# MS IN HEALTH ANALYTICS (MSHA)

**MSHA 401-DL Programming for Health Analytics (1 Unit)**
In this course students utilize data science software to practice R programming. Students will install and launch software and apply this industry relevant programming language to generate, manipulate, manage, and visualize health (or related) data. In this course students complete a variety of hands-on programming exercises to develop data science programming skills.

**MSHA 403-DL Introduction to American Healthcare, Digital Health, and Analytics (1 Unit)**
This course will provide an introduction to the current structure and emerging trends shaping the US Healthcare System. Students will learn what it means to navigate the confusing, bottom-up, and variously incentivized entities in the American health care system. Additionally, we will cover foundational healthcare data sources for the 3Ps (Providers, Patients, and Payers) and fundamentals of Health Information Technology including electronic health records, health information exchanges, clinical decision support, consumerism, and the impact of big data and predictive analytics. Topics center on how information technology and analytics enables patient care and fuels modern health care organizations.

**MSHA 405-DL Data Literacy and Analytics in Healthcare (1 Unit)**
Students will learn about current and future data trends, relational databases, healthcare data standards, and the basics of utilizing SQL for data and analytics. Becoming familiar with the fundamentals of relational databases and SQL, the most popular language used to query data from relational databases, is an essential part of this class. Students will leave this course with a strong understanding of standard healthcare terminologies (i.e., RxNorm, SNOMED), relational databases, and how to retrieve, analyze, and aggregate relational data for analytics purposes using SQL. Concepts learned in this class can be used to store, prepare, and analyze large data sets using SQL.

**MSHA 407-DL Data Security, Ethics and Governance (1 Unit)**
This course provides a working knowledge of the specific considerations for health data and the appropriate application of privacy laws to protect personal health information and maintain confidentiality. This will include oversight of technical, administrative, and physical safeguards needed to maintain a secure environment and minimize the risk of a data breach. Additionally, the course will address ethical concerns and dilemmas in the use and disclosure of health data, such as use in public safety and medical research. Topics include: ensuring system specifications and configurations meet regulatory requirements; ensuring cybersecurity risks are mitigated; addressing European Union Privacy Laws for international systems; and managing organizational & technical governance.

**MSHA 409-DL Statistical Analysis (1 Unit)**
This is an introductory course to general concepts and fundamentals in the practice of biostatistics as commonly used in health data. This will form the foundation for more advanced topics to come in later courses, such as intermediate biostatistics. On its own, the material covered here will be sufficient to perform basic descriptive statistical analyses on your own, and indicate when you should ask for assistance. The goal of this course is to teach students how to perform basic statistical analysis of health data sets in RStudio. The techniques you'll learn in this course are important in themselves, and will form the foundation for later courses in the MSHA program, as well as learning how to be productive in R Studio.

**MSHA 410-DL Regression and Multivariate Analysis (1 Unit)**
This course develops the foundations of predictive modeling by: introducing the conceptual foundations of regression and multivariate analysis; developing statistical modeling as a process that includes exploratory health data analysis, model identification, and model validation; and discussing the difference between the uses of statistical models for statistical inference versus predictive modeling. The high level topics covered in the course include: exploratory data analysis, statistical graphics, linear regression, automated variable selection, principal components analysis, exploratory factor analysis, and cluster analysis. (Required: MSHA 409-DL.)

**MSHA 411-DL Advanced Data Modeling for Health Analytics (1 Unit)**
This course extends the health analytics conception of predictive modeling with ordinary least-squares regression to the situations of repeated measures, dichotomous responses, and survival times/outcomes. Learners will survey essential topics such as longitudinal data analysis, logistic regression, and survival analyses. Students will explore issues of data preparation, model fit and interpretation, model development strategies, and validation. Students will also model real world healthcare data containing missing values and outliers. (Required: MSHA 409-DL and MSHA 410-DL.)

**MSHA 412-DL Feature Engineering and Text Mining (1 Unit)**
This course will provide students with the skills to develop analytical features from health datasets. Students will develop an understanding of healthcare data, particularly electronic health record (EHR) data, and use R & SQL to build features for analytical modeling. In addition to working with continuous and categorical health data, students will understand and develop skills for natural language processing to extract discrete data elements from free-text clinical documentation, such as physician notes, for the development of analytical features. (Required: MSHA 405-DL.)

**MSHA 422-DL Artificial Intelligence and Practical Machine Learning (1 Unit)**
The course introduces machine learning and applications to problems in health care. It surveys machine learning techniques, including resampling techniques, model selection and regularization, tree-based methods, principal components analysis, cluster analysis, ensemble methods, and artificial neural networks. Students implement machine learning models with open-source software for data science. They explore data and learn from data, finding underlying patterns useful for data reduction, feature analysis, prediction, and classification. (Required: MSHA 409-DL and MSHA 410-DL.)

**MSHA 455-DL Data Visualization and Storytelling (1 Unit)**
This course will build upon the analytical tools learned during the previous courses in the MSHA sequence to enable students to visually convey their findings to both technical and non-technical audiences. In this course, students will learn how to identify and explain the layers of the grammar of graphics, select effective static data visualizations, write R code to manipulate data visualizations, and construct their own compelling visualizations from scratch using health data. Course goals will be achieved using the ggplot2 package in R. By the end of the course, students should be effective visual communicators of their findings and will be proficient in producing impactful visualizations using ggplot2.

**MSHA 480-DL Health Analytics Leadership (1 Unit)**
This course is an introduction to health analytics leadership, high-level project management, customer engagement, and effective communication in health care organizations. Students will learn organizational strategies for developing and executing a robust BI vision and strategic plan. Students will also learn methods to effectively lead projects and engage both leadership and key stakeholders using

change management principles, models, and project management tools. This course introduces best practices in leading change and project management. Students will develop effective communication and presentation skills to translate analytics to actionable recommendations to solve problems in their organizations.

**MSHA 498-DL Capstone (1 Unit)**
The Capstone is intended to be the culmination of coursework towards the MSHA degree. In the Capstone, students will apply tools learned during MSHA coursework to define a problem in health care Define the data needed to resolve the problem Perform the analysis, and Communicate the results and conclusion of the analysis in written form.