ME.250 (HEALTH SCIENCES INFORMATICS)

Courses

ME.250.651. Topics in Interdisciplinary Medicine - Clinical Informatics.

ME.250.750. Design Discovery for Healthcare. 1.5 Credits.
This course is the first of the design for healthcare series (it is strongly recommended that prototyping for healthcare design is taken just after this course). Design discovery for healthcare applies design thinking techniques to the beginning stages of digital health app ideation. Working as part of a team, participants will explore methods for mapping stakeholders, and plan for and execute user interviews to gain insights about user needs for a digital health app. They will also choose design research methods, practice synthesizing results, and facilitate ideation sessions, with a goal of creating a design research brief. Teams will explore design software tools in this course but will not be required to code.

ME.250.755. Natural Language Processing in the Health Sciences. 1.5 Credits.
There is significant demand in both academia, research and industry for informatics professionals who are well versed in natural language processing (NLP). In this course, students will be oriented to the various applications of NLP in biomedicine, healthcare and public health. The course will emphasize the importance of clearly defining what problem needs to be solved or what questions one seeks to get answered via the use of NLP. Approaches to data mining of free text from the biomedical literature, clinical narratives, and other novel data sources will be covered. There will be opportunities for students to develop NLP and machine learning algorithms. Applications of these tools in epidemiologic surveillance, clinical decision support, and other relevant use cases will be covered.

ME.250.756. Informatics and the Clinical Research Lifecycle: Tools, Techniques and Processes. 1.5 Credits.
Research informatics deals with how informatics can and should support research and how research is altered by that support. The course addresses the entire life cycle of a clinical-research program: idea generation, team building, protocol development, obtaining funding, addressing ethical concerns, obtaining permissions, recruiting participants, providing the intervention and associated care, data collection, data analysis, data archiving, and results dissemination. The course addresses the related topic of translational informatics, incorporating the results of clinical and bioinformatics research into health practice. In each case, the course will highlight novel principles involved, tools available, evidence for their success, and implications for the future.

ME.250.770. Clinical Data Analysis with Python. 1.5 Credits.
This course introduces the knowledge of Object Oriented Programming and Python programming language. Covers Python data structures and practical data analysis skills in a clinical informatics context. Presents methods for data manipulation, data cleaning, and data visualization using Python Pandas, Numpy, and Matplotlib libraries. Discusses basicc statistical analyses methods in the healthcare setting.

ME.250.771. Introduction to Precision Medicine Data Analysis. 1.5 Credits.
This course will introduce students to the rapidly evolving field of precision medicine and the role of big data analytics in improving patient care, clinical decision making, and population health management. The course will provide an overview of the array of different tools that can be used by data scientists and clinical informaticians in a secure research environment.

ME.250.775. Advanced informatics Elective: Informatics Education. 1 Credit.
This practicum is intended to provide senior graduate students with experience in curriculum design, teaching, and pedagogy in the field of informatics. Students will be introduced to the CAHIM accreditation standards and AMIA competencies around health informatics.

ME.250.776. Advanced informatics Elective: Telemedicine. 1 Credit.
This practicum is intended to provide senior students in the Informatics Education Program with experience in the fild of telemedicine. Experiences may include exposure to clinical workflows, strategic planning around technology, reimbursement/policy, elements of data collection, and other esstential concepts.

ME.250.777. Clinical Decision Analysis. 1.5 Credits.
This advanced elective introduces students to the basic theory and practice of decision analysis as applied to the clinical context, with an eye towards clinical decision support and the place of decision modeling in the informatics context. Topics includes: articulating and structuring in decision trees, creating a decision model, skill building in decision trees, and exposure to Markov models and discrete event simulation.

ME.250.778. Implementing Fast Healthcare Interoperability Resources. 1.5 Credits.
Fast Healthcare Interoperability Resources (FHIR) is transforming healthcare with an open-web services' standards approach to clinical integration. This course is a hands-on experience working on integrating digital health and clinical systems interoperability.

