

INFORMATICS (INFR)

Explanation of Course Numbers

- Courses in the 1000s are primarily introductory undergraduate courses
- Those in the 2000s to 4000s are upper-level undergraduate courses that can also be taken for graduate credit with permission and additional work assigned
- Those in the 6000s and 8000s are for master's, doctoral, and professional-level students
- The 6000s are open to advanced undergraduate students with approval of the instructor and the dean or advising office

INFR 3101. Introduction to Bioinformatics. 3 Credits.

Basic principles of bioinformatics, including genome sequencing, models, and evolution and computational approaches for analyzing biological data. Four credits in general biology courses may be substituted for the prerequisite. Prerequisites: BISC 1111.

INFR 3102. Scripting. 3 Credits.

Basic concepts of scripting in bioinformatics, such as alignments, searches, and data manipulation for biological data. Four credits in general biology courses may be substituted for the prerequisite. Prerequisites: BISC 1111.

INFR 3103. Genomics. 3 Credits.

Genes and genomes; computational and statistical approaches for analyzing genomic and metagenomic data. Four credits in general biology courses may be substituted for the prerequisite. Prerequisites: BISC 1111. Recommended background: declared major in the bioinformatics or the medical informatics program.

INFR 3104. Human Genetics. 3 Credits.

The application of genetics to the understanding and treatment of human disease; basic methods for design, analysis, interpretation and follow-up of rare variant, candidate gene, and genome-wide association studies. Four credits in general biology courses may be substituted for the prerequisite. Prerequisites: BISC 1111.

INFR 4101. Introduction to Medical Informatics. 3 Credits.

Medical informatics applications and innovations in health care and the health care system; implications for health care delivery and patient outcomes, including electronic medical records, health system databases, and medical data analysis. Laboratory fee. Restricted to medical informatics program majors.

INFR 4102. Survey of Medicine for Informaticians. 3 Credits.

Survey of clinical medicine and basic concepts related to clinical process, medical vocabulary, anatomy, pathophysiology, and clinical disease management for selected organ systems and health care specialties; evaluation of medical records, clinical decision making, and health providers in the U.S. health care system. Laboratory fee. Completion of one course in general biology, anatomy, or physiology may be substituted for the prerequisite. Restricted to students in the medical informatics program or with permission of the instructor. Prerequisite: HSCI 2102.

INFR 4103. Programming for Informaticians. 3 Credits.

Programming (Java), databases, and data models in medical informatics. Laboratory fee. Restricted to medical informatics program majors; permission of the instructor may be substituted.

INFR 4104. Medical Informatics Terminology & Standards. 3 Credits.

Terminology and standards commonly used in clinical and public health systems; practical experience in selecting terminology, mapping concepts to standard terminologies, and creating and testing standardized messages. Laboratory fee. Restricted to medical informatics program majors. Prerequisites: INFR 4101.

INFR 4105. Consumer Health Informatics. 3 Credits.

Consumer health informatics as a field of research and development in the context of medical informatics, including patient and provider perspectives and technology innovations utilized by patients and health care systems. Laboratory fee. Restricted to medical informatics program majors. Prerequisite: INFR 4101.

INFR 4106. Population Health for Medical Informatics. 3 Credits.

Population health informatics, and informatics techniques used on population-level data to improve health. Laboratory fee. Restricted to medical informatics program majors. Prerequisites: INFR 4103 and INFR 4104.

INFR 4107. Clinical Decision Support. 3 Credits.

Examination of clinical decision support systems and associated quality improvement efforts. Laboratory fee. Restricted to students in the medical informatics degree program. Prerequisites: INFR 4103 and INFR 4104.

INFR 4108. Information Extraction for Medical Informatics. 3 Credits.

The automatic extraction of information from clinical text; specificities, information extraction methods, existing applications, and resources for information extraction. Laboratory fee. Restricted to students in the medical informatics degree program. Prerequisites: INFR 4103 and INFR 4104.

INFR 4109. Evaluation Methods in Medical Informatics. 3 Credits.

Evaluation methods associated with clinical information systems and informatics interventions; objective and subjective evaluation, design, measurement, and analysis of medical informatics cases. Laboratory fee. Restricted to students in the medical informatics degree program. Prerequisites: HSCI 3117 and INFR 4103 and INFR 4104.

INFR 4110. Biomedical Data Science. 3 Credits.

Principles of health analytic techniques, and implications associated with big data uses in clinical and health care settings. Laboratory fee. Restricted to students in the medical informatics degree program. Prerequisites: HSCI 3117 and INFR 4101 and INFR 4103.

INFR 4120. Bioinformatics Algorithms. 3 Credits.

Algorithmic foundations of bioinformatics; string, combinatorial, graph, and clustering algorithms. Restricted to bioinformatics majors. Prerequisites: HSCI 3117 and INFR 3101.

INFR 4121. High Performance Computing. 3 Credits.

Concepts and practice in high performance computing for scientists; systems, resource management, parallel programming, and nationally shared resources. Restricted to bioinformatics majors. Prerequisites: INFR 3101, INFR 3102 and HSCI 3117.

INFR 4122. Advanced Scripting. 3 Credits.

Advanced scripting skills in the context of computational biology problems. Restricted to bioinformatics majors. Prerequisites: INFR 3101 and INFR 3102.

INFR 4123. Statistical Genetics. 3 Credits.

