

Biomedical Informatics Courses (BMIG)

- BMIG 5001** **Data Information and Knowledge Representation: 3 credits** - This course provides students with the foundational ideas of how information is modelled to facilitate easy access to knowledge. The course defines data, information and knowledge and explains how the three are connected. The course introduces students to basic information modeling methodologies both in relational databases (RDB) and graph databases, in particular semantic web technologies. **No Prerequisites**
- BMIG 5002** **Biomedicine for Informaticists: 3 credits** - This course is an introduction to the range of terminology, concepts, tools and methods used in biologic and clinical environments important to Biomedical Informaticists. The course focuses on the comprehension of key biomedical concepts important for interaction and communication with biologists and clinicians needed for graduate study in Biomedical Informatics. **No Prerequisites**
- BMIG 5003** **Computational Methods in Biomedical Informatics: 3 credits** - - This course is an introduction to the range of computational tools and techniques often used by Biomedical Informaticists. The course focuses on a series of hands-on exercises designed for the student to gain a basic knowledge of those tools, principles, and techniques demonstrating the basic computational competencies needed. **No Prerequisites.**
- BMIG 5010** **Biomedical Informatics Project Rotations: 2 credits** - This lab introduces methods and tools used in Biomedical Informatics through "hands-on" experiences. It is intended to help solidify a student's ability to grasp core concepts of research, develop a properly-scoped proposal, plans to implement the proposal, and carry out those plans, all under the guidance of a faculty mentor. **No Prerequisites.**
- BMIG 5013** **Health Information Systems: 1 credit**- This graduate course covers information systems used in healthcare. Topics focus on system functionality required to support care in inpatient and outpatient settings and associated data and workflows. **No Prerequisites.**
- BMIG 5014** **Anatomy for Imaging: 3 credits** - This graduate course covers information systems used in healthcare. Topics focus on system functionality required to support care in inpatient and outpatient settings and associated data and workflows. **No Prerequisites.**
- BMIG 5015** **Introduction to Biology Network Analysis: 1 credit** - The aim of this course is to provide an introduction to network/Graph theory, how it can be applied to biological data and statistical analysis of biological networks. The course will start with an overview of graphs; basic definitions and concepts, families of graphs, describe creating network graphs and analysis of network graph characteristics, statistical models for Network graphs and network topology inference. The course will concentrate on building correlation networks as an example. **No Prerequisites.**
- BMIG 5017** **Clinical Data Standards: 1 credit** - This graduate course reviews the various standards used in healthcare, with special focus on how those standards are used in electronic health records. **No Prerequisites.**
- BMIG 5021** **Medical Decision-Making: 1 credit** - This graduate course covers medical decision making with a focus on traditional approaches and methods. **No Prerequisites.**
- BMIG 5101** **Foundations of Biomedical Informatics: 2 credits - Sequences as Biological Information** - This course introduces the molecular foundations of biomedical informatics, from the perspective of Translational Bioinformatics. "Translational Bioinformatics" in this context means translating or moving the discoveries and innovations in the laboratory to the bedside; that is, applying bioinformatics to healthcare. **No Prerequisites.**
- BMIG 5102** **Foundations of Biomedical Informatics: 2 credits - Clinical Information** - This course is designed as the introduction and foundational data collection and concepts of the discipline of clinical informatics. Major topics include defining the data collection methods and key needs for information flow and use in healthcare, clinical disciplines and systems, the various terminology, methodology, and types. **No Prerequisites.**
- BMIG 5103** **Foundations of Biomedical Informatics: Population Health Information: 2 credits** - An introduction to the discipline of biomedical informatics, this graduate course introduces Public and Population Health Informatics. The course will explore common information sources and uses in the domain, information-related challenges in the domain and application of Biomedical Informatics theories, methods and tools to overcome them. **No Prerequisites.**
- BMIG 5113** **Clinical Imaging Informatics: 3 credits** - This graduate course covers the basic principles of the field of Medical Imaging Informatics, with an emphasis on Clinical Imaging Informatics. Starting from an introduction to the basic imaging modalities, the course continues with how images are captured, stored, processed, viewed, documented, and tied into a patient's medical record. The course covers the use of imaging information in several key medical specialties. **Prerequisites: BMIG 5113 requires a pre-requisite of BMIG 5011.**