ME.250.779. Advanced Elective in Precision Medicine. 1 Credit.
This elective option is with the Biomedical Informatics and Data Science education program. It is intended for graduate students in the Certificate or Masters programs with an interest in exploring advanced topics on precision medicine analytics. Students will have access to the Precision Medicine Analytics Platform (PMAP) and focus on a specific topic of interest. These topics may include: artificial intelligence, machine learning, common data models, fast healthcare interoperability resources, and the programming languages Python and Structured Query Language (SQL).

ME.250.780. Information Sources & Search Techniques for informatics Professionals. 0.5 Credits.
As a professional in the health informatics field, you will need to be able to stay current on key topics related to your profession, find evidence to solve informatics problems that cross the disciplinary boundaries of health, computing, and human factors, and contribute publishable papers to the body of informatics scholarship. This course will introduce you to the foundation and skills that you will need to engage in these research endeavors. You will learn about the biomedical sources available to you and how to efficiently and effectively search these sources. You will also learn techniques for evaluating what you find from these sources and what tools to use for storing and managing this information. The course will also address issues in the research field including how open access impacts your work as a scholar and consumer of research. Finally, you will gain the tools for establishing yourself as a professional and staying current in your field.

ME.250.781. Data Driven Digital Health Entrepreneurship. 0.5 Credits.
This seminar is for graduate students with an interest in digital health innovation who want to explore pathways to entrepreneurship. We are in the midst of a revolution in digital health with the widespread adoption of electronic medical records and increasing adoption of wearable fitness and health tracking devices. Maturing big data analytics, artificial intelligence and clinical decision support tools allow for rapid deployment of innovations. Although we now have the ability to derive insights from text, data and images spanning petabytes of data, learners in this course will have the opportunity to carefully define what the exact healthcare problem is that any particular solution is looking to solve. They will hear from experts in the field about features of digital health solutions that can be used to solve problems. Students will explore the advantages, disadvantages and value proposition for various digital health solutions and the associated market opportunities.

ME.250.782. Observational Health Research Methods on Medical Records. 1.5 Credits.
This course provides practical experience working with the OMOP common data model (CDM) from the Observational Health Data Science and Informatics (OHDSI) community. The class will provide students with an understanding of the research challenges posed by traditional healthcare data sources and will highlight the importance of the standardized data model. Students will gain familiarity with tools for cohort discovery such as Athena and Atlas.

ME.250.783. Imaging Informatics and Deep Learning. 1.5 Credits.
This class will describe how to leverage deep learning models for classification and segmentation of clinical medical imaging data. Students will get hands-on experience in working with medical images and learn how to integrate AI models in a clinical setting using the DICOM (Digital Imaging Communication in Medicine) interoperability standard.Goals:1. Understand the DICOM standard data model for the medical imaging industry.2. Illustrate DICOMWeb REST API for querying, retrieving, and storing of medical images3. Be able to identify the components of building a deep learning convolutional neural network for classification and segmentation.4. Understand how to create and annotate a robust training set for medical imaging.5. Create a deep learning model for segmentation and understand how to evaluate the performance of the model.
Prerequisite(s): ME.250.770[C]

ME.250.784. Clinical Decision Support (CDS) Application Interoperability. 1.5 Credits.
The ultimate goal of informatics and data science is to drive patient care. This class discusses the implementation of Clinical Decision Support applications integrated with the practice of medicine.Goals: By the completion of this course, students should be able to:1.) Describe the current state of CDS implementation in EHRs2.) List the advantages of implementing interoperable CDS algorithms in EHRs3.) Implement basic interoperability of CDS algorithms using CDShooks and HL7 FHIR4.) Implement basic HL7 Clinical Query Language (CQL) queries for EHR data to support CDS algorithms

ME.250.785. Generative Artificial Intelligence (AI) and Ethics. 1.5 Credits.
This course is designed to bridge the gap between engineering and medicine by exploring the application of generative artificial intelligence (AI) technologies in healthcare settings. Through a combination of lectures, case studies, and hands-on projects, students will gain a comprehensive understanding of how generative AI can be leveraged to solve complex health-related problems, while also navigating the ethical, legal, and social implications of these technologies. The course will cover a range of topics, including but not limited to, the fundamentals of generative AI, its current and potential applications in healthcare, data privacy and security, ethical considerations in AI deployment, regulatory frameworks, and the impact of AI on patient care and healthcare systems.

