COURSE DESCRIPTIONS

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BMI 5001 Special Topics in Biomedical Informatics (3 Credits)
This course provides a timely way to examine cutting-edge topics of interest to students and faculty. The varying content may include topics such as: technical writing in Biomedical Informatics, comparing knowledge use across disciplines, and computational knowledge methods in Biomedical Informatics. This course may be repeated as topics vary. Letter Graded

BMI 5001W Special Topics Health Informatics (3 Credits)
This course provides a timely way to examine cutting-edge topics of interest to students and faculty. The varying content may include topics such as: technical writing in Biomedical Informatics, comparing knowledge use across disciplines, and computational knowledge methods in Biomedical Informatics. This course may be repeated as topics vary. Letter Graded

BMI 5004 Introduction to Clinical Healthcare (3 Credits)
This course will present a survey of modern American clinical health care for students without a health care background who are entering fields that interact with health care such as biomedical informatics, cancer biology, and translational science. It is not a health care system course and is not intended to teach students how to practice medicine. The course is not appropriate for students who have a healthcare background (e.g., international medical graduates). We will focus on how clinical health care is delivered, rather than on health care financing, administration, regulation or governance. Students will attend lectures and "mini rotations" during which they will visit operational health care settings including outpatient clinics (pediatric and adult), emergency departments, intensive care units, clinical research and surgical settings. Major medical specialties including pediatrics, emergency medicine, internal medicine, radiology, etc. are presented. Students will interact with a variety of clinical practitioners. Letter Graded Lab fee: $30.00

BMI 5004W Introduction to Clinical Healthcare (3 Credits)
This course will present a survey of modern American clinical health care for students without a health care background who are entering fields that interact with health care such as biomedical informatics, cancer biology, and translational science. It is not a health care system course and is not intended to teach students how to practice medicine. The course is not appropriate for students who have a healthcare background (e.g., international medical graduates). We will focus on how clinical health care is delivered, rather than on health care financing, administration, regulation or governance. Students will attend lectures and 'mini rotations' during which they will visit operational health care settings including outpatient clinics (pediatric and adult), emergency departments, intensive care units, clinical research and surgical settings. Major medical specialties including pediatrics, emergency medicine, internal medicine, radiology, etc. are presented. Students will interact with a variety of clinical practitioners. Letter Graded

BMI 5007 Methods in Health Data Science (3 Credits)
The course introduces methods in health data science - defining the problem, accessing, and loading the data, formatting it into data structures required for analysis. This course covers the basics of computational thinking to define a computational solution, methods to access healthcare data from a variety of sources in different data formats. The students will apply methods for data wrangling and data quality assessments to structure the data for analysis. The students will be introduced to the basics of design and evaluation of algorithms and application of data structures for healthcare data. The course will use Python programming language and basic python libraries for data sciences such as pandas and matplotlib. Students should expect a good amount of programming exercises for each week. This course is not an introduction to programming, and not a course to improve programming skills. Students are expected to have some experience with introductory / beginner-level Python programming. Letter Graded Lab fee: $30.00

BMI 5007W Methods in Health Data Science (3 Credits)
The course introduces methods in health data science - defining the problem, accessing, and loading the data, formatting it into data structures required for analysis. This course covers the basics of computational thinking to define a computational solution, methods to access healthcare data from a variety of sources in different data formats. The students will apply methods for data wrangling and data quality assessments to structure the data for analysis. The students will be introduced to the basics of design and evaluation of algorithms and application of data structures for healthcare data. The course will use Python programming language and basic python libraries for data sciences such as pandas and matplotlib. Students should expect a good amount of programming exercises for each week. This course is not an introduction to programming, and not a course to improve programming skills. Students are expected to have some experience with introductory / beginner-level Python programming. Letter Graded

BMI 5300 Introduction to Biomedical Informatics (3 Credits)
This introductory graduate level survey course provides an overview of Biomedical Informatics and Health Information Technology and introduces the student to the major areas of the evolving discipline. The competencies for graduate education in the discipline are presented as well as the definitions of biomedical informatics. A systems framework for understanding informatics is also considered. The course focuses on the application of health information technology for healthcare delivery, education and research as well as the multidisciplinary nature of biomedical informatics. The knowledge and skills presented in this course will help the student progress to other more advanced or specialized courses throughout the curriculum since an understanding of health care, health information technology and recent governmental efforts is necessary in order to function in the biomedical informatics discipline. Letter Graded Lab fee: $30.00

BMI 5300W Introduction to Biomedical Informatics (3 Credits)
This introductory graduate level survey course provides an overview of Biomedical Informatics and Health Information Technology and introduces the student to the major areas of the evolving discipline. The competencies for graduate education in the discipline are presented as well as the definitions of biomedical informatics. A systems framework for understanding informatics is also considered. The course focuses on the application of health information technology for healthcare delivery, education and research as well as the multidisciplinary nature of biomedical informatics. The knowledge and skills presented in this course will help the student progress to other more advanced or specialized courses throughout the curriculum since an understanding of health care, health information technology and recent governmental efforts is necessary in order to function in the biomedical informatics discipline. Letter Graded

BMI 5301 The US Healthcare System (3 Credits)
This course will present a survey of the modern American health care system. The course will focus on the major pieces of legislation that serve as the foundation of the current U.S. health care structures. Topics in the course will include Medicare, Medicaid, and HIPAA, their impacts on financing, health care access and professional roles. The course will integrate current legislative actions, public concerns, implications, and discussions surrounding health care reform. Letter Graded

BMI 5301W The US Healthcare System (3 Credits)
This course will present a survey of the modern American health care system. The course will focus on the major pieces of legislation that serve as the foundation of the current U.S. health care structures. Topics in the course will include Medicare, Medicaid, and HIPAA, their impacts on financing, health care access and professional roles. The course will integrate current legislative actions, public concerns, implications, and discussions surrounding health care reform. Letter Graded

BMI 5302 Intro to Human Factors in Healthcare (3 Credits)
The course covers human factors topics with focus on healthcare. The topics include basics of human computer interactions, design and evaluation of healthcare interfaces, and role of usability in patient safety. The students will evaluate design of healthcare systems, including EHR modules, health information display (dashboards, health education material), social networks for health, mobile health (apps, sensors, wearables, and devices) and medical devices. The students will also develop functioning prototypes for healthcare design solutions. Letter Graded Lab fee: $30.00

BMI 5302W Intro to Human Factors in Healthcare (3 Credits)
The course covers human factors topics with focus on healthcare. The topics include basics of human computer interactions, design and evaluation of healthcare interfaces, and role of usability in patient safety. The students will evaluate design of healthcare systems, including EHR modules, health information display (dashboards, health education material), social networks for health, mobile health (apps, sensors, wearables, and devices) and medical devices. The students will also develop functioning prototypes for healthcare design solutions. Letter Graded

BMI 5303 Methods in Human Factors Engineering (3 Credits)
This course will introduce students to key methods employed in biomedical informatics and human factors research. Students will have the opportunity to explore and learn about differing techniques, methods and design considerations. Students will conduct different types of data collection, analysis, and interpretation using both quantitative and qualitative methods. Ethnography, task analysis, questionnaires/surveys, log analysis, and gaze behavior are some of the topics covered. Through user experience projects, as well as critical evaluation of existing work, students will gain insight into the strengths and limitations of each approach. Letter Graded BMI 5302 or 5302W

BMI 5303W Methods in Human Factors Engineering (3 Credits)
This course will introduce students to key methods employed in biomedical informatics and human factors research. Students will have the opportunity to explore and learn about differing techniques, methods and design considerations. Students will conduct different types of data collection, analysis, and interpretation using both quantitative and qualitative methods. Ethnography, task analysis, questionnaires/surveys, log analysis, and gaze behavior are some of the topics covered. Through user experience projects, as well as critical evaluation of existing work, students will gain insight into the strengths and limitations of each approach. Letter Graded BMI 5302 or 5302W

BMI 5304 Advanced Database Concepts for Biomedical Informatics (3 Credits)
Database processing is a key area of competency in biomedical informatics. This course introduces the concepts and methods of database processing in the context of healthcare and biomedicine. Topics covered include developing data models, designing, accessing and implementing databases, and database web access. We will cover relational databases (SQL), XML, no-SQL databases, ontologies and introduction to public databases for biomedical information. Letter Graded BMI 5007 or 5007W Lab fee: $30.00

BMI 5304W Advanced Database Concepts for Biomedical Informatics (3 Credits)
Database processing is a key area of competency in biomedical informatics. This course introduces the concepts and methods of database processing in the context of healthcare and biomedicine. Topics covered include developing data models, designing, accessing and implementing databases, and database web access. We will cover relational databases (SQL), XML, no-SQL databases, ontologies and introduction to public databases for biomedical information. Letter Graded BMI 5007 or 5007W

BMI 5305 Legal Ethical Aspects of Health Informat (3 Credits)
Biomedical Informatics involves rapidly changing technology, which impacts the way in which legal and ethical considerations are understood in our culture. This course will examine the relationships between law and ethics. Particular considerations will be given to the concepts of privacy, autonomy, responsibility and decision-making. These concepts will be discussed from both legal and ethical perspectives in the policy and regulatory arena. The impact of current and future technology, such as patient portals and social media, will be discussed as it relates to these concepts and the impact on Biomedical Informatics. Letter Graded Lab fee: $30.00

BMI 5305W Legal and Ethical Aspects of Health Informatics (3 Credits)
Biomedical Informatics involves rapidly changing technology, which impacts the way in which legal and ethical considerations are understood in our culture. This course will examine the relationships between law and ethics. Particular considerations will be given to the concepts of privacy, autonomy, responsibility and decision-making. These concepts will be discussed from both legal and ethical perspectives in the policy and regulatory arena. The impact of current and future technology, such as patient portals and social media, will be discussed as it relates to these concepts and the impact on Biomedical Informatics. Letter Graded

