QUANTITATIVE ANALYSIS CENTER (QAC)

QAC150 Working with SQL and Databases
Many of you have heard of studies that analyzed Twitter messages and predicted some phenomena--spread of flu in New York, consumer confidence index, and so on. Behind the success of these studies are the systems for data storage and retrieval. A regular user can access only the latest nine days of tweets. Any study that aspires to analyze longer periods has to deal with the issues of storing the observations and retrieving them later for analysis. The goal of this course is to show you how to do that--how to connect to various types of databases and how to retrieve and update your data. We will start with relational databases; learn SQL, the language used to query and update the data; and explore the latest developments in the database field--Hadoop and MapReduce.
Offering: **Host**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **None**

QAC151 Working with Excel and VBA
Many of us know Excel for its spreadsheets: a quick and easy way to store some information, share it, and maybe make some charts. The goal of this course is to show you the more advanced features of Excel. We will write code in Visual Basic for Applications (VBA), learn how to import data from external databases and Web-based resources, create custom menus to interact with a user, and examine how Excel can be used in business decision making.
Offering: **Host**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **None**

QAC153 Working with Mathematica
This course introduces students to Mathematica's computing environment and all the basic features of the software. Starting with basic operations and computations, students will be introduced to graphics, visualization, and mathematical computations and will learn through a series of hands-on lab exercises to use the Mathematica programming language for modeling and data analysis. While there are no prerequisites, a basic familiarity with computing tools, an understanding of descriptive statistics, a basic calculus background, and a willingness to make mistakes and learn from them is expected.
Offering: **Host**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **NSM-QAC**
Prereq: **None**

QAC154 Working with MATLAB
The content of this course focuses on learning the basics of utilizing MATLAB to program and solve basic problems. We will operate on the assumption that students have no prior experience with programming. The goals of the course will be to develop algorithmic thinking, problem solving, and quantitative skills within the context of MATLAB. The course will cover essential mechanics of programming, many of which are common to all programming languages, as well as some selected advanced topics. With the expectation that students with a broad background with various motivating factors lead them to enroll in the course, students will be invited to apply the skills learned in the course to completing the culminating final project related to their specific interests.
Offering: **Host**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Identical With: **IDEA154, CIS154**
Prereq: **None**

QAC155 Working with Python
This course introduces students to programming, data management, and analysis with Python. Through a series of hands-on lab exercises, students learn to work with a variety of data using a high-level programming language and associated libraries to effectively manage and analyze their data. The emphasis is on data exploration and visualization and includes work with unstructured data generated by social media interactions. While there are no prerequisites, a basic familiarity with computing tools, an understanding of descriptive statistics, and a willingness to make mistakes and learn from them is expected.
Offering: **Host**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **None**

QAC156 Working with R
This course introduces students to programming, data management, and analysis with R. Through a series of hands-on lab exercises, students learn to work with a variety of data formats and use R's programming language and associated packages to effectively manage and analyze their data, with an emphasis on data exploration and visualization. While there are no prerequisites, a basic familiarity with computing tools, an understanding of descriptive statistics, and a willingness to make mistakes and learn from them is expected.
Offering: **Host**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **None**

QAC157 Working with SAS
This course introduces students to programming, data management, and analysis with SAS. Through a series of hands-on lab exercises, students learn to work with a variety of data formats and use SAS's programming capabilities to effectively manage and analyze their data, with an emphasis on data exploration and visualization. While there are no prerequisites, a basic familiarity with computing tools, an understanding of descriptive statistics, and a willingness to make mistakes and learn from them is expected.
Offering: **Host**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **None**

QAC158 Working with Stata
This course introduces students to programming, data management, and analysis with Stata. Through a series of hands-on lab exercises, students learn to work with a variety of data formats and use Stata's programming capabilities to effectively manage and analyze their data, with an emphasis on data exploration and visualization. While there are no prerequisites, a basic familiarity with computing tools, an understanding of descriptive statistics, and a willingness to make mistakes and learn from them is expected.
Offering: **Host**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **None**

