

Credit Hours: 3
Prerequisites: college algebra and statistics

BBME 7564: Health Ethics Theory
An introduction to health ethics theory and methodology. We discuss metaethics and normative ethics theories, normative ethics in health ethics and methods of ethics case work up.

Credit Hours: 3

BBME 7566: Health Informatics Ethics
An introduction to how the increasing use of distance-based technologies, computers, and online communications may impact the ethical delivery of health care. Examples of questions to be addressed: Is it possible that the increasing use of computers in healthcare has made things worse? How should HIPAA be interpreted and why is there such confusion about it? Should patients be able to "post" negative comments about providers on social media sites? What should be done about the increasing amounts of personal information healthcare corporations are collecting on patients?

Credit Hours: 3

BBME 7567: Health Organizational Ethics
Examples of questions to be addressed: Should hospitals and doctors try to maximize profits? Do providers have a moral obligation to serve people who cannot pay? Is it okay to deceive an insurance company if it means better patient care? What should employees do if their employer is committing fraud? Is it ethical for hospitals to drug-test employees and investigate their private lives? What is the ethical way to hire and fire healthcare staff? What should you do if your supervisor is evil?

Credit Hours: 3

BBME 7580: Healthcare Project Management
This course is designed to provide an in-depth understanding of the fundamentals of project management and its application to the provision of health care. A problem-based approach is used to frame both the theoretical underpinnings of project management and hands-on practical application. Students will develop an understanding of the foundations of project management designed to enable them to successfully complete the certification exam to become a certified project manager. Course content includes project scope development, project work breakdown, financial control, and human resources management for projects.

Credit Hours: 3

BBME 7880: Agile Project Management in Healthcare
Overview of the theory and methods associated with agile project management within the context of healthcare operations. Focus of the course is on knowledge of agile principles and agile techniques and the use of appropriate analysis tools. Course encompasses many approaches to agile project management including Scrum, Kanban, Lean, extreme programming (XP) and test driven development (TDD), and appropriate construction and management of information projects that are supportive of best practice clinical, administrative, and strategic policy and procedure in the delivery of health. A problem-based approach is used to provide the basis for addressing issues and solutions specific to the health delivery environment. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: BBME 7580 or permission of instructor

BBME 7900: Medical Ethics and the Law
This course examines the interrelationship between ethical principles and legal frameworks in health care delivery. Through analysis of landmark case law, statutes, regulations, and real-world clinical scenarios, students explore how legal doctrine shapes, constrains, and sometimes enables ethical decision-making in medicine. Topics include informed consent and capacity, confidentiality and health information privacy, end-of-life decision-making and surrogate decision-making, allocation of scarce resources, reproductive and genetic ethics, public health imperatives, and emerging issues in biomedical innovation. Emphasis is placed on developing competencies in ethical reasoning, legal literacy, and interdisciplinary collaboration across clinical, administrative and legal domains. Graded on A-F basis only.

Credit Hours: 3

BBME 8090: Thesis Research in Informatics
Research leading to a thesis. May be repeated to maximum of 9 hours. Graded on S/U basis only.

Credit Hour: 1-6
Prerequisites: Advisor's consent

BBME 8401: Topics in Informatics
Organized study of selected topics. Subjects will vary from semester to semester. May be repeated for credit with departmental consent.

Credit Hours: 3

BBME 8435: Information Security, Evaluation and Policy
The purpose of this course is to provide an extensive overview, practical applications and analyses of functionality and usability evaluations of health care information technology, and to discuss the impact of security on the present and future health care settings.

Credit Hours: 3

BBME 8437: Data Warehousing and Data/Text Mining for Health Care
An introduction to the basic concepts of data warehouse and data/text mining, creating an understanding of why we need those technologies and how they can be applied to healthcare problems.

Credit Hours: 3
Prerequisites: BBME 8441

BBME 8441: Biomedical and Health Vocabularies and Ontologies
Basic and advanced concepts of controlled terminologies and their use in the representation of biomedical information and knowledge, with emphasis on terminology management in the health care enterprise. Syntactic and semantic structure of controlled terminologies are examined and a number of representative terminologies are analyzed.

Credit Hours: 3

BBME 8443: Enterprise Information and Solutions Architecture for Strategic Healthcare Operations
Organization and development of infrastructure necessary to support an enterprise information system for patient care. Components of architecture are introduced in a problem-based approach, case examples are presented as the basis for addressing specific attributes of the components, as well as problems facing the design of an enterprise information system for health care.

Credit Hours: 3

BBME 8451: Individual Executive Management Studies
Students will investigate and address important issues in their organizations. Students will use scientific evidence and techniques to solve applied problems. They will develop data collection protocols, collect and analyze data, draw conclusions, and develop recommendations using basic research methods tools. They will provide actionable and feasible recommendations based on their analysis. Graded on S/U basis only.

Credit Hours: 3
Prerequisites: BBME 7410, BBME 8450 or permission of instructor

---

BBME 8485: Problems in Biomedical Informatics
Intensive study of an area of health services management.