BMI 5306 Security for Health Information Systems (3 Credits)
This course will address security issues as they impact health information systems. Physical security of the hardware and software including redundancy, back up and restricted access will be discussed. Security and appropriateness of access will be addressed in terms of both hardware and software solutions. Data integrity, audit ability and system integrity will be considered along with the unique problems, such as the hacking of implantable devices, wired, wireless, and cellular networks, as well as the challenges of personally owned devices. Solutions to these concerns will be discussed in terms of industry standards, those that already exist, and those that are still evolving (i.e. Blockchain). Hands on experience with Splunk, a network security monitoring program. Features and functionality of Splunk include search, reporting, and analytics using machine data. Letter Graded

BMI 5306W Security for Health Information Systems (3 Credits)
This course will address security issues as they impact health information systems. Physical security of the hardware and software including redundancy, back up and restricted access will be discussed. Security and appropriateness of access will be addressed in terms of both hardware and software solutions. Data integrity, audit ability and system integrity will be considered along with the unique problems, such as the hacking of implantable devices, wired, wireless, and cellular networks, as well as the challenges of personally owned devices. Solutions to these concerns will be discussed in terms of industry standards, those that already exist, and those that are still evolving (i.e. Blockchain). Hands on experience with Splunk, a network security monitoring program. Features and functionality of Splunk include search, reporting, and analytics using machine data. Letter Graded

BMI 5310 Foundations of Biomedical Information Sciences I (3 Credits)
This course provides an overview of topics, concepts, theories and methods that form the foundations of biomedical information sciences. It gives students the fundamental knowledge and skills to pursue further study in biomedical informatics. Foundations I presents a general framework for computational models including symbolic and statistical approaches for solving problems throughout the range of biomedical science, from genetics to clinical care to public health. It covers concepts, theories and methods that deal with how biomedical information is acquired, discovered, represented, managed, organized, communicated, retrieved, and processed. It also provides an overview of the primary research and application areas in biomedical informatics. Letter Graded BMI 5300 or 5300W Lab fee: $30.00

BMI 5310W Foundations of Biomedical Information Sciences I (3 Credits)
This course provides an overview of topics, concepts, theories and methods that form the foundations of biomedical information sciences. It gives students the fundamental knowledge and skills to pursue further study in biomedical informatics. Foundations I presents a general framework for computational models including symbolic and statistical approaches for solving problems throughout the range of biomedical science, from genetics to clinical care to public health. It covers concepts, theories and methods that deal with how biomedical information is acquired, discovered, represented, managed, organized, communicated, retrieved, and processed. It also provides an overview of the primary research and application areas in biomedical informatics. Letter Graded BMI 5300 or 5300W

BMI 5311 Foundations of Biomedical Information Sciences II (3 Credits)
This course provides an overview of theories and methods that are broadly applicable to all health informaticians. Students will be exposed to a variety of theories and frameworks needed to pursue study in biomedical informatics. In-demand skills such as working effectively in interprofessional teams, as well as creating and delivering an effective presentation will be demonstrated. This class will also present various informatics career paths for students. Letter Graded BMI 5310 or 5310W Lab fee: $30.00

BMI 5311W Foundations of Biomedical Information Sciences II (3 Credits)
This course provides an overview of theories and methods that are broadly applicable to all health informaticians. Students will be exposed to a variety of theories and frameworks needed to pursue study in biomedical informatics. In-demand skills such as working effectively in interprofessional teams, as well as creating and delivering an effective presentation will be demonstrated. This class will also present various informatics career paths for students. Letter Graded BMI 5310 or 5310W

BMI 5313 Foundations of Electronic Health Records and Clinical Information Systems (3 Credits)
This course is designed to provide informatics students with an overview of the key concepts regarding implementation of a clinically-oriented information system (e.g., an electronic medical record, computer-based provider order entry). The course will examine how health data are collected, how they are used and the impact of electronic records on the health data. The course will review standards, standards development, languages used, usability and issues related to information processing in health care. The course will review the impact of electronic records and patient portals on health and health care including, legal, financial, and clinical design issues. Challenges encountered during training and go-live will be discussed. Students will receive hands-on experience with an electronic health record in the training environment. Letter Graded Course fee: $100.00 Lab fee: $30.00

BMI 5313W Foundations of Electronic Health Records and Clinical Information Systems (3 Credits)
This course is designed to provide informatics students with an overview of the key concepts regarding implementation of a clinically-oriented information system (e.g., an electronic medical record, computer-based provider order entry). The course will examine how health data are collected, how they are used and the impact of electronic records on the health data. The course will review standards, standards development, languages used, usability and issues related to information processing in health care. The course will review the impact of electronic records and patient portals on health and health care including, legal, financial, and clinical design issues. Challenges encountered during training and go-live will be discussed. Students will receive hands-on experience with an electronic health record in the training environment. Letter Graded

BMI 5315W Quality & Outcome Improvement in Healthcare (3 Credits)
This introductory course provides an overview to health care quality from the view of information science and the discipline of informatics. It takes a patient-centered approach that covers the complexities of quality and the scientific basis for understanding the measurement and improvement of quality, including exposure to multiple measures from a variety of organizations and measure comparison sites such as Medicare Compare. It provides the learner with a framework for key theories and concepts and models of quality improvement. Students will be introduced to health information technology safety issues, including tools for operationalizing HIT safety. Learners will be introduced to data quality, the challenges of data from devices and e-quality measures, as well as experience the challenge of calculating quality measures with data from the EHR. The merging of quality outcomes with evolving reimbursement paradigms and models will be examined. Letter Graded

BMI 5317 Applied Data Management (3 Credits)
This course provides a broad foundation for health care data management. Students will develop a data model for a relational database, evaluate the quality of a variety of datasets, utilize common tools to produce actionable information from data, and develop and design processes for effective data and information governance. After the introduction of key theories and concepts across these topics, students will complete hands-on projects. Letter Graded BMI 5300 or 5300W Lab fee: $30.00

BMI 5317W Applied Data Management (3 Credits)
This course provides an introduction and broad orientation to health care data management. Students are introduced to computer programming languages such as R and Structured Query Language (SQL) and have the opportunity to complete module assignments to demonstrate basic competencies. Selected course assignments help students gain skills and experience using Excel. Real-world or simulated data sets are used for most module assignments to help students gain an appreciation of the complexity of health data and how data are used in a learning health organization. Students have the experience to complete a data governance project. Letter Graded BMI 5300 or 5300W

BMI 5327W Standards in Health Informatics (3 Credits)
Unlike much of the world, American health care standards are frequently developed by private organizations rather than the government. The Standards Development Organizations (SDOs) create an alphabet soup of organizations that are often not well known to people within health care, let alone those just entering the field. This course will explore the history of a variety of SDOs, examining their membership and focus domain. Students will examine the role of the major SDOs and their impact on the structure and function of health care delivery in the United States. The relationship between U.S. and international standards organizations will be reviewed. Letter Graded

BMI 5328W System Analysis and Project Management (3 Credits)
This course is an introduction to both systems analysis and project management. The student will have the opportunity to learn more about the approaches and tools available for systems analysis. Additionally, the student will learn more about the roles, responsibilities, and duties of a project manager. Moreover, the student will learn project management methods and the core activities of a project manager as well as the tools and techniques required to ensure the success of a large health care information technology project such as the implementation of a system or the evaluation of an existing system. Specific emphasis will be on training and support during go-live, total costing of projects, and explicit change management techniques. Letter Graded

BMI 5329 Workflow Process Modeling (3 Credits)
Students in this course will learn how to identify and assess different aspects of health care systems and health care workflow as well as how to evaluate a health information system. Students will learn the skills needed to assess and help improve workflow and the quality of health care delivery, with a special emphasis on optimization after implementation. Students will also be introduced to different methods of evaluation and how they would apply to health information systems, as well as the use of health information systems themselves. Letter Graded Lab fee: $30.00

BMI 5329W Workflow Process Modeling (3 Credits)
Students in this course will learn how to identify and assess different aspects of health care systems and health care workflow as well as how to evaluate a health information system. Students will learn the skills needed to assess and help improve workflow and the quality of health care delivery, with a special emphasis on optimization after implementation. Students will also be introduced to different methods of evaluation and how they would apply to health information systems, as well as the use of health information systems themselves. Letter Graded

BMI 5330 Introduction to Bioinformatics (3 Credits)
The course gives a comprehensive entry-level introduction to bioinformatics. It covers a wide variety of topics in bioinformatics, including but not limited to genome analysis, transcription profiling, protein structure and proteomics. Two major goals are 1) to help students understand the scope, basic concepts and theory of bioinformatics; and 2) to become familiar with tools for bioinformatics-related data analysis. Using software tools will be a major component of the course but advanced programming skills are not required (see minimum programming skills requirements below). A laptop computer is necessary to use the bioinformatics software and tools in class and while performing the research tasks for the course project. Letter Graded

BMI 5330W Introduction to Bioinformatics (3 Credits)
The course gives a comprehensive entry-level introduction to bioinformatics. It covers a wide variety of topics in bioinformatics, including but not limited to genome analysis, transcription profiling, protein structure and proteomics. Two major goals are 1) to help students understand the scope, basic concepts and theory of bioinformatics; and 2) to become familiar with tools for bioinformatics-related data analysis. Using software tools will be a major component of the course but advanced programming skills are not required (see minimum programming skills requirements below). A laptop computer is necessary to use the bioinformatics software and tools in class and while performing the research tasks for the course project. Letter Graded

BMI 5331 Foundations of Pharmacogenomics (3 Credits)
Pharmacogenomics is the study of how human genetic variation impacts drug response. It is one of the major promises of the genome project: that individual genetic information can be used to tailor drugs to patients, maximizing efficacy and minimizing adverse reactions. An understanding of pharmacogenomics requires dual understanding of the basics of genetics and genomics and of pharmacology. This course will provide the background to understand the current state and literature in pharmacogenomics, including the methods used in research and the current issues in discovery and implementation of pharmacogenomics. Letter Graded BMI 5330 or 5330W Lab fee: $30.00