QAC159 Working with High Performance Computing (HPC) Tools
This is a cross-disciplinary course designed to introduce students to UNIX and learn how to perform calculations/analysis in a high performance computing

(HPC) environment. We assume students have a basic understanding of computing, but no prior experience with working with UNIX or HPC is expected. All students will gain experience working on Wesleyan's High Performance Computing cluster. We will learn to work in a UNIX environment, how to write BASH scripts, and how to schedule and complete our work in a multiuser HPC environment. In the second part of the course, we shift the focus to parallel computing. We introduce CUDA devices used for parallel computing, and work to convert a serial program into its parallel version. Students will develop and implement a project of their choosing, which may involve UNIX and HPC combined with any area of interest. Anticipating the course will be taken by students studying a broad range of disciplines brought together by a common interest in HPC, individualized support and feedback will be provided at several checkpoints throughout the course. Students will gain insight into the many ways UNIX and HPC are crossing traditional disciplinary boundaries to advance research in a variety of fields, expanding the possibilities in our data-driven era.
Offering: **Host**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **SBS-QAC**
Prereq: **COMP112**

QAC171 Business Modeling with Excel
Broadly speaking, this course is about evidence-based decision-making. It is intended for students with a background in Excel and VBA who want to learn how to use spreadsheets to develop business and financial models and communicate the results. Model building is different from the usual Excel skills as it focuses more on the analytical/mathematical aspects than on data wrangling and requires some basic familiarity with economic/financial models and data analysis tools. We will start with problems where the inputs are deterministic and we must decide on optimal allocation of resources. We will then advance to problems with stochastic inputs and explore solutions either through simulation or through optimization of goal functions. Through this work we will develop the appropriate programming skills (e.g., VBA) and learn to effectively use Excel to implement our models and display the results of our analyses.
Offering: **Host**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **QAC151 AND ECON300**

QAC190F Big Data, Big Promises, Big Problems? (FYS)
This seminar explores the transformation of the modern data landscape from its pre-datafication beginnings in the early 90s to the contemporary age of "big data." Throughout this transformation, various sectors of society, including healthcare, education, business, urban planning, governance, sustainability, media, science, and art, have experienced unprecedented opportunities for growth and advancement. However, alongside these opportunities, significant challenges have arisen, including privacy concerns, fairness and bias issues, data governance, and model interpretability, all of which have far-reaching implications. The seminar provides a systematic exploration of the characteristics of the "big data" landscape, its impact on the production and distribution of goods and services, and its "data ethics" implications. We will explore the promises, and problems, of our data-driven era, paving the way for informed discussions and critical thinking in our fields of study.
Offering: **Host**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **SBS-QAC**
Prereq: **None**

QAC201 Applied Data Analysis
In this project-based course, you will have the opportunity to answer questions that you feel passionately about through independent research based on existing data. You will develop skills in generating testable hypotheses, conducting a literature review, preparing data for analysis, conducting descriptive and inferential statistical analyses, and presenting research findings. The course offers one-on-one support, ample opportunities to work with other students, and training in the skills required to complete a project of your own design. These skills will prepare you to work in many different research labs across the University that collect empirical data. It is also an opportunity to fulfill an important requirement in several different majors.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Identical With: **GOVT201, PSYC280, NS&B280**
Prereq: **None**

QAC201Z Applied Data Analysis
In this project-based course, you will have the opportunity to answer questions that you feel passionately about through independent research based on existing data. You will develop skills in generating testable hypotheses, conducting a literature review, preparing data for analysis, conducting descriptive and inferential statistical analyses, and presenting research findings. The course offers one-on-one support, ample opportunities to work with other students, and training in the skills required to complete a project of your own design. These skills will prepare you to work in many different research labs across the University that collect empirical data. It is also an opportunity to fulfill an important requirement in several different majors.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Identical With: **GOVT201Z, NS&B280Z, PSYC280Z**
Prereq: **None**