ME.250.786. Mastering Quality Measures: Interpret, Design, Excel. 1.5 Credits.
This course will introduce the students to the world of healthcare quality measures. Participants will learn about the different ways to measure quality, the lifecycle of a quality measure, and how various programs use them. Students will translate measure specifications into outputs that can be used for downstream analytics. Through practice exercises, students will actively engage in codifying and interpreting quality measures. JHU students, faculty, and staff not matriculated in our formal degree or certificate programs must seek the instructor's permission.

ME.250.787. Data-Driven Design: Business Intelligence (BI) Visual Analytics. 1.5 Credits.
This course aims to familiarize students with the optimal approaches for crafting data visualizations suitable for both internal and external stakeholders. Participants will gain proficiency in the fundamentals of data visualization design, the scaling of visualizations, and the art of storytelling with data. Through practical exercises, students will actively engage in designing and constructing a comprehensive Business Intelligence (BI) dashboard. JHU students, faculty, and staff not matriculated in our formal degree or certificate programs must seek the instructor's permission.

ME.250.788. Observational Research Methods in R. 1.5 Credits.
This course will teach students how to conduct data characterization, time at risk analysis, and causal inference testing on EHR based observational research data.

ME.250.854. Health Sciences Informatics Mentored Research. 1 - 6 Credits.
This course number applies to Research Masters students and both lab rotations for PhD students and to continuing research for PhD students. The informatics research is precepted by a faculty member in the Division or approved by the Training Program Director. The research may originate with the preceptor or with the student, and may be different phases of development. In the case of the lab rotation, most of the activity is supervised by the preceptor. In the case ongoing research, there is supervision by the Training Program Director as well as the research committee assembled by the student. Milestones are set for each quarter. Please note that a comprehensive research plan must by submitted to the program director for approval no later than Septermber 15 of Year 2. Failure to do so will result in probation for the student.

ME.250.855. Health Sciences Informatics Technology Practicum. 1.5 Credits.
A practical experience supervised by Hopkins faculty that enables students to showcase and develop skills gained during the didactic curriculum. In correct with a preceptor and an academic advisor, students articulate a concrete deliverable and work with the preceptor and their team to accomplish the deliverable. Example activites include, but are not limited to, literature review, systems analysis, systems evaluations, data analysis, or plans for any of these.

ME.250.856. Health Sciences Informatics Independent Study. 1 - 2 Credits.
Independent study courses must be approved by the Program Director. Please note that it is important to follow the steps outlined below in order to comply with BIDS/SOM registration and grading policies. Students submit a course description to the Training Program Director. Course Instructor and Program Coordinator. The description will include the length of Independent Study (up to 2 quarters or 1 semester), the time commitment (given in hours per week or quarter), the student's goals and what the deliverable will be. On approval by the Program Director, the Coordinator will supply you with the appropriate course number for registration. It is important that the course instructor be prepared to submit a letter grade on their department letterhead to the Program Coordinator

ME.250.858. Capstone. 1 - 4 Credits.
The Capstone Project will generally last 2 quarters. Students will join an active work group, supervised directly or indirectly by the practicum preceptor.

ME.250.859. Informatics PhD Research. 1 - 18 Credits.
After selecting a laboratory for their thesis, the student will establish a research plan wih their faculty advisor.

ME.250.860. Student Seminar and Grand Rounds. 0.5 Credits.
Weekly combined seminar and Grand Rounds during term. Students not matriculated in our formal degree or certificate program must seek the instructor's permission. Grand Rounds is open to all for those not seeking course credit for attending.

ME.250.901. HSI: Knowledge Engineering and Decision Support. 1.5 Credits.
This course provides a framework for understanding decision support in the workflow of the health sciences. The focus is on the types of support needed by decision makers, and the features associated with those types of support. A variety of decision support algorithms are discussed, examining advantages and disadvantages of each, with a strong emphasis on decision analysis as the basic science of decision making.Students are expected to demonastrate facility with one algorithm in paritcular through the creation of a working prototype, and to articulate the evidence and effectiveness of various types of decision support in health sciences and practice, in general.