BMI 5331W Foundations of Pharmacogenomics (3 Credits)
Pharmacogenomics is the study of how human genetic variation impacts drug response. It is one of the major promises of the genome project: that individual genetic information can be used to tailor drugs to patients, maximizing efficacy and minimizing adverse reactions. An understanding of pharmacogenomics requires dual understanding of the basics of genetics and genomics and of pharmacology. This course will provide the background to understand the current state and literature in pharmacogenomics, including the methods used in research and the current issues in discovery and implementation of pharmacogenomics. Letter Graded BMI 5330 or 5330W

BMI 5332 Statistical Analysis of Genomic Data (3 Credits)
This course provides students practical skills and statistical concepts and methods that underlie the analysis of high-dimensional genomic and Omics big data generated by high throughput technologies. It will also address issues related to the experimental design and implementation of these technologies. Lectures will often be delivered with live demonstrations. Students will engage in practical problem solving sessions. The R language will be used for programming throughout the course. Letter Graded BMI 5330/W and 5352/W Lab fee: $30.00

BMI 5332W Statistical Analysis of Genomic Data (3 Credits)
This course provides students practical skills and statistical concepts and methods that underlie the analysis of high-dimensional genomic and Omics big data generated by high throughput technologies. It will also address issues related to the experimental design and implementation of these technologies. Lectures will often be delivered with live demonstrations. Students will engage in practical problem solving sessions. The R language will be used for programming throughout the course. Letter Graded BMI 5330/W and 5352/W

BMI 5333 Systems Medicine: Principles and Practice (3 Credits)
Systems medicine is an interdisciplinary field of study that looks at the systems of the human body as part of an integrated whole, incorporating biochemical, physiological, and environment interactions. Systems medicine draws on systems science, omics, imaging, systems biology, and considers complex interactions within the human body in light of a patient's genomics, behavior and environment, and design the precision medicine at systems level. Students will engage in hands-on projects exploring methods of systems medicine. Letter Graded Lab fee: $30.00

BMI 5333W Systems Medicine: Principles and Practice (3 Credits)
Systems medicine is an interdisciplinary field of study that looks at the systems of the human body as part of an integrated whole, incorporating biochemical, physiological, and environment interactions. Systems medicine draws on systems science, omics, imaging, systems biology, and considers complex interactions within the human body in light of a patient's genomics, behavior and environment, and design the precision medicine at systems level. Students will engage in hands-on projects exploring methods of systems medicine. Letter Graded

BMI 5334 Biomedical Data Privacy (3 Credits)
The massive increase in the number of biomedical and health related datasets offer great opportunities for optimizing healthcare and understanding the molecular basis of diseases. These also bring novel challenges centered around protecting the privacy of consumers, patients, and their family members. Students will explore privacy preserving data analysis methods aimed at maximizing data utility while respecting the privacy of individuals. Foundational statistical methods that protect the privacy of individuals will be applied during hands-on exercises. Letter Graded

BMI 5334W Biomedical Data Privacy (3 Credits)
The massive increase in the number of biomedical and health related datasets offer great opportunities for optimizing healthcare and understanding the molecular basis of diseases. These also bring novel challenges centered around protecting the privacy of consumers, patients, and their family members. Students will explore privacy preserving data analysis methods aimed at maximizing data utility while respecting the privacy of individuals. Foundational statistical methods that protect the privacy of individuals will be applied during hands-on exercises. Letter Graded

BMI 5351 Research Design and Evaluation in Biomedical Informatics (3 Credits)
This course provides the student the opportunity to develop more advanced competencies in the design, analysis, interpretation and critical evaluation of experimental, quasi-experimental, pre-experimental and qualitative biomedical informatics research and evaluation studies. The student will identify flaws or weaknesses in research and evaluation designs, choose which of several designs most appropriately tests a stated hypothesis or controls variables potentially jeopardizing validity, and analyze and interpret research and evaluation results. Through exposure to the basic "building block" designs, students will have the opportunity to develop the competence to appropriately choose and use the most important and frequently used design procedures for single or multifactor research or evaluation studies. Letter Graded BMI 5300 or 5300W Lab fee: $30.00

BMI 5351W Research Design and Evaluation in Biomedical Informatics (3 Credits)
This course provides the student the opportunity to develop more advanced competencies in the design, analysis, interpretation and critical evaluation of experimental, quasi-experimental, pre-experimental and qualitative biomedical informatics research and evaluation studies. The student will identify flaws or weaknesses in research and evaluation designs, choose which of several designs most appropriately tests a stated hypothesis or controls variables potentially jeopardizing validity, and analyze and interpret research and evaluation results. Through exposure to the basic "building block" designs, students will have the opportunity to develop the competence to appropriately choose and use the most important and frequently used design procedures for single or multifactor research or evaluation studies. Letter Graded BMI 5300 or 5300W

BMI 5352 Statistical Methods in Biomedical Infomatics (3 Credits)
This course provides the student the opportunity to develop essential competencies in the measurement, design, analysis, interpretation and critical evaluation of health, information, and behavioral science research and evaluation studies. Students will have the opportunity to learn and apply the most important and most frequently used statistical measures and methods, as well as critically evaluate their appropriate use. Topics include the study of frequency distributions, measures of central tendency, variance, hypothesis testing, correlation and both parametric and non-parametric inferential methods including t-tests, analysis of variance, chi-square, Kruskal-Wallis, Mann-Whitney, and Wilcoxon tests of significance, as well as tests of measures of association. Letter Graded Lab fee: $30.00

BMI 5352W Statistical Methods in Biomedical Infomatics (3 Credits)
This course provides the student the opportunity to develop essential competencies in the measurement, design, analysis, interpretation and critical evaluation of health, information, and behavioral science research and evaluation studies. Students will have the opportunity to learn and apply the most important and most frequently used statistical measures and methods, as well as critically evaluate their appropriate use. Topics include the study of frequency distributions, measures of central tendency, variance, hypothesis testing, correlation and both parametric and non-parametric inferential methods including t-tests, analysis of variance, chi-square, Kruskal-Wallis, Mann-Whitney, and Wilcoxon tests of significance, as well as tests of measures of association. Letter Graded

BMI 5353 Biomedical Data Analysis (3 Credits)
This course provides an overview of the data analysis process, with particular attention paid to the data quality issues encountered with biomedical data. The course will cover the entire data analysis pipeline from needs analysis to presentation of final results. The course is primarily project-based. The projects will cover a wide variety of biomedical data, including bioinformatics, clinical, public health, and literature datasets. Students will implement their analysis in Python and present their work in a variety of presentation formats. Letter Graded BMI 5007 or 5007W Lab fee: $30.00

BMI 5353W Biomedical Data Analysis (3 Credits)
This course provides an overview of the data analysis process, with particular attention paid to the data quality issues encountered with biomedical data. The course will cover the entire data analysis pipeline from needs analysis to presentation of final results. The course is primarily project-based. The projects will cover a wide variety of biomedical data, including bioinformatics, clinical, public health, and literature datasets. Students will implement their analysis in Python and present their work in a variety of presentation formats. Letter Graded BMI 5007 or 5007W

BMI 5354 Cognitive Engineering in Biomedical Informatics I (3 Credits)
This course focuses on cognitive engineering techniques for designing user-centered health information systems. Such systems provide appropriate functionality to the user, are easy to use and learn, reduce the chance of user error, and increase user efficiency. The course emphasizes how human cognitive abilities and limitations impose requirements on the design of effective interfaces. It covers the theory and practical application of several cognitive engineering techniques, including cognitive task analysis, verbal protocol analysis, propositional analysis and cognitive walkthroughs. Letter Graded BMI 5302 or 5302W Lab fee: $30.00

BMI 5354W Cognitive Engineering in Biomedical Informatics I (3 Credits)
This course focuses on cognitive engineering techniques for designing user-centered health information systems. Such systems provide appropriate functionality to the user, are easy to use and learn, reduce the chance of user error, and increase user efficiency. The course emphasizes how human cognitive abilities and limitations impose requirements on the design of effective interfaces. It covers the theory and practical application of several cognitive engineering techniques, including cognitive task analysis, verbal protocol analysis, propositional analysis and cognitive walkthroughs. Letter Graded BMI 5302 or 5302W

BMI 5360 Clinical Decision Support Systems (3 Credits)
This course is designed to provide an overview of decision support systems in health care, with a particular emphasis on design, evaluation and application of clinical decision support systems (CDSS) across all health care settings - in-patient, ambulatory care, long-term care, pharmacy, etc. The course explores the background and features of CDSS. Students will understand the mathematical foundations of knowledge-based systems, learn to identify areas which might benefit from a decision support system, evaluate the challenges surrounding development and implementation and consider issues of CDSS appropriateness and usability. The course also includes a detailed discussion of issues in clinical vocabularies and other important issues in the development and use of CDSS, and provides guidance on the use of decision support tools for patients. Students will have hands-on experience with EHR CDSS modification. Letter Graded

BMI 5360W Clinical Decision Support Systems (3 Credits)
This course will train the next generation of clinical researchers in the basics of clinical information systems (CIS). Students will be introduced to the skills needed to both use the data that is derived from these systems as well as understand the issues surrounding the design, development, implementation, and evaluation of CIS-based interventions. Letter Graded

BMI 5361W Informatics for Clinical Researchers (2 Credits)
This course will train the next generation of clinical researchers in the basics of clinical information systems (CIS). Students will be introduced to the skills needed to both use the data that is derived from these systems as well as understand the issues surrounding the design, development, implementation, and evaluation of CIS-based interventions. Pass/Fail

BMI 5371 Business and Technical Communication (3 Credits)
This course provides the advanced skills necessary to write a full range of business documents, including letters, memos, emails, technical and non-technical user guides, training documentation, system documentation, and application tip sheets. The reason for and appropriate uses of each of these types of documents will be examined. There will also be an introduction to scientific writing, which will be compared and contrasted with business and technical writing. The course presents techniques for producing high-quality business or technical writing. Students will apply these techniques by examining selected documents and published papers, producing their own writing, and critiquing the writing of others in class. Letter Graded