QAC203 Hollywood and Big Data
Taught by a media research executive with a long industry experience this course is designed to provide students with an introduction and understanding of how the media industry is using data to make decisions that shape the art landscape of our times. Data around consumer behavior--what, how and why people are watching--has exploded recently and is extensively used in making decisions about what TV shows and movies to produce, how to promote them and how to make them. The course will explore how the media industry quantifies different kinds of content, the ways in which people watch and pay for that content, and how value is attributed across the media landscape. Students will be introduced to essential "media metrics" (e.g. viewership, box office, engagement) and learn to evaluate different data sets for their integrity and representative insights. Visiting media executives will discuss how data informs their jobs ("evidence-based decision making"). Assignments will include written briefs based on different data sets and a final project presentation highlighting skills in analyzing and presenting insights extracted from media research data. By the end of this course, students will be familiar with key decision-making tools in the media industry and be able to analyze and understand the impact on media output
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **SBS-QAC**
Identical With: **FILM203**
Prereq: **None**

QAC204 Visualizing Firearms History: An Applied Quantitative and Archival Approach for a Project-Based Expl
This project-based course provides a unique cross-disciplinary opportunity to study important historical questions surrounding firearms. Combining quantitative methodology in data science with qualitative research methods in history, students will answer questions they are passionate about based on existing datasets. Students will read, discuss, and write responses to the latest

historical scholarship on the technological development of guns, firearms in media, gun violence statistics, and advertisements. Students will choose one of four datasets to research and analyze. These include data sets related to firearms patents since the 1820s, firearms in media (film, television, anime, games), firearms-related deaths, and advertisements of firearms. Students will develop skills in hypothesis testing and inferential statistical analysis alongside qualitative research methods used in history. The course offers one-on-one support and training in the skills required to complete a team-based final project. The final project will be hybrid between a research paper and also an exhibit (e.g., film, website, media, art installation). Students will present their work at the center's third annual undergraduate research conference (Spring 2025). Select students can apply to continue on as QAC summer apprentices and Baker Collabria Fellows in Data Analysis, and as CSGS NEH-funded summer history research fellows and as History thesis researchers.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **SBS-HIST**
Identical With: **HIST278, CHUM278**
Prereq: **None**

QAC211 Digging the Digital Era: A Data Science Primer
The course introduces students to the practice of what has come to be known as data science. Using a multidisciplinary approach and data from a variety of sources that cover any aspect of everyday life--from credit card transactions to social media interactions and Web searches--data scientists try to analyze and predict events and behavior. The first part of the course defines the area and introduces basic concepts, tools, and emerging applications that will include a broad introduction to machine learning tools and algorithms. It will include a brief mathematical background and introduction to modeling across disciplines. In part two of the course, we work on data acquisition and management and introduce appropriate programming and data management tools. In part three, we concentrate on basic analytical and visualization techniques as we explore and understand the emerging patterns. Using a learning-by-doing approach in a computing laboratory, students will learn how to write computer programs in R to access, organize, and analyze data through a series of small projects designed to illustrate the application of the techniques we develop for a variety of data sets and situations. The class will include hot topics like big data, privacy, and ethical issues around data, to name a few. Students will also engage in a semester-long project where they will address their own research questions working with "messy data."
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **None**

QAC216 Introduction to Survey Design and Analysis
Survey data provide valuable information for the study of public opinion and behavior, and they are commonly used in several fields such as political science, public policy, economics, education and psychology. This course is an introduction to survey design, current implementation methods, and survey data analysis. By the end of the course, students will be able to design and conduct their own survey research projects. The class meetings include lectures, discussions, hands-on exercises, and work on a term project.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **SBS-QAC**
Prereq: **None**

QAC220 Applied Vectors and Matrices
An introduction to the mathematics of matrices and their application in traditional and modern methods of data analysis and scientific computing. The course promotes an interdisciplinary approach, and topics may include:

- Coordinate transformations in data visualization, iterated patterns in mosaics and art

- Use of least squares approach with linear solvers for regression, as well as image alignment

- PCA-decomposition of computer images (the "eigenfaces" example)

- Matrix decomposition methods: Singular Value Decomposition and Non-negative Matrix Factorization

- Dimensionality reduction and data compression

- Matrix operations in deep learning.