- BMIG 5114** **Bioconductor for Genomic Scale Data Analysis: 3 credits** - The aim for this course is to introduce students to tools required for analysis of high-throughput genomic data using Bioconductor. The focus will be on two main technologies: next generation sequencing and microarrays. The class will cover installation of Bioconductor, common data structures including Expression Sets, Summarized Experiments container for multiple assays, G Ranges objects used across several types of analyses, computing on genomic regions and genomic annotations with Bioconductor. An introduction to statistical concepts and methodologies in the analysis of data based on microarrays and next generation sequencing platforms will be covered. Lastly the course will introduce reproducible reports and workflows using Rmarkdown. **No Prerequisites.**
- BMIG 5115** **Healthcare in the US: 1 credit** - This course presents the components of the healthcare system in the United States with a focus on current challenges and external forces shaping those challenges. Special emphasis is given to topics impacting or impacted by technology in healthcare. **No Prerequisites.**
- BMIG 5116** **Managing Organizations, People, and Projects: 1 credit** - This course covers principles of leadership and management of organizations and projects. Topics covered include leadership models, interdisciplinary teams, effective communication, project management, change management, and strategic and financial planning for clinical information.
- BMIG 5190** **Biomedical Informatics Research and Application Seminar: 1 credit** - This seminar provides exposure to current research and application in Biomedical Informatics and the faculty, trainees, and other experts conducting it. Topics include ongoing research, research results, and translation of findings into practice and reflect the breadth of ongoing work across Biomedical Informatics as a discipline. This weekly seminar is given by local and visiting researchers and practitioners in the discipline. Seminar speakers will highlight relevant informatics and information science principles and methodology. Students participating in the seminar for course credit will be encouraged to explore literature relevant to the seminar topic and participate in constructive critique and academic discussion about the research. Seminar attendance encourages use of critical analysis and appraisal skills to participate in scientific dialog. This course can be taken for 1 credit hour. ACCME Continuing Education Units (CEUs) can be obtained by those not receiving course credit. **No Prerequisites.**
- BMIG 5210** **Genomics and Metagenomics: 3 credits** - This graduate course teaches methods for comparison of genomes and metagenomes. Students completing this course should be able to located reference genomes, computationally compare genomes of interest and clearly communicate the results of the investigation using three different formats: a journal club report critiquing a recently published paper, a poster, and finally by writing a scientific paper with is formatted and suitable for publication. **No Prerequisites.**
- BMIG 5211** **User Interface Design and Data Visualization: 1 credit** This graduate course is a survey course covering select topics from cognitive science, human factors, human centered design, and usability relevant to biomedical informatics.- **No Prerequisites.**
- BMIG 5800** **Thesis: Variable credits** - Under supervision of graduate faculty, an original research study will be designed and conducted with written thesis following Graduate School guidelines. **Prerequisite: Advancement to Candidacy**
- BMIG 5801** **Capstone: Variable credits** - A capstone project will be performed under the close supervision of each student's advisor. Project possibilities include, but are not limited to: developing a project that fits into a larger framework, systematic review, piece of an ongoing research project, substantial background literature review, grant writing, and etc.
- BMIG 6011** **Clinical Trial Data Management: 4 Credits** - This graduate course will provide a broad introduction to clinical trials with a special, in depth emphasis and practical experience in data management. The course covers information systems used in Clinical Trials with an emphasis on automation, system functionality, system integration, and information exchange. Common information-reliant and automated processes and methodology are explored. **Prerequisites: BMIG 5112.**
- BMIG 6012** **Database Systems and Data Warehousing: 3 credits** - This graduate course covers database and data warehousing concepts necessary to implement and query databases management systems and appreciate role of data warehousing in clinical research. Students develop the required skills to define data structures and manipulate data load and retrieval using Structured Query Language (SQL). **No Prerequisites.**
- BMIG 6013** **Healthcare Informatics of Quality and Patient Safety - 1 credit** - This course presents topics in healthcare quality and safety. Topics focus on methods and tools to achieve the Institute of Medicine components of healthcare quality in clinical settings. **No Prerequisites.**
- BMIG 6014** **Natural Language Processing in Biomedical Informatics- 3 credits** - This course trains students to understand and apply natural language processing (NLP) theory, techniques, and tools, with a focus on biomedical text for informatics applications and research. Guest lectures will highlight applications of NLP in core areas of biomedical informatics. Prerequisites: BMIG 5001 and BMIG