BMI 5371W Business and Technical Communication (3 Credits)
This course provides the advanced skills necessary to write a full range of business documents, including letters, memos, emails, technical and non-technical user guides, training documentation, system documentation, and application tip sheets. The reason for and appropriate uses of each of these types of documents will be examined. There will also be an introduction to scientific writing, which will be compared and contrasted with business and technical writing. The course presents techniques for producing high-quality business or technical writing. Students will apply these techniques by examining selected documents and published papers, producing their own writing, and critiquing the writing of others in class. Letter Graded

BMI 5380 Principles and Foundations of Public Health Informatics (3 Credits)
This course provides foundational knowledge relevant to Public Health Informatics (PHI), and exposes students to emerging research and application areas in this field. Topics covered include: public health registries and databases, surveillance systems, data exchange and standards, interoperability issues, the role of informatics in health promotion, use of web 2.0 informatics tools to understand behavior change, public health communication and dissemination, public health policy, and project management. Letter Graded Lab fee: $30.00

BMI 5380W Principles/Foundations in PH Informatics (3 Credits)
This course provides foundational knowledge relevant to Public Health Informatics (PHI), and exposes students to emerging research and application areas in this field. Topics covered include: public health registries and databases, surveillance systems, data exchange and standards, interoperability issues, the role of informatics in health promotion, use of web 2.0 informatics tools to understand behavior change, public health communication and dissemination, public health policy, and project management. Letter Graded

BMI 5381 Methods in Public Health Informatics (3 Credits)
This course introduces practical methods and techniques used in PHI. The course will focus on methods for evaluation of the effectiveness and efficiency of public health protection and delivery. The course modules are organized into four sub-domains of PHI methods: 1) theoretical frameworks, evaluation methods, and technological insights of digital behavior change support systems, 2) Legal and policy framework of PHI; 3) GIS and spatial analysis; and 4) Social network methods. The course is designed to familiarize students with methods for addressing the core concepts and issues confronting public health practitioners and researchers in planning, implementation and evaluation of information systems. Published articles will be used as reading assignments to complement class discussions and will provide with the background knowledge and practical context to understand and apply the concepts and the experiences from the class. Letter Graded Lab fee: $30.00

BMI 5381W Methods in Public Health Informatics (3 Credits)
This course introduces practical methods and techniques used in PHI. The course will focus on methods for evaluation of the effectiveness and efficiency of public health protection and delivery. The course modules are organized into four sub-domains of PHI methods: 1) theoretical frameworks, evaluation methods, and technological insights of digital behavior change support systems, 2) Legal and policy framework of PHI; 3) GIS and spatial analysis; and 4) Social network methods. The course is designed to familiarize students with methods for addressing the core concepts and issues confronting public health practitioners and researchers in planning, implementation and evaluation of information systems. Published articles will be used as reading assignments to complement class discussions and will provide with the background knowledge and practical context to understand and apply the concepts and the experiences from the class. Letter Graded

BMI 5382W Synthesis Project in Public Health Informatics (3 Credits)
This course provides an opportunity for students to gain practical, hands-on cumulating knowledge and experience in PHI. This project should reflect a substantial effort and competency of synthesis in informatics developed through the course training that address core competencies of the PHI system by working through a problem of the student's choice. The selected problem should be discussed and approved by a faculty mentor. This should be tied to research/practice of a student's interest that includes one or more didactic modules covered in the prior courses. The synthesis project should be based upon the combined efforts of (online) library database search, fieldwork, and mentored research approved by the mentor(s). Expectations of the class include the presentation of the conclusions from the project in a written manner for academic dissemination as a conference abstract/poster. Letter Graded

BMI 5390 Methods in Pharmacy Informatics (3 Credits)
Methods for pharmacy informatics focuses on the opportunities and challenges in integrating information technology into contemporary pharmacy practice in acute and ambulatory settings. It is designed to introduce students to basic and practical informatics problems and solutions in pharmacy practice. Letter Graded

BMI 5390W Methods in Pharmacy Informatics (3 Credits)
Methods for pharmacy informatics focuses on the opportunities and challenges in integrating information technology into contemporary pharmacy practice in acute and ambulatory settings. It is designed to introduce students to basic and practical informatics problems and solutions in pharmacy practice. Letter Graded

BMI 5391 Synthesis Project in Pharmacy Informatics (3 Credits)
This course provides an opportunity for students to gain practical, hands-on cumulating knowledge and experience in Pharmacy Informatics. This project should reflect a substantial effort and competency of synthesis in informatics developed through the course training that address core competencies of the pharmacy informatics system by working through a problem of the student's choice. The selected problem should be discussed and approved by a faculty mentor. This should be tied to research/practice of a student's interest that includes one or more didactic modules covered in the prior courses. The synthesis project should be based upon the combined efforts of (online) library database search, fieldwork, and mentored research approved by the mentor(s). Expectations of the class include the presentation of the conclusions from the project in a written manner for academic dissemination as a conference abstract/poster. Letter Graded BMI 5300/W and 5390/W

BMI 5391W Synthesis Project in Pharmacy Informatics (3 Credits)
This course provides an opportunity for students to gain practical, hands-on cumulating knowledge and experience in Pharmacy Informatics. This project should reflect a substantial effort and competency of synthesis in informatics developed through the course training that address core competencies of the pharmacy informatics system by working through a problem of the student's choice. The selected problem should be discussed and approved by a faculty mentor. This should be tied to research/practice of a student's interest that includes one or more didactic modules covered in the prior courses. The synthesis project should be based upon the combined efforts of (online) library database search, fieldwork, and mentored research approved by the mentor(s). Expectations of the class include the presentation of the conclusions from the project in a written manner for academic dissemination as a conference abstract/poster. Letter Graded BMI 5300/W and 5390/W

BMI 6000 Practicum in Biomedical Informatics (1-3 Credits)
During the practicum, each student will select an area of interest in which to apply the knowledge and skills gained during the didactic courses. Students will become active participants in the work of developing informatics-based applications. Each student will develop a specific set of goals, to be approved by the student's advising committee and practicum supervisor, to be accomplished. These goals will reflect the student's area of interest and the needs of the organization. This course is graded on a pass/fail basis and is repeated for a maximum of six semester credit hours to meet degree requirements. Pass/Fail Course fee: $1650.00

BMI 6000W Practicum in Biomedical Informatics (1-3 Credits)
During the practicum, each student will select an area of interest in which to apply the knowledge and skills gained during the didactic courses. Students will become active participants in the work of developing informatics-based applications. Each student will develop a specific set of goals, to be approved by the student's advising committee and practicum supervisor, to be accomplished. These goals will reflect the student's area of interest and the needs of the organization. This course is graded on a pass/fail basis and is repeated for a maximum of six semester credit hours to meet degree requirements. Pass/Fail

BMI 6001 Special Topic:Biomedical Informatics (3 Credits)
This course provides a timely way to examine cutting-edge topics of interest to students and faculty. The varying content may include topics such as technical writing in Biomedical Informatics, comparing knowledge use across disciplines or computational knowledge methods in Biomedical Informatics. May be repeated as topics vary. Letter Graded

BMI 6001W Special Topic:Biomed Informatics (3 Credits)
This course provides a timely way to examine cutting-edge topics of interest to students and faculty. The varying content may include topics such as technical writing in Biomedical Informatics, comparing knowledge use across disciplines or computational knowledge methods in Biomedical Informatics. May be repeated as topics vary. Letter Graded

BMI 6002 Directed Study: Biomedical Informatics (1-6 Credits)
This course provides a mechanism for students to explore issues of personal interest in the field of biomedical informatics. The varying content may include topics such as display of large-scale nursing data, mapping issues for dentistry or linking public health knowledge to clinical medicine. This course may be graded on a letter grade or pass/fail basis, and may be repeated as topics vary. Maximum allowed hours of BMI 6002: 3 hours maximum certificate students and 6 hours for master's and doctoral students. Letter Graded

BMI 6002W Directed Study: Biomedical Informatics (1-6 Credits)
This course provides a mechanism for students to explore issues of personal interest in the field of biomedical informatics. The varying content may include topics such as display of large-scale nursing data, mapping issues for dentistry or linking public health knowledge to clinical medicine. This course may be graded on a letter grade or pass/fail basis, and may be repeated as topics vary. Maximum allowed hours of BMI 6002: 3 hours maximum certificate students and 6 hours for master's and doctoral students. Letter Graded

BMI 6300 Advanced Health Information Technology (3 Credits)
The course is a hands-on coverage of advanced health information technology, such as FHIR, SMART on FHIR, and CDS Hooks, with focus on implementation of the solution as an app. These advanced technologies solve the problems of implementing informatics solutions within existing systems such as EHRs, Decision Support Systems, Mobile Health, Consumer Health, etc. Students will develop an app as part of the course work. Letter Graded BMI 5007 or 5007W Lab fee: $30.00

BMI 6300W Advanced Health Information Technology (3 Credits)
The course is a hands-on coverage of advanced health information technology, such as FHIR, SMART on FHIR, and CDS Hooks, with focus on implementation of the solution as an app. These advanced technologies solve the problems of implementing informatics solutions within existing systems such as EHRs, Decision Support Systems, Mobile Health, Consumer Health, etc. Students will develop an app as part of the course work. Letter Graded BMI 5007 or 5007W

BMI 6301 Health Data Display (3 Credits)
This course will examine the evaluation and design of information displays for health care. The course will focus on three areas: (1) Theories and methodologies for the evaluation of information displays; (2) Techniques and tools for generating effective information displays through visualization; and (3) How the formats of information displays affect decision making in health care. Letter Graded

BMI 6301W Health Data Display (3 Credits)
This course will examine the evaluation and design of information displays for health care. The course will focus on three areas: (1) Theories and methodologies for the evaluation of information displays; (2) Techniques and tools for generating effective information displays through visualization; and (3) How the formats of information displays affect decision making in health care. Letter Graded

BMI 6303 Introduction to Telehealth (3 Credits)
The course will provide an overview of telehealth in the context of the general health care system. It will survey the application of telehealth in various medical specialties and different settings, e.g., rural, military/aerospace and corrections. The course will identify key issues in implementing and operating a telehealth program, including technology, economics, law/ethics, training, protocol development, and evaluation. Letter Graded BMI 5300 or 5300W Lab fee: $30.00