- ChatGPT and word vector embeddings

Students will use R for most of the computational tasks, and Mathematica for symbolic math and deep learning.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **SBS-QAC**
Prereq: **MATH121**

QAC231 Introduction to (Geo)Spatial Data Analysis and Visualization
Geographic information systems (GIS) provide researchers, policy makers, and citizens with a powerful analytical framework for spatial pattern recognition, decision making, and data exploration. This course is designed to introduce social science and humanities students to spatial thinking through the collection, management, analysis, and visualization of geospatial data using both graphical and command line-based spatial analysis platforms. Classes will consist of short lectures, hands-on training, group projects, critiques, and class discussions. Weekly readings and assignments will build skills and reinforce concepts introduced in class. The course will culminate in a group project developed through student-driven inquiry and including geocomputation. Readings across multiple disciplines will allow students to comprehend the breadth of applied geospatial thinking in today's research arena. The course is part of Wesleyan's Digital and Computational Knowledge Initiative and is aimed at students with limited or no prior GIS experience.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **None**

QAC232Z Mapping the Pandemic
The COVID-19 pandemic has altered the global community's daily relationship with space and movement, both at a hyperlocal scale of social distancing to

a global scale of disease spread. Spatiotemporal visualizations in the form of maps and apps have allowed us to watch the worldwide spread of COVID-19 and keep tabs on local case counts in our own spaces. Geographic information systems (GIS) provide citizens, researchers, health care providers, and policy makers with a powerful analytical framework for visualization, data exploration, spatial pattern recognition, response planning, and decision making within our life in the time of COVID-19. This course is designed to develop spatial thinking and visualization skills relevant to COVID-19. Students will look at (and critically evaluate) existing maps and apps related to the current pandemic, create their own maps and apps, and critically evaluate their classmates' maps and apps. Class meetings will consist of case study lectures/discussions, instructor-led skill-building workshops, studio work sessions, and presentation/critique sessions. Spatial data collection, management, analysis, and visualization will occur within a cloud-based GIS (ArcGIS Online). Readings prior to the first class will establish a baseline for student comprehension of the breadth of applied geospatial thinking in today's research arena. The course is aimed at students with limited or no prior GIS experience.
Offering: **Crosslisting**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-EES**
Identical With: **E&ES271Z**
Prereq: **None**

QAC234 Working with Remote Sensing Data with Applications in Social Science Research
The last decade has seen an increase in application of remote sensing data in social science research: nighttime light data is used to support research into economic development and urbanization, measurements of pollutants serve as a proxy for economic activity, digital elevation models are used by historians to reconstruct most probable locations of ancient roadways, and archeologists use image analysis to discover ancient sites. This course will introduce students to the universe of publicly available remote sensing data products and will teach the students how to work with the remote sensing data (e.g., using Google's Earth Engine and its scripting platform). Topics covered in the course include the manipulation of geometric features, making of maps and animations of environmental variables, generation of time series for geographic regions, and operations on aerial photography.
Offering: **Host**
Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **QAC155 OR QAC156 OR COMP112 OR COMP114**