Introduction to basic concepts in statistical genetics and molecular evolution. Restricted to bioinformatics majors. Prerequisites: INFR 3101, INFR 3102 and INFR 3103.

INFR 4197. Medical Informatics Internship. 1-12 Credits.

Supervised field work in medical informatics, arranged in consultation with the program director. May be repeated for credit. Restricted to students in the medical informatics program. Prerequisites: HSCI 2105.

INFR 4198. Medical Informatics Research Project. 1-12 Credits.

Supervised research project in medical informatics, arranged in consultation with the program director. May be repeated for credit. Restricted to students in the medical Informatics degree program. Prerequisites: HSCI 2105.

INFR 4203. Seminar in Computational Biology. 3 Credits.

Bioinformatics research across the fields of biology, computer science, and mathematics to address contemporary health science and basic science problems; career and research opportunities. Restricted to bioinformatics majors. Prerequisites: HSCI 4112W, INFR 3101, INFR 3102 and INFR 3103.

INFR 4204. Bioinformatics Internship. 3-12 Credits.

Supervised field work in bioinformatics, arranged in consultation with the program director. May be repeated for credit. Restricted to bioinformatics majors with program approval. Prerequisites: HSCI 2105.

INFR 4205. Bioinformatics Research Project. 3-12 Credits.

Supervised research project in bioinformatics, arranged in consultation with the program director. May be repeated for credit. Restricted to bioinformatics majors with program approval. Prerequisites: HSCI 2105 and HSCI 4112W.

INFR 6101. Principles of Medical Informatics. 3 Credits.

Analysis of medical informatics applications and innovations in health care and the health care system; implications for health care delivery and patient outcomes, including electronic medical records, health system databases, and medical data analysis. Restricted to graduate students. Recommended background: graduate enrollment in data science or related field. Credit cannot be earned for this course and INFR 4101.

INFR 6102. Principles of Medicine for Informaticians. 3 Credits.

Survey of clinical medicine and basic concepts related to clinical process, medical vocabulary, anatomy, pathophysiology, and clinical disease management for selected organ systems and health care specialties; evaluation of medical records, clinical decision making, and health providers in the U.S. health care system. Laboratory fee. Restricted to graduate students. Recommended background: graduate students in the data science program or those with prior undergraduate coursework in general biology or anatomy and physiology or pathophysiology. Credit cannot be earned for this course and INFR 4102.

INFR 6103. Advanced Computing Applications for Biomedical Informatics. 3 Credits.

The course examines advanced scripting skills in the context of biomedical informatics. This is an programming course utilizing current language for applied systems. Proctor fee. Prerequisites: HSCI 6263, INFR 6101 and INFR 6102. Recommended background: graduate students in biomedical Informatics programs. Credit cannot be earned for this course and INFR 4122.

INFR 6104. Database Design for Biomedical Informatics. 3 Credits.

Introduction to database design and its bioinformatics applications in machine learning and precision medicine. Also includes multiple bioinformatics and medical databases. Prerequisites: INFR 6101.

INFR 6105. Health Care Quality for Informatics. 3 Credits.

Health care quality theory, principles, and practice for medical informatics professionals. Restricted to students in the biomedical informatics program.

INFR 6106. Data Structure and Algorithms for Biomedical Informatics. 3 Credits.

Introduction to data structures and algorithms commonly used in the field of bioinformatics. Focus on topics related to classical and modern techniques employed for biological sequence and peptide analysis. Prerequisites: INFR 6101.

INFR 6121. High Performance Computing. 3 Credits.

Applied contemporary concepts and practice in high performance computing for scientists; systems, resource management, parallel programming, and nationally shared resources. Proctor fee. Prerequisites: INFR 6101, INFR 6102, and HSCI 6263 (or equivalent statistics course). Recommended background: graduate students in biomedical Informatics programs. Same As: INFR 4121.

INFR 6197. Biomedical Informatics Practicum. 1-3 Credits.

Supervised field work in biomedical informatics arranged in consultation with the program director. Students must have completed 9 credits of graduate INFR coursework and have program approval in order to enroll. May be repeated for credit. Prerequisites: graduate students in biomedical Informatics programs.

INFR 6198. Biomedical Informatics Capstone. 3 Credits.

Capstone project for biomedical informatics arranged in consultation with the program director. Students must have completed 12 credits of graduate INFR coursework and have program approval in order to enroll. May be repeated for credit. Recommended background: graduate students in biomedical Informatics programs.

INFR 6250. Data Mining and Visualization for Biomedical Informatics. 3 Credits.

This course introduces topics on data mining and visualization tools that are necessary to facilitate the decision-making process to improve healthcare outcomes and support strategic and operational decisions. Prerequisites: INFR 6101.

INFR 6260. Machine Learning and Artificial Intelligence for Biomedical Informatics. 3 Credits.

Introduction to machine learning and artificial intelligence (AI) and their bioinformatics applications in machine learning and precision medicine. Prerequisites: INFR 6101 or with the permission of the instructor.

INFR 6540. Medical Decision Making and Decision Support Systems. 3 Credits.

Clinical decision support systems (CDSS) used in biomedical informatics to assist health care providers with decision making tasks related to patient care and associated quality improvement efforts. Artificial intelligence in medicine. Restricted to students in the biomedical informatics program. Prerequisite: INFR 6121.