BMI 6303W Introduction to Telehealth (3 Credits)
The course will provide an overview of telehealth in the context of the general health care system. It will survey the application of telehealth in various medical specialties and different settings, e.g., rural, military/aerospace and corrections. The course will identify key issues in implementing and operating a telehealth program, including technology, economics, law/ethics, training, protocol development, and evaluation. Letter Graded BMI 5300 or 5300W

BMI 6305 Social Dynamics & Health Information (3 Credits)
The implementation of information systems will not only greatly enhance the quality of health care but also radically change the nature of health care. This course will look at health care as a distributed system composed of groups of people interacting with each other and with information technology. Two major areas will be covered in the course. The first area is computer-supported cooperative work (CSCW), which is defined as computer assisted coordinated activity such as reasoning, problem solving, decision-making, routine tasks and communication carried out by a group of collaborating individuals who interact with complex information technology. Most health information systems (such as EMR) are large group-wares that support large numbers of synchronous and asynchronous users with diverse backgrounds in the executions of many different types of tasks. The second area is the social impact of information technology. This area will focus on the impact of the Internet on health care, such as the functions and impacts of virtual communities, online health groups, and telehealth care through the web. Letter Graded BMI 5300/W or BMI 5310/W

BMI 6305W Social Dynamics & Health Information (3 Credits)
The implementation of information systems will not only greatly enhance the quality of health care but also radically change the nature of health care. This course will look at health care as a distributed system composed of groups of people interacting with each other and with information technology. Two major areas will be covered in the course. The first area is computer-supported cooperative work (CSCW), which is defined as computer assisted coordinated activity such as reasoning, problem solving, decision-making, routine tasks and communication carried out by a group of collaborating individuals who interact with complex information technology. Most health information systems (such as EMR) are large group-wares that support large numbers of synchronous and asynchronous users with diverse backgrounds in the executions of many different types of tasks. The second area is the social impact of information technology. This area will focus on the impact of the Internet on health care, such as the functions and impacts of virtual communities, online health groups, and telehealth care through the web. Letter Graded BMI 5300/W or BMI 5310/W

BMI 6306 Biomedical Ontologies and Knowledge Representation (3 Credits)
The purpose of this course is to examine the role of information representation, controlled vocabularies and knowledge engineering constructs such as ontologies in conceptualization, design and implementation of modern health information systems. The course will introduce approaches for representing information and knowledge in a distributed network of health information systems. Moving beyond a general understanding of taxonomies, students will gain an understanding of the conceptual foundations of ontologies, including the limitations of the modern systems. Knowledge modeling and engineering principals will be introduced through lectures, hands-on practice and the class project. This will include the design, construction and use of ontologies in health care applications. Through hands-on experience, students will gain insight into the strengths and limitations of the existing resources, approaches and systems as well as point to directions where future work needs to be done. Letter Graded BMI 5304 or 5304W Lab fee: $30.00

BMI 6306W Biomedical Ontologies and Knowledge Representation (3 Credits)
The purpose of this course is to examine the role of information representation, controlled vocabularies and knowledge engineering constructs such as ontologies in conceptualization, design and implementation of modern health information systems. The course will introduce approaches for representing information and knowledge in a distributed network of health information systems. Moving beyond a general understanding of taxonomies, students will gain an understanding of the conceptual foundations of ontologies, including the limitations of the modern systems. Knowledge modeling and engineering principals will be introduced through lectures, hands-on practice and the class project. This will include the design, construction and use of ontologies in health care applications. Through hands-on experience, students will gain insight into the strengths and limitations of the existing resources, approaches and systems as well as point to directions where future work needs to be done. Letter Graded BMI 5304 or 5304W

BMI 6308 Digital Technologies and Analytics for Personalized Health (3 Credits)
Digital technologies have been gaining popularity in personal health and wellness. A plethora of mobile and connected platforms, patient centered solutions are poised to transform the role of public, care providers, and health systems. The key driving forces of this digital era are personalized health data and advanced analytics. In this course, students will explore these key facets of digital health and learn to (a) apply text analytics and machine learning models to describe user needs in digital settings, (b) synthesize best practices and tools for optimizing and measuring user experiences in digital solutions, and (c) discuss the emerging trends in the field that have the potential to transform health care. Letter Graded BMI 5300 or 5300W Lab fee: $30.00

BMI 6308W Digital Technologies and Analytics for Personalized Health (3 Credits)
Digital technologies have been gaining popularity in personal health and wellness. A plethora of mobile and connected platforms, patient centered solutions are poised to transform the role of public, care providers, and health systems. The key driving forces of this digital era are personalized health data and advanced analytics. In this course, students will explore these key facets of digital health and learn to (a) apply text analytics and machine learning models to describe user needs in digital settings, (b) synthesize best practices and tools for optimizing and measuring user experiences in digital solutions, and (c) discuss the emerging trends in the field that have the potential to transform health care. Letter Graded BMI 5300 or 5300W

BMI 6309 Healthcare Interface Design (3 Credits)
This course is a project-based course, and covers topics of user interface design for healthcare related systems (such as EHR, clinical decision support system, dashboards). Students will apply the fundamental principles of human-computer interaction and human factors to real world problems through class projects, and will develop formal documentations of user-centered design process for interface design. The focus is executing a design project to develop user-friendly interfaces, and interfaces that are compliant with industry and government standards (e.g., FDA, CMS, NIST) for healthcare. Letter Graded BMI 5302/W or BMI 5303/W Lab fee: $30.00

BMI 6309W Healthcare Interface Design (3 Credits)
This course is a project-based course, and covers topics of user interface design for healthcare related systems (such as EHR, clinical decision support system, dashboards). Students will apply the fundamental principles of human-computer interaction and human factors to real world problems through class projects, and will develop formal documentations of user-centered design process for interface design. The focus is executing a design project to develop user-friendly interfaces, and interfaces that are compliant with industry and government standards (e.g., FDA, CMS, NIST) for healthcare. Letter Graded BMI 5302/W or BMI 5303/W

BMI 6311 Leadership and Decision Making (3 Credits)
Healthcare is challenging with a high degree of uncertainty, making decision making more complex. Leadership is fundamentally about getting things done through people, while decision making is the process behind choosing. In this course we will focus on how to lead, choose between alternatives, measure productivity, streamline process flows, and implement project plans in health/clinical informatics. We will incorporate theories behind uncertainty and decision modeling, and spend time assessing examples of both superior and inferior leadership in healthcare and health informatics. Letter Graded Lab fee: $30.00

BMI 6311W Leadership and Decision Making (3 Credits)
Healthcare is challenging with a high degree of uncertainty, making decision making more complex. Leadership is fundamentally about getting things done through people, while decision making is the process behind choosing. In this course we will focus on how to lead, choose between alternatives, measure productivity, streamline process flows, and implement project plans in health/clinical informatics. We will incorporate theories behind uncertainty and decision modeling, and spend time assessing examples of both superior and inferior leadership in healthcare and health informatics. Letter Graded

BMI 6313 Scientific Writing in Healthcare (3 Credits)
This course provides the advanced skills necessary to write a full range of scientific manuscripts in Biomedical Informatics. The course begins with the philosophy of science, types of scientific research, and types of scientific manuscripts (including review, applied, and research articles). The course then examines each component of a scientific manuscript in detail, including the title, abstract, introduction, literature review, method, discussion, conclusion and appendices. The course covers the purpose of each of these components, discusses properties that distinguish good components from bad, and presents techniques for producing high-quality scientific writing. Students will apply these techniques by examining selected published papers, producing their own scientific writing, and critiquing the writing of others in the class. Students are expected to enter the class with a draft scientific paper that they have written and a high degree of general writing skills. Letter Graded Lab fee: $30.00

BMI 6313W Scientific Writing in Healthcare (3 Credits)
This course provides the advanced skills necessary to write a full range of scientific manuscripts in Biomedical Informatics. The course begins with the philosophy of science, types of scientific research, and types of scientific manuscripts (including review, applied, and research articles). The course then examines each component of a scientific manuscript in detail, including the title, abstract, introduction, literature review, method, discussion, conclusion and appendices. The course covers the purpose of each of these components, discusses properties that distinguish good components from bad, and presents techniques for producing high-quality scientific writing. Students will apply these techniques by examining selected published papers, producing their own scientific writing, and critiquing the writing of others in the class. Students are expected to enter the class with a draft scientific paper that they have written and a high degree of general writing skills. Letter Graded

BMI 6315 Advanced Electronic Health Records (3 Credits)
This course is designed to provide informatics students with an in-depth overview of the key concepts regarding implementation of a clinically-oriented information system (e.g., an electronic medical record, computer-based provider order entry, nursing). The course will strive to present best practices in cases which there is evidence to support such assertions. The course will rely heavily upon the published literature as well as the experience of the instructors. Letter Graded BMI 5313 or 5313W Lab fee: $30.00

BMI 6316 Change Management for Health Informatics (3 Credits)
The ability to manage change - people, process, and technology - may be the most important factor in successful implementation and in producing sustained outcomes from applied health informatics projects. This course will cover the theory and principles of change management, with a particular emphasis on healthcare and information technology innovation at both the individual and organizational level. Tools and techniques for developing comprehensive change management plans will be presented. Case studies of successful and failed change efforts will demonstrate applications of these principles and techniques. Letter Graded BMI 5300/W or concurrent enrollment with 5300/W

BMI 6316W Change Management for Health Informatics (3 Credits)
The ability to manage change - people, process, and technology - may be the most important factor in successful implementation and in producing sustained outcomes from applied health informatics projects. This course will cover the theory and principles of change management, with a particular emphasis on healthcare and information technology innovation at both the individual and organizational level. Tools and techniques for developing comprehensive change management plans will be presented. Case studies of successful and failed change efforts will demonstrate applications of these principles and techniques. Letter Graded