QAC239 Proseminar: Machine Learning Methods for Audio and Video Analysis
In this course, students are introduced to machine learning techniques to analyze image, audio, and video data. The course is organized in three parts, and in each part we will first introduce how these nontraditional data can be converted into appropriate (mathematical) objects suitable for computer processing, and, particularly, for the application of machine learning techniques. Students then will learn and work with a number of machine learning algorithms and deep learning methods that are effective for image and audio analysis. We will also explore major applications of these techniques such as object detection, face recognition, image classification, audio classification, speaker detection, and speech recognition.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC**
Identical With: **CIS239**
Prereq: **COMP112 OR QAC155 OR QAC156 OR COMP112Z**

QAC241 Introduction to Network Analysis
This is an interdisciplinary hands-on course examining the application of network analysis in various fields. It will introduce students to the formalism of networks, software for network analysis, and applications from a range of disciplines (history, sociology, public health, business, political science). We will review the main concepts in network analysis and learn how to use the software (e.g., network analysis and GIS libraries in R) and will work through practice problems involving data from several sources (Twitter, Facebook, airlines, medical innovation, historical data). Upon completion of the course, students will be able to conduct independent research in their fields using network analysis tools.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **SBS-QAC**
Identical With: **CIS241**
Prereq: **None**

QAC250 An Introduction to Data Journalism
This course is designed to familiarize students with the basic principles and tools of data journalism and to provide a wider understanding of the role of basic data analysis in society. To that end, the course will focus on developing a solid familiarity with basic data analysis and visualization software. It will also focus on developing the tools of journalism: retrieving public data, interviewing people and databases, and the basic principles of journalistic writing. By the end of the course, students will be able to analyze data, identify stories within the data, and create a news story complete with data visualizations of publishable quality--a skill transferable to many fields and disciplines. Both online and traditional print platforms will be covered.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **SBS-QAC**
Identical With: **CSPL250, WRCT250**
Prereq: **None**

QAC251 Data Visualization: An Introduction
This course will introduce students to the principles and tools necessary to present quantitative information in a visual way. While tables and graphs are widely used in our daily lives, it takes skill to deconstruct what story is being told. It also takes a perceptive eye to know when information is being misrepresented with particular graphics. The main goals of the course are for students to learn how to present information efficiently and accurately so that we enhance our understanding of complex quantitative information and to become proficient with data visualization tools. Beginning with basic graphing tools, we will work our way up to constructing map visualizations and interactive graphs. This course will require a substantial amount of computation in R. No prior programming experience is necessary, but learning does require willingness and time.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Identical With: **CIS251**
Prereq: **None**

QAC251Z Data Visualization: An Introduction
This course will introduce students to the principles and tools necessary to present quantitative information in a visual way. While tables and graphs are widely used in our daily lives, it takes skill to deconstruct what story is being told. It also takes a perceptive eye to know when information is being misrepresented with particular graphics. The main goals of the course are for students to learn how to present information efficiently and accurately so that we enhance our understanding of complex quantitative information, and to become proficient with data visualization tools. Beginning with basic graphing tools, we will work

our way up to constructing map visualizations and interactive graphs. This course will require a substantial amount of computation in R. No prior programming experience is necessary, but learning does require willingness and time.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Identical With: **CIS251Z**
Prereq: **None**

QAC260 Special Topics in Computer Science
This course is designed for nonmajors who wish to pursue some topic in computer science beyond introduction to programming. Topics will vary according to the instructor.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-MATH**
Identical With: **COMP260**
Prereq: **COMP112**

QAC301 Statistics Education Practicum
This course will serve students who are pursuing their undergraduate degree in a variety of disciplines but who want to expand their skills in statistics and applied data analysis in preparation for a future career. It will also serve students who are currently pursuing independent, quantitative research at the undergraduate or graduate level. The course will center on personal interaction in support of introductory statistics students. Active peer mentoring and supporting experiences will be based on the theory that good teachers (and learners) of statistics need to be developed, as opposed to being trained. In line with this theory, this hands-on course will provide an intensive opportunity to build specific knowledge regarding teaching and learning in the area of data-driven statistical inquiry. Students enrolled in this course will (1) attend statistics-mentoring development sessions (one hour per week); (2) provide one-on-one support for introductory statistics students during workshop-oriented class sessions (three hours per week); (3) lead small group-mentored meetings for five to six statistics students (one hour per week); and (4) monitor and critique progress on applied data assignments (one hour per week). In addition to these hands-on experiences, students will pursue a project aimed at furthering the field of statistics education. Projects may take the form of course evaluation, content/conceptual curriculum development, or translation of educational statistical software materials.