Credit Hour: 1-6
Prerequisites: instructor's consent

BBME 8510: Research Synthesis for Clinical Decision-Making: Systematic Review and Meta-analysis
This graduate course teaches the full pipeline of evidence synthesis for research, quality improvement, and clinical and biomedical decision-making, from question formulation and protocol registration to reproducible searches, screening, data extraction, risk of bias assessment, quantitative synthesis, certainty of evidence, and translation to practice. Students complete a hands-on mini-review using JASP/MetaWin/R and modern tools for screening, visualization, and reporting aligned to PRISMA, Cochrane, and GRADE standards. Emphasis is on decisions in clinical research, quality improvement, and health policy, with extensions to research & applied informatics and artificial intelligence. Graded on A-F basis only.

Credit Hours: 3
Recommended: Graduate statistics or biostatistics training is recommended

---

BBME 8515: Problems in Medical Ethics and Clinical Ethics Consultation Practicum
The Problems in Medical Ethics Course is a practicum based course with a hands-on clinical ethics consultation component. The course will provide the student with a tailored learning experience that will encourage and develop skills and a working knowledge about health care ethics, and the ability to respond effectively when confronted with the difficult ethical dilemmas that may be encountered at multiple levels in the complex arena of health care. Specifically students will cultivate skills which will optimize their ability to work as an ethics consultant in a multidimensional and diverse society as well as an inclusive health care environment. The course is designed with flexibility in mind, however there are mandatory onsite components which will require the student to attend structured meetings, consultations and presentations.

Credit Hours: 5
Prerequisites: M-4 status for medical students. For Graduate students, BBME 7564 and BBME 8565 and permission of instructor

---

BBME 8550: Health Data Analytics
The purpose of this course is to provide you with an applied approach to analyze healthcare data. It will enhance abilities to know when and how to use theories, concepts, and tools of data analysis and statistics to evaluate and analyze health care data systematically. The emphasis of the course is on the use of data analysis in the health care field. The focus is on applying data analysis to health care data, problems and

issues in the health care system, and on the data application necessary to make decisions based on the analysis. This course builds upon previous knowledge of basic statistics and analytics, concepts, and tools by applying them specifically to the health care system.

Credit Hours: 3
Prerequisites: college algebra and statistics or permission of instructor

---

BBME 8560: Data Design and Analysis I
(same as TR_BIOSC 8560). This course covers the introductory epidemiology and biostatistics concepts essential for biosciences and health research with applied programming skills in R. Graded on A-F basis only.

Credit Hours: 3

BBME 8565: Health Care Ethics
Explores ethics issues and controversies facing clinicians and healthcare administrators. Topics may include end-of-life care, imperiled newborns, maternal-fetal conflict, procreative liberty, genetic screening and enhancement, organ procurement and allocation, rationing, public health, workplace relationships, and conflicts of interest.

Credit Hours: 3

BBME 8571: Decision Support in Health Care Systems for Biomedical Informatics
Applies principles and techniques of computer-assisted decision making to solve health care problems. Clinical and managerial applications of artificial intelligence, including expert systems reviewed. Advantages of integrating decision support programs with databases are discussed.

Credit Hours: 3

BBME 8610: Consumer Health Informatics
Consumer health informatics is the branch of medical informatics that analyzes consumers' needs for information; studies and implements methods of making information accessible to consumers; and models and integrates consumers' preferences into medical information systems. This course focuses on aspects of consumer health information seeking as well as resources which respond to these information needs. Topics include models for the delivery of consumer health information; Internet-based information delivery; access to patient information and privacy issues; quality of consumer health information; health literacy and health information literacy; design and development of consumer health information resources; consumer access to clinical information; and current research topics.

Credit Hours: 3
Prerequisites: Graduate standing or permission of the instructor

---

BBME 8689: Field Experience in Informatics
Supervised field experience in approved health agencies and institutions. Opportunity for observation and service participation in various fields of health. Graded on an A-F basis only.

Credit Hours: 3

BBME 8870: Knowledge Representation in Biology and Medicine
The main topics presented in the course are: logic systems, knowledge representation methods, production systems and representation of statistical and uncertain knowledge. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: BBME 7430 and BBME 7440

BBME 8910: AI in Healthcare: From Design to Deployment and Oversight
This course trains students to plan, evaluate, and implement artificial intelligence (AI)- enabled decision support in real clinical settings. We cover the full lifecycle: problem framing; data specification; development choices; internal and external validation; clinical evaluation; deployment pathways; monitoring for dataset shift and performance drift; safety, equity, and governance; and health-system integration. We emphasize standards and guidance that shape real deployments: TRIPOD+AI reporting for prediction models, DECIDE-AI for early clinical evaluation, CONSORT-AI/SPIRIT-AI for trials, PROBAST+AI for risk-of-bias assessment, the National Institute of Standards and Technology (NIST) AI Risk Management Framework, and current United States regulatory and certification expectations for decision support and software as a medical device. Graded on A-F basis only.

Credit Hours: 3
Recommended: Graduate intro to biostatistics or epidemiology