5003; Co-requisite: BMIG 6201.

- BMIG 6050** **Research Design in Biomedical Informatics: 3 Credits** - This course provides an introduction to research design in biomedical informatics. Topics include epistemology, concept, construct and theory development, qualitative and mixed methods approaches as well as experimental and quasi-experimental design. This course will aid students in selecting, articulating and defending research designs for thesis or doctoral research. **No Prerequisites.**
- BMIG 6110** **Clinical Decision Support: 2 credits** -This graduate course covers clinical decision support approaches and methods in healthcare settings. **Prerequisites: BMIG 5013**
- BMIG 6111** **Comparative Microbial Genomics: 2 credits** - The aim for this graduate course is to teach about the comparison of massive availability of genome sequence of microbes and other organisms. The course is designed to enable students to use computational tools through lectures and hands-on practicals to extract biological meanings and discover novel features from the genomics data. **Prerequisites: BMIG 5210**
- BMIG 6201** **Machine Learning for Biomedical Informatics: 3 credits** - This course will provide a broad introduction to machine learning algorithms and techniques and their applications in different areas of biomedical informatics and data science. The mathematical bases for different classes of machine learning algorithms will be explained so the student has a broad understanding of the fundamental concepts. Prerequisites: BMIG 5001 and BMIG 5003.
- BMIG 6202** **Fundamentals of the Human Microbiome: 3 credits** - This course will provide students with foundational knowledge and practical analytical skills required for analyzing microbiome data sets. The course will explore the microbial inhabitants of the human body, with an emphasis on how microbial communities affect human health and disease progression. Prerequisites: BMIG 5002, BMIG 5003, and BMIG 5101. **BMIG 6202 requires prerequisites of BMIG 5002, 5003 and 5101.**
- BMIG 6203** **Genomic Surveillance of Antimicrobial Resistance: 1 credit** - The emergence and spread of antimicrobial resistant pathogens are now a global threat to public health. Whole genome sequencing (WGS) of pathogens is becoming relevant for the medical sector. This graduate course will provide a basis to understand applications of WGS with Illumina and Nanopore technologies for infection control and antibiotic stewardship.
- BMIG 6210** **Research Imaging Informatics: 3 credits** - This graduate course will explore in depth the use of advanced radiology and pathology imaging techniques and quantitative analysis approaches in biomedical research. The focus is distinct from clinical imaging and standard clinical practice. Pre-clinical and advanced imaging techniques not yet approved for the clinic will be explored. Image creation, quantitative analysis and management technologies will be presented drawing on the primary literature and making full use of unique imaging resources at UAMS such as the Cancer Imaging Archive. **Prerequisites: BMIG 5014, PHYO 5103, BMIG 5010, BMIG 5113**
- BMIG 6215** **Research – Variable credits** - Students will participate in a research project under the supervision of a faculty member. **No Prerequisites.**
- BMIG 6220** **Neuroimaging Informatics and Connectomics: 3 credits** - This graduate course will explore in depth the use of advanced imaging techniques and quantitative analysis approaches in Neuroscience research. The focus is distinct from clinical imaging and standard clinical practice. Pre-clinical and advanced imaging techniques not yet approved for the clinic will be explored. **Prerequisites: BMIG 5014, PHYO 5103, BMIG 5015, and BMIG 6210.**
- BMIG 6800** **Dissertation Research: Variable credits** - Under supervision of graduate faculty, an original research study will be designed and conducted with written dissertation following Graduate School guidelines. **No Prerequisites.**