BMI 6318 Big Data in Biomedical Informatics (3 Credits)
This course will expose students to the technologies used to solve 'Big Data' problems in biomedicine and healthcare. Through hands-on exercises, we will learn how to distill actionable information from small and large data leveraging multiple machines. We will cover the Health Data Science toolboxes for processing data sets with distributed algorithms, how to apply machine learning models in this context and finally, evaluate and report on the analysis. Students will be required to complete hands-on exercises and working knowledge of Python and SQL is required. Letter Graded BMI 5007 or 5007W Lab fee: $30.00

BMI 6318W Big Data in Biomedical Informatics (3 Credits)
This course will expose students to the technologies used to solve 'Big Data' problems in biomedicine and healthcare. Through hands-on exercises, we will learn how to distill actionable information from small and large data leveraging multiple machines. We will cover the Health Data Science toolboxes for processing data sets with distributed algorithms, how to apply machine learning models in this context and finally, evaluate and report on the analysis. Students will be required to complete hands-on exercises and working knowledge of Python and SQL is required. Letter Graded BMI 5007 or 5007W

BMI 6319 Data Analysis for Scientific Research in Biomedical Informatics (3 Credits)
This is a PhD level course which will expose students to the best practices in Health Data Science in biomedicine and healthcare. The students will devise a plan for a reproducible data analysis pipeline which will be developed throughout the course. The course will involve class discussions and sharing of ideas on methodologies and Health Data Science tools, with particular emphasis on reproducibility. The data analysis plan, including choice of dataset, will be student driven but it will require approval from the students' PhD supervisor and the course instructor. Pass/Fail BMI 5007 or 5007W Lab fee: $30.00

BMI 6319W Data Analysis for Scientific Research in Biomedical Informatics (3 Credits)
This is a PhD level course which will expose students to the best practices in Health Data Science in biomedicine and healthcare. The students will devise a plan for a reproducible data analysis pipeline which will be developed throughout the course. The course will involve class discussions and sharing of ideas on methodologies and Health Data Science tools, with particular emphasis on reproducibility. The data analysis plan, including choice of dataset, will be student driven but it will require approval from the students' PhD supervisor and the course instructor. Pass/Fail BMI 5007 or 5007W

BMI 6322 Distributional Semantics in BMI (3 Credits)
This course concerns computational methods that learn about the meaning of words and concepts from their distribution in natural language, and consequently are able to perform cognitive tasks in a human-like manner. For example, with the appropriate learning materials, these methods have shown performances comparable with English as a second language speakers on the Test of English as a Foreign Language synonym test. Applications in the biomedical domain include information retrieval, automated indexing of the biomedical literature, literature-based knowledge discovery and the analysis of biological sequences. This course will explore the underlying theories and various methodological approaches used to measure semantic relatedness (the extent to which the meaning of two terms is related), as well as their application in biomedical and other domains. The course will provide hands-on instruction so that students will emerge with the ability to apply the methods taught in the class in their own research. Letter Graded Lab fee: $30.00

BMI 6323 Machine Learning in Biomedical Informatics (3 Credits)
The increased digitization of biomedical data has dramatically increased interest in methods to analyze large quantities of data. Data mining is the process of transforming this raw data into actionable knowledge, which has led to many spectacular advances in biomedicine. This course provides an introduction to data mining methods from a biomedical perspective. The primary focus will be on practical and commonly used machine learning techniques for data mining (e.g., decision trees, support vector machines, clustering) and how these techniques transform data into knowledge. Students will engage in hands-on projects that expose them to data mining methods. Further, students will be able to critically evaluate the appropriateness of data mining methods on different tasks. Letter Graded Lab fee: $30.00

BMI 6323W Machine Learning in Biomedical Informatics (3 Credits)
The increased digitization of biomedical data has dramatically increased interest in methods to analyze large quantities of data. Data mining is the process of transforming this raw data into actionable knowledge, which has led to many spectacular advances in biomedicine. This course provides an introduction to data mining methods from a biomedical perspective. The primary focus will be on practical and commonly used machine learning techniques for data mining (e.g., decision trees, support vector machines, clustering) and how these techniques transform data into knowledge. Students will engage in hands-on projects that expose them to data mining methods. Further, students will be able to critically evaluate the appropriateness of data mining methods on different tasks. Letter Graded

BMI 6324 Health Information Technology Policy (3 Credits)
This course will examine policy issues related to the use of information technologies in health care. It will examine key policies and policy issues in three areas: clinical informatics, consumer informatics and population health informatics. The primary focus will be on the United States, but international approaches will also be discussed. Letter Graded

BMI 6324W Health Information Technology Policy (3 Credits)
This course will examine policy issues related to the use of information technologies in health care. It will examine key policies and policy issues in three areas: clinical informatics, consumer informatics and population health informatics. The primary focus will be on the United States, but international approaches will also be discussed. Letter Graded

BMI 6328 Value in the Health Data Eco-system (3 Credits)
This course will expose doctoral students to an interdisciplinary research area that aims to explore the challenges of improving health care delivery, and reducing costs in a health information technology-enabled environment. Data and information are assets and a strategic resource for an organization that can add value or cause major disruptions. An understanding of the relationships and use of data and its interdependencies are essential to manage an organization. Improving healthcare requires knowledge of the intersections between data systems and relationships, data governance, data definitions, representative metrics, evidence-based interventions and outcomes. Letter Graded BMI 5300 or 5300W

BMI 6328W Value in the Health Data Eco-system (3 Credits)
This course will expose doctoral students to an interdisciplinary research area that aims to explore the challenges of improving health care delivery, and reducing costs in a health information technology-enabled environment. Data and information are assets and a strategic resource for an organization that can add value or cause major disruptions. An understanding of the relationships and use of data and its interdependencies are essential to manage an organization. Improving healthcare requires knowledge of the intersections between data systems and relationships, data governance, data definitions, representative metrics, evidence-based interventions and outcomes. Letter Graded BMI 5300 or 5300W

BMI 6330 Biomedical Natural Language Processing (3 Credits)
This course focuses on current natural language processing (NLP) methods and their applications in the biomedical domain. It is a project-based student-driven course while also providing a systematic introduction to basic NLP concepts and methods, especially with a biomedical focus. Students will gain knowledge and skills in various NLP tasks such as named entity recognition, information extraction, and information retrieval. Prior to enrollment in the course, students are required to select and prepare a research project. This includes both having direct access to the raw text data as well as high-level goals for the NLP task. Please contact the instructor with questions and pointers to potential data sources. Students will be expected to manually annotate this data, create an automatic machine learning-based NLP system, and write a paper describing their results. Letter Graded

BMI 6330W Biomedical Natural Language Processing (3 Credits)
This course focuses on current natural language processing (NLP) methods and their applications in the biomedical domain. It is a project-based student-driven course while also providing a systematic introduction to basic NLP concepts and methods, especially with a biomedical focus. Students will gain knowledge and skills in various NLP tasks such as named entity recognition, information extraction, and information retrieval. Prior to enrollment in the course, students are required to select and prepare a research project. This includes both having direct access to the raw text data as well as high-level goals for the NLP task. Please contact the instructor with questions and pointers to potential data sources. Students will be expected to manually annotate this data, create an automatic machine learning-based NLP system, and write a paper describing their results. Letter Graded

BMI 6331 Medical Imaging and Signal Pattern Recognition (3 Credits)
Biomedical data in the form of images, videos or other unstructured signals are continuously collected by clinicians, such as radiologists, dermatologists or ophthalmologists, life science researchers and increasingly by ourselves with our personal devices. Tools able to distill quantitative actionable information from these data are essential to generate phenotypes, aid diagnosis, screening, treatment and automate repetitive tasks. In the era of personalized medicine and big data, they have become an urgent medical need. In this course, you will be introduced to the essential pattern recognitions techniques to build and evaluate such tools. We will be covering the basics of image/signal processing, computer vision and applied machine learning with hands on examples relevant to biomedical applications. Letter Graded BMI 5007 or 5007W Lab fee: $30.00

BMI 6331W Medical Imaging and Signal Pattern Recognition (3 Credits)
Biomedical data in the form of images, videos or other unstructured signals are continuously collected by clinicians, such as radiologists, dermatologists or ophthalmologists, life science researchers and increasingly by ourselves with our personal devices. Tools able to distill quantitative actionable information from these data are essential to generate phenotypes, aid diagnosis, screening, treatment and automate repetitive tasks. In the era of personalized medicine and big data, they have become an urgent medical need. In this course, you will be introduced to the essential pattern recognitions techniques to build and evaluate such tools. We will be covering the basics of image/signal processing, computer vision and applied machine learning with hands on examples relevant to biomedical applications. Letter Graded BMI 5007 or 5007W

BMI 6332 Genomics and Precision Medicine (3 Credits)
This course will provide the foundations of precision medicine and its relations with genomics by exposing trainees to the use and interpretation of genetic studies of human populations in the context of phenotypes and diseases. The course will cover principles of genetics underlying associations between genetic variants and disease susceptibility and drug response. Letter Graded BMI 5330 or 5330W Lab fee: $30.00

BMI 6332W Genomics and Precision Medicine (3 Credits)
This course will provide the foundations of precision medicine and its relations with genomics by exposing trainees to the use and interpretation of genetic studies of human populations in the context of phenotypes and diseases. The course will cover principles of genetics underlying associations between genetic variants and disease susceptibility and drug response. Letter Graded BMI 5330 or 5330W

BMI 6333 Current Topics in Genomics (3 Credits)
Bioinformatics play significant roles in modern genetics and genomics studies. Nearly every large-scale biology projects require a significant component of bioinformatics and computational approaches. This course provides an introduction to advanced technologies and resources in genetics, epigenetics, transcriptomics, and phenotype studies, organized as "topics". Students will be provided with knowledge and skills to apply canonical algorithms in bioinformatics tasks, to identify potential challenges, and to develop their own analysis pipelines. Letter Graded BMI 5330 or 5330W