ME.250.952. Leading Change Through Health IT. 1.5 Credits.
Prepares learners to lead organizations implementing new IT systems. Covers the knowledge and skills that enable clinical and public health informaticians to lead and manage changes associated with implementation, adoption, and evaluation of effective use of health information systems. The course covers the following topics: Leadership & governance in Health IT, Project Management, Strategic Planning for Health Information Systems, Workflow Re-engineering and Change Management.

ME.250.953. Introduction to Biomedical Informatics. 1.5 Credits.
Introduces students to the core principles of informatics as applied to the entire range of health, from prevention, through illness, to population and public health. Focuses on frameworks within which to describe and explain health information systems. Provides to non-clinicians basic exposure to the terminology of clinical care and public health. Provides to technical novices of basic exposure to IT terminology. Provides all students entry-level concepts and skills for later courses in the informatics sequences.

ME.250.954. HIT Standards and Systems Interoperability. 1.5 Credits.
The purpose of this course is to learn the data, information and knowledge standards critical to the successful implementation of local, regional and national health-related information systems. Target competencies are to identify the apropriate level of HITSP standards for an informatics problem, and select the appropriate standard within that level: create use cases and an organizational process to define an interoperability standard for a specific healthcare/regional situation; participate in a national standards-creation process.

ME.250.955. Applied Clinical Informatics. 1.5 Credits.
This course introduces students to the field of Applied Clinical Informatics, which is focused on improving patient care through enhanced use of clinical information systems. Students will be exposed to a wide range of cliniclal workflows and how health information technology and systems support them. Topics in the course included: Bar Coding, Clinical Decision Support, Computerized Provider Order Entry, Electronic Health Records, Electronic Prescribing, Health Information Exchange, Master Patient Index, and Telehealth/Telemedicine. Each of these will be examined within the appropriate context of clinical care transitions, patient saftey and care quality, inpatient/ambulatory care settings, information security and deployment of HIT.

ME.250.957. Database Querying in Health. 1.5 Credits.
This course introduces core concepts of relational databases using SQL along with special issues related to databases used in health information systems. Students will learn how to answer key questions using data originating from their Electronic Medical Record using SQL. This course builds upon the Intro to Precision Medicine course and is a prerequisite for Clinical Data Analytics with Python. Students will utilize the Precision Medicine Analytics Platform with access to de-identified medical records of 60k patients with Asthma with over 100 Million data elements including labs, medications, encounters, procedures, symptoms, and vitals.JHU students, faculty, and staff not matriculated in our formal degree or certificate programs must seek the instructor's permission.

ME.250.958. Digital Health Innovation & Regulatory Science. 0.5 Credits.
From smartwatch apps and telehealth to the use of artificial intelligence (AI) and machine learning (ML) on big data, digital health is shaking up the health care industry. These tools promise to revolutionize how patients and healthcare providers access health data. In some cases, digital health tools will even diagnose and treat diseases. For all its potential, digital health is not without risks, though. There must be adequate legal, quality, and safety protections to ensure responsible and high-quality innovation. This course will introduce students to the rapidly evolving field of digital health regulation and the role of the FDA, FTC, OCR, and other legal and regulatory bodies in this space. At the end of this course, students will be able to: Define key terminology relevant to the fields of digital health innovation and medical device regulation. Discuss the relationships between regulators, technology developers, healthcare providers, and patients. Describe the requirements for digital health technology to be considered Software as a Medical Device (SaMD) by the FDA Identify the various regulatory pathways for SaMD and the main considerations.

ME.250.959. Digital Health Laws and Regulations. 1.5 Credits.
From smartwatch apps and telehealth to artificial intelligence and machine learning, digital health is revolutionizing the practice of medicine. In some instances, medical software is not only increasing access to data but also diagnosing and treating diseases. For all its potential, digital health is not without risks, though. This seminar is for students who want to explore the promise that digital health devices offer and investigate the legal, quality, and safety protections in place to help ensure responsible and high-quality innovation. Students will explore key digital health terminology and trends and examine the regulatory pathways to usher medical software devices from bench to bedside. Goals: At the end of this course, you will be able to: 1. Define key terminology relevant to the fields of digital health law and medical device regulation. 2. Discuss the relationships between regulators, technology developers, healthcare providers, and patients. 3. Describe the requirements for digital health technology to be considered software as a Medical Device (SaMD) by the FDA 4. Identify the various regulatory pathways for SaMD and the main considerations.