BMI 6333W Current Topics in Genomics (3 Credits)
Bioinformatics play significant roles in modern genetics and genomics studies. Nearly every large-scale biology projects require a significant component of bioinformatics and computational approaches. This course provides an introduction to advanced technologies and resources in genetics, epigenetics, transcriptomics, and phenotype studies, organized as "topics". Students will be provided with knowledge and skills to apply canonical algorithms in bioinformatics tasks, to identify potential challenges, and to develop their own analysis pipelines. Letter Graded BMI 5330 or 5330W

BMI 6334 Deep Learning in Biomedical Informatics (3 Credits)
Deep learning and artificial intelligence have disrupted multiple industries including healthcare. This class offers students exposure to basic concepts of and practical skills for deep learning and its applications in selected problems in biomedical informatics. Students will study the foundations of deep learning, understand how to build neural networks, and conduct successful machine learning analyses. Deep learning architectures such as convolutional neural networks, recurrent neural networks, and autoencoders will be explored, along with concepts such as embeddings, dropout, and batch normalization. Case studies from biomedical informatics, including biomedical and clinical natural language processing, medical imaging, electronic health records, and genomics data will be utilized. Students will use the Python language and the state-of-the-art deep learning frameworks to implement deep learning models to solve real world problems. Experience with Python programming and basic knowledge of linear algebra is required. Letter Graded BMI 5007/W and 5353/W Lab fee: $30.00

BMI 6334W Deep Learning in Biomedical Informatics (3 Credits)
Deep learning and artificial intelligence have disrupted multiple industries including healthcare. This class offers students exposure to basic concepts of and practical skills for deep learning and its applications in selected problems in biomedical informatics. Students will study the foundations of deep learning, understand how to build neural networks, and conduct successful machine learning analyses. Deep learning architectures such as convolutional neural networks, recurrent neural networks, and autoencoders will be explored, along with concepts such as embeddings, dropout, and batch normalization. Case studies from biomedical informatics, including biomedical and clinical natural language processing, medical imaging, electronic health records, and genomics data will be utilized. Students will use the Python language and the state-of-the-art deep learning frameworks to implement deep learning models to solve real world problems. Experience with Python programming and basic knowledge of linear algebra is required. Letter Graded BMI 5007/W and 5353/W

BMI 6335 Technical Foundations of Generative Artificial Intelligence (3 Credits)
BMI 6335 Technical Foundations of Generative Artificial Intelligence 3 semester credit hours Lecture contact hours: 2; Lab contact hours: 3 Web-based and classroom instruction Prerequisite: BMI 5007 Generative Artificial Intelligence (AI) holds immense potential to revolutionize the field of biomedicine by enhancing accuracy, efficiency, and personalization in healthcare, ultimately leading to better patient outcomes and a more robust healthcare system. It is crucial in improving diagnostic capabilities, personalized medicine, drug discovery, clinical decision support, and patient engagement and support. This course provides fundamental and technical skills in generative AI, offering hands-on experience with Large Language Models (LLMs), Stable Diffusion Models, and Generative Adversarial Networks (GANs). Students will engage in using generative AI to solve real-world biomedical problems and will be critically evaluated on their methodology and results. Upon successfully completing this course, students will: Select an appropriate generative AI model for a specific data science task. Modify, adapt, and deploy generative AI models for specific biomedical problems. Train, evaluate, and compare the outputs of generative AI. Identify the ethical and real-world implementation implications of generative AI models Letter Graded BMI 5007 or 5007W

BMI 6335W Technical Foundations of Generative Artificial Intelligence (3 Credits)
BMI 6335 Technical Foundations of Generative Artificial Intelligence 3 semester credit hours Lecture contact hours: 2; Lab contact hours: 3 Web-based and classroom instruction Prerequisite: BMI 5007 Generative Artificial Intelligence (AI) holds immense potential to revolutionize the field of biomedicine by enhancing accuracy, efficiency, and personalization in healthcare, ultimately leading to better patient outcomes and a more robust healthcare system. It is crucial in improving diagnostic capabilities, personalized medicine, drug discovery, clinical decision support, and patient engagement and support. This course provides fundamental and technical skills in generative AI, offering hands-on experience with Large Language Models (LLMs), Stable Diffusion Models, and Generative Adversarial Networks (GANs). Students will engage in using generative AI to solve real-world biomedical problems and will be critically evaluated on their methodology and results. Upon successfully completing this course, students will: Select an appropriate generative AI model for a specific data science task. Modify, adapt, and deploy generative AI models for specific biomedical problems. Train, evaluate, and compare the outputs of generative AI. Identify the ethical and real-world implementation implications of generative AI models Letter Graded BMI 5007 or 5007W

BMI 6340 Health Information Visualization and Visual Analytics (3 Credits)
This course introduces the basics of information visualization, which is the use of interactive visual representations of data to amplify human cognition. Properly constructed visualizations allow us to analyze data by exploring it from different perspectives and using the power of our visual system to quickly reveal patterns and relationships. This course uses practical, hands-on examples and exercises to teach the theory and application of information visualization for health data. The class emphasizes visual analysis of time-series data, ranking and part-to-whole relations, deviations, distributions, correlations, multivariate, and geographic data. You will also learn how to combine multiple visualizations into interactive dashboards and how to use Tableau, a state-of-the-art information visualization tool to produce and deliver visualizations and dashboards quickly and easily. Letter Graded Lab fee: $30.00

BMI 6340W Health Information Visualization and Visual Analytics (3 Credits)
This course introduces the basics of information visualization, which is the use of interactive visual representations of data to amplify human cognition. Properly constructed visualizations allow us to analyze data by exploring it from different perspectives and using the power of our visual system to quickly reveal patterns and relationships. This course uses practical, hands-on examples and exercises to teach the theory and application of information visualization for health data. The class emphasizes visual analysis of time-series data, ranking and part-to-whole relations, deviations, distributions, correlations, multivariate, and geographic data. You will also learn how to combine multiple visualizations into interactive dashboards and how to use Tableau, a state-of-the-art information visualization tool to produce and deliver visualizations and dashboards quickly and easily. Letter Graded

BMI 6370 Advanced Standards and Terminologies in Nursing and Health Informatics (3 Credits)
This course will explore the history of healthcare SDOs, examining their membership and focus domain. Students will examine the role of the major SDOs and their impact on the structure and function of global healthcare delivery. The relationship between US and International Standards Organizations will be reviewed. Furthermore, the course will explore emerging standards. Additionally, students will have the opportunity to compare and contrast nursing terminologies and classification systems relevant to the Electronic Health Record (EHR). Students will create a nursing standard for implementation in an electronic health record (EHR) and propose a method to evaluate the standard post implementation. Letter Graded

BMI 6370W Advanced Standards and Terminologies in Nursing and Health Informatics (3 Credits)
This course will explore the history of healthcare SDOs, examining their membership and focus domain. Students will examine the role of the major SDOs and their impact on the structure and function of global healthcare delivery. The relationship between US and International Standards Organizations will be reviewed. Furthermore, the course will explore emerging standards. Additionally, students will have the opportunity to compare and contrast nursing terminologies and classification systems relevant to the Electronic Health Record (EHR). Students will create a nursing standard for implementation in an electronic health record (EHR) and propose a method to evaluate the standard post implementation. Letter Graded

BMI 7000 Advanced Preceptorship (1-9 Credits)
The student will use this course to develop a research proposal that will be used as a basis for their doctoral dissertation. The student must complete nine semester credit hours with the supervision of the mentor or primary advisor. The result will be used to prepare for the advance to candidacy exam. Pass/Fail

BMI 7000W Advanced Preceptorship (1-10 Credits)
The student will use this course to develop a research proposal that will be used as a basis for their doctoral dissertation. The student must complete nine semester credit hours with the supervision of the mentor or primary advisor. The result will be used to prepare for the advance to candidacy exam. Pass/Fail

BMI 7050 Research in Biomedical Informatics (1-9 Credits)
The doctoral candidate must complete 21 hours of research in Biomedical Informatics. The mentor or primary advisor will supervise the advancement of the candidates progress. Pass/Fail

BMI 7050W Research in Biomed Informatics (1-9 Credits)
The doctoral candidate must complete 21 hours of research in Biomedical Informatics. The mentor or primary advisor will supervise the advancement of the candidates progress. Pass/Fail

BMI 7070 Fellowship in Health Informatics (1-9 Credits)
DHI students will use this course to implement their translational practice project under the supervision of their primary advisor and in collaboration with their additional committee members. The translational practice project requirements will consist of background and review of relevant literature/evidence, project overview, theoretical framework/logic model, purpose statement/significance of project, evaluation design (including return on investment), implementation/gather evidence, recommendations and finally, future implications. This course must be repeated as students must earn a total of 21 semester credit hours to meet the degree requirement. Pass/Fail

BMI 7150 Research Seminar (1 Credit)
This course involves the weekly research seminars in which both invited speakers and students present their work to an audience of SBMI affiliates. Students participating in the course for credit are required to both give a seminar presentation, attend at least 80% of the weekly seminars, and fill out evaluation forms (available online). Each student seminar must be supervised by a faculty member (not necessarily the student's advisor). The faculty member will work with students to ensure that the seminars are both appropriate and interesting for the audience. Pass/Fail

BMI 7151 Seminar in Precision Medicine (1 Credit)
Seminar in Precision Medicine will introduce and discuss recent advances, frontier technologies, case studies, and future direction in precision medicine. The topics cover precision medicine, bioinformatics, systems biology, pharmacogenomics, genetics, genomic medicine, study design, methodologies and computational tools. Students enrolled in the course for credit are required to give a seminar presentation, attend at least 80% of the weekly seminars, and fill out evaluation forms. Each student seminar must be supervised by a faculty member (not necessarily the student's advisor). The faculty member will work with students to ensure that the seminars are both appropriate and interesting for the audience. Pass/Fail

BMI 7170 Project Advisement (1 Credit)
DHI students will use this course to develop a proposal/plan to be used as a basis for their translational practice project. Students must complete three semester credit hours with the supervision of their primary advisor and additional committee members. The proposal/plan will be used to prepare for the project execution as students develop a timeline for completion of the translational practice project during this course. Pass/Fail

BMI 7301 Grant Writing (3 Credits)
Students will develop skills in the planning and execution of grant development. The focus will be on NIH and NSF grants forms, but students will also be exposed to grant applications from private organizations. The goal of the course is to enable students to develop a draft that can be used for the funding of dissertation work or to develop a grant that would allow students to continue their dissertation work in a post-dissertation award. Students will learn how to write the narrative, project time lines, include appropriate evaluation and draft budgets. Letter Graded

BMI 7301W Grant Writing (3 Credits)
Students will develop skills in the planning and execution of grant development. The focus will be on NIH and NSF grants forms, but students will also be exposed to grant applications from private organizations. The goal of the course is to enable students to develop a draft that can be used for the funding of dissertation work or to develop a grant that would allow students to continue their dissertation work in a post-dissertation award. Students will learn how to write the narrative, project time lines, include appropriate evaluation and draft budgets. Letter Graded

BMI 7302 Theories & Frameworks for BMI (3 Credits)
This course introduces a variety of significant theories, frameworks and models that are relevant to biomedical informatics knowledge and research. Students will explore these through exploration of methods and application papers. By the end of the semester students will be able to identify theories, frameworks and models that are applicable to their doctoral research. Letter Graded BMI 5300/W, 5310/W, and 5311/W

BMI 7302W Theories and Frameworks for Biomedical Informatics Research (3 Credits)
This course introduces a variety of significant theories, frameworks and models that are relevant to biomedical informatics knowledge and research. Students will explore these through exploration of methods and application papers. By the end of the semester students will be able to identify theories, frameworks and models that are applicable to their doctoral research. Letter Graded BMI 5300/W, 5310/W, and 5311/W

BMI 7303 Critical Review of Biomedical Informatics Literature Seminar (3 Credits)
The purpose of the critical literature review seminar is to apply and deepen knowledge from an area of biomedical informatics study and demonstrate proficiency in reviewing, synthesizing, and critically analyzing the research literature in a topic area that relates directly to the student's chosen dissertation topic. By the end of the semester each student will have completed a draft literature review of their chosen subject. Letter Graded BMI 5300/W, 5352/W, 5310/W, and 5311/W

BMI 7303W Critical Review of Biomedical Informatics Literature Seminar (3 Credits)
The purpose of the critical literature review seminar is to apply and deepen knowledge from an area of biomedical informatics study and demonstrate proficiency in reviewing, synthesizing, and critically analyzing the research literature in a topic area that relates directly to the student's chosen dissertation topic. By the end of the semester each student will have completed a draft literature review of their chosen subject. Letter Graded BMI 5300/W, 5352/W, 5310/W, and 5311/W

BMI 7304 Advanced Research Design for Biomedical Informatics (3 Credits)
This course will provide an in-depth examination of advanced research design and methods for establishing causal statements about the efficacy, effectiveness and generalizability of biomedical informatics research to improve human health. Standards for stating/claiming than an intervention is evidence-based will also be addressed. By the end of the semester students will be able to provide a plausible research design given a scenario and hypothesis. Letter Graded BMI 5300/W, 5352/W, 5310/W, and 5311/W

BMI 7304W Advanced Research Design for Biomedical Informatics (3 Credits)
This course will provide an in-depth examination of advanced research design and methods for establishing causal statements about the efficacy, effectiveness and generalizability of biomedical informatics research to improve human health. Standards for stating/claiming than an intervention is evidence-based will also be addressed. By the end of the semester students will be able to provide a plausible research design given a scenario and hypothesis. Letter Graded BMI 5300/W, 5352/W, 5310/W, and 5311/W

BMI 7320 Topics for Artificial Intelligence in Cancer Discovery (3 Credits)
This course introduces a few common deep learning architectures (e.g., convolution neural network, graph neural network, recurrent neural network and autoencoder) to the students who are new to AI. The primary aim of this course is to flatten the learning curve in AI and to provide students with a basis for further implementation of more complex models using enormous real-world data, especially in cancer research. This course will have a combination of lectures and demos to guarantee the students will have adequate first-hand experience with course concepts and with the opportunity to explore AI methods implemented in cancer research. We also include one tutorial of basic programming skills with Python and its machine learning libraries. Pass/Fail, F not in GPA

BMI 7320W Topics for Artificial Intelligence in Cancer Discovery (3 Credits)
This course introduces a few common deep learning architectures (e.g., convolution neural network, graph neural network, recurrent neural network and autoencoder) to the students who are new to AI. The primary aim of this course is to flatten the learning curve in AI and to provide students with a basis for further implementation of more complex models using enormous real-world data, especially in cancer research. This course will have a combination of lectures and demos to guarantee the students will have adequate first-hand experience with course concepts and with the opportunity to explore AI methods implemented in cancer research. We also include one tutorial of basic programming skills with Python and its machine learning libraries. Pass/Fail, F not in GPA

BMI 7350W Scholarly Foundations of Advanced Health Informatics Practice (3 Credits)
This foundational course focuses on analyzing health informatics competencies, role, and scholarship as the foundation for scholarly practice at the doctoral level. The foundations of science and scientific inquiry are explored including the epistemological and ontological bases for scientific methods, theory, and knowledge. Sources of evidence, theory, and knowledge for health informatics practice are analyzed. Evidence based practice, leadership, innovation/change, inter-professional collaboration/teams, and quality and safety, are introduced as fundamental components of health informatics practice. Implementation science is investigated as a means of guiding science-based practice. Letter Graded BMI 5300 or 5300W

BMI 7351 Evidence-based Health Informatics Practice (3 Credits)
In this course the doctoral student will learn the importance of evidence for the advancement of Informatics practice, improvement of varied outcomes, and advancement of the information technology to support a learning health system. The student will apply skills to focus on the current urgency of evidence application to practice, and have a hands on illustration of how to appraise, summarize and translate evidence to support recommendations for quality improvement and sustainment in a learning health system. In addition, this course is intended to update and enhance evidence-based practice knowledge and process for conducting a search, critiquing, and evaluating research publications. Students will learn to perform an electronic literature search from electronic databases and assess, investigate and recommend informatics practice using an evidence-based practice methodology. Letter Graded BMI 5300 or 5300W

BMI 7351W Evidence-based Health Informatics Practice (3 Credits)
In this course the doctoral student will learn the importance of evidence for the advancement of Informatics practice, improvement of varied outcomes, and advancement of the information technology to support a learning health system. The student will apply skills to focus on the current urgency of evidence application to practice, and have a hands on illustration of how to appraise, summarize and translate evidence to support recommendations for quality improvement and sustainment in a learning health system. In addition, this course is intended to update and enhance evidence-based practice knowledge and process for conducting a search, critiquing, and evaluating research publications. Students will learn to perform an electronic literature search from electronic databases and assess, investigate and recommend informatics practice using an evidence-based practice methodology. Letter Graded BMI 5300 or 5300W

BMI 7360 Advanced Project Management (3 Credits)
This course is an advanced project management for doctoral students. The student will develop a management plan for a health care information technology project identifying a specific set of operations designed to accomplish a singular goal, to deliver on-time, on-budget, evaluating performance and project integration supporting the strategic goals of the organizations. Moreover, the student will learn to apply evidence-based practice and project management methods and core activities of a project manager that incorporate the five project management processes as well as the tools and techniques essential to the ten project management knowledge areas as defined by the Project Management Institute, Inc. Letter Graded BMI 5328W Course fee: $50.00 Lab fee: $30.00

BMI 7360W Advanced Project Management (3 Credits)
This course is an advanced project management for doctoral students. The student will develop a management plan for a health care information technology project identifying a specific set of operations designed to accomplish a singular goal, to deliver on-time, on-budget, evaluating performance and project integration supporting the strategic goals of the organizations. Moreover, the student will learn to apply evidence-based practice and project management methods and core activities of a project manager that incorporate the five project management processes as well as the tools and techniques essential to the ten project management knowledge areas as defined by the Project Management Institute, Inc. Letter Graded BMI 5328W

BMI 7361 Business, Contract, and Vendor Management (3 Credits)
In this course the doctoral student will learn the skills needed to effectively manage vendors, as well as negotiate and manage contracts. Through hands-on exercises, students will learn the role of governance to oversee contractual, financial, and service delivery performance that can improve outcomes within projects, programs, and the overall organization portfolio. This governance can be built into the relationship from the onset of the engagement to improve the overall health of the relationship and maximize value for current and future engagements. Students will develop an integrated understanding of how vendors are chosen, motivated and managed, as well as strong contract negotiation skills. Letter Graded BMI 5300 or 5300W

BMI 7361W Business, Contract, and Vendor Management (3 Credits)
In this course the doctoral student will learn the skills needed to effectively manage vendors, as well as negotiate and manage contracts. Through hands-on exercises, students will learn the role of governance to oversee contractual, financial, and service delivery performance that can improve outcomes within projects, programs, and the overall organization portfolio. This governance can be built into the relationship from the onset of the engagement to improve the overall health of the relationship and maximize value for current and future engagements. Students will develop an integrated understanding of how vendors are chosen, motivated and managed, as well as strong contract negotiation skills. Letter Graded BMI 5300 or 5300W

BMI 9950 Project Evaluation and Writing (1-9 Credits)
Doctoral students will use this course to develop a project evaluation report to be written upon completion of the translational practice project. Students must present the translational project findings at an oral session that is open to the public. This course may be repeated for at least 9 semester credit hours to meet the degree requirement. Pass/Fail

BMI 9999 Dissertation in Biomedical Informatics (1-9 Credits)
The post-candidacy doctoral student will use this course to write their doctoral dissertation under the supervision of their primary mentor, and in collaboration with their advisory committee. This course may be repeated for at least 9 hours to meet the degree requirement. Pass/Fail

BMI 9999W Dissertation in Biomedical Informatics (1-9 Credits)
The post-candidacy doctoral student will use this course to write their doctoral dissertation under the supervision of their primary mentor, and in collaboration with their advisory committee. This course may be repeated for at least 9 hours to meet the degree requirement. Pass/Fail