ME.250.960. The Role of Digital Health and the Health Care Delivery System. 1.5 Credits.
This course introduces the digital health landscape and will focus on the perspectives of the buyer and seller. This class discusses the importance of various stakeholders in a digital health ecosystem and shares some successes and failures from real world examples. Goals: By the completion of this course, students should be able to: 1.) Describe the current state of the digital health market 2.) Outline the key elements of a sales pitch needed to successfully pitch the care delivery system 3.) Identify the potential buyers for a digital health solution in the care delivery system 4.) Articulate some common mistakes that past digital health solutions have made 5.) Describe the need for buyers to be better positioned for the acquisition and adoption of digital health solutions

ME.250.961. Large Scale Observational Research Preparation. 1.5 Credits.
This project-oriented class is designed to equip clinical investigators with the team, essential knowledge, and skills to effectively leverage the observational medical outcomes partnership (OMOP) common data model (CDM) to engage and conduct network studies for their research endeavors. Students will form into investigation-based teams and gain in-depth knowledge and practical insights into use case selection, study design, IRB considerations, protocol development, and preliminary phenotypes. By the end of the program, participants will have a solid foundation in these crucial aspects, enabling them to conduct robust network studies using the OHDSI community. Goals: · Equip clinical investigators with the knowledge and skills to leverage OHDSI data partners for network studies. · Coaching and guidance to teams regarding development and execution of network study packages. · Foster partnerships with renowned health systems within the OHDSI data network comprising of medical records from 350 health systems and over 960 Million unique patients. · Develop participants' proficiency in use case selection, study design, IRB considerations, protocol development, and preliminary phenotypes. · Prepare participants for the 2024 OHDSI's Phenotype Phebruary and the SOS Challenge. · Demonstrate leadership in precision medicine by highlighting the potential of the OHDSI network.

ME.250.962. Prototyping for Healthcare Design. 1.5 Credits.
This course is the second part of the design for healthcare series (to directly follow design discovery for healthcare). Participants will build from prior design research to explore wireframing and prototyping a software application with a team. The project includes testing the prototype directly with users and applying feedback to make iterative improvements. Participants will learn to recognize common patterns and language to promote a seamless user experience and prepare a design plan for hand off. Teams will explore design software tools in this course but will not be required to code. Goals: 1. Design the basic components of a healthcare user interface following recognized patterns 2. Create a prototype and collect feedback to iterate on a healthcare user interface 3. Compile and prioritize user requirements/user stories with design-based methods for a healthcare software project 4. Understand the fundamentals of user experience writing and product branding 5. Prepare a design plan for delivery to a development team
Prerequisite(s): ME.250.750[C]

ME.250.963. Health Information Technology Startup Generator / Accelerator. 1.5 Credits.

Description: Hexcite (Excited for Healthcare) is an early-stage medical software accelerator program for entrepreneurs hosted by the Johns Hopkins Medicine Technology Innovation Center in collaboration with Johns Hopkins Technology Ventures Care providers with an idea who are eager to drive change within their practice are matched with business, design, and technical team members to work together in creating a software solution that will improve patient care. Weekly, expert-led virtual sessions help teams navigate the first steps of business and technical design using the Lean Start-up methodology which focuses on growing a business with maximum acceleration. Teams must go through customer discovery (interviewing to test assumptions), a design thinking process to prioritize technology requirements, and built a pitch that includes market research and storytelling components. During the course, Hexcite teams are prepared to build their technology with professional software development teams like the Technology Innovation Center, conduct an internal pilot at Johns Hopkins, and launch a Baltimore start-up. They are introduced to guest speakers and reviewers from the local healthcare technology entrepreneurial community and experts in building digital health tools from Johns Hopkins. Goals: 1. Work with a clinical team to conduct interviews with users and build a design centered proposal to solve a healthcare problem. 2. Understand how the technology could be constructed and integrated into a healthcare setting.