Similar to QAC380 (Introduction to Statistical Consulting), this course is aimed at providing students with an opportunity to enhance their statistical skills beyond the introductory level.
Offering: **Host**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **None**

QAC302 National Education Equity Lab Teaching Fellowship
This course is for students serving as Teaching Fellows for a National Education Equity Lab course, which provides college courses to Title I and Title I-eligible high schools nationwide. Students will oversee a single course section for one of the offered classes, with responsibility to manage up to 25 high school students in a once-weekly Zoom meeting, as well as prep and grading time. Specific time assignments for sessions with high school students and required Teaching Fellow group meetings will be scheduled at the same time every week based on availability. This course counts for practicum credit in the EDST program.
Offering: **Crosslisting**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **SBS-EDST**
Identical With: **EDST405**
Prereq: **None**

QAC305 Exploratory Data Analysis and Pattern Discovery
The course introduces the theory and practice of exploring, describing, summarizing and detecting patterns of interest in complex datasets. Various approaches including aggregation, clustering, data visualization, and latent variable modeling will be employed. This course will give students an opportunity to develop computational skills (primarily in R) and to learn how to discover and interpret relationships in unstructured observational data. The applications and examples for this course will be broad and relevant to many fields of study.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **QAC211 OR ECON300 OR GOVT367**

QAC307 Experimental Design and Causal Inference
The course provides the foundations and statistical thinking to design, collect, and analyze experimental data and introduces appropriate techniques for observational data when causal inference is the objective of the analysis. Throughout the course, we introduce and compare various experimental designs. We will discuss sample size and power calculations as well as the advantages and disadvantages of each of these designs. With observational data, we will explore difference-in-difference models, propensity score matching techniques, regression discontinuity designs. This course gives students the opportunity to develop further their computational skills as we learn how to describe, interpret, control, and draw inferences from experimental and observational data.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Identical With: **CIS307**
Prereq: **QAC201 OR PSYC200 OR MATH132 OR ECON300**

QAC311 Longitudinal Data Analysis
Work across different fields, from medicine and public health to social sciences and education, often involves the collection and analysis of longitudinal data--combination of cross-sectional and time series (repeated measures for the unit of observation) data. This rich data structure provides opportunities to explore questions that could not be addressed with simpler data sets, but at the same time requires special considerations because we are analyzing observations that are not independent. The course introduces students to appropriate graphical exploration of the data and the specification and estimation of fixed and random-effects models. It also develops the basic framework for difference-in-differences models and explores their applications.
Offering: **Host**
Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **[QAC201 or GOVT201 or PSYC280 or NS&B280] OR QAC380 OR ECON300 OR GOVT367 OR PSYC200**

QAC312 Hierarchical Linear Models
Research questions cannot always be explored by collecting data with independent observations. Sometimes this is due to limitations or constraints on the data collection method, and other times our questions pertain to data that are measured at both the individual and group levels (e.g., patients from different hospitals or students from different schools that belong to different districts). Hierarchical linear models (HLM), also called multi-level or mixed models, explicitly model such nested data structures and address analytical and estimation issues not accounted within the framework of the classical linear

model. Using data sets from different fields of study (e.g., education, medicine, and health) students will learn to formulate multilevel research questions, estimate and critically examine HLM applications.
Offering: **Host**
Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **[QAC201 or GOVT201 or PSYC280 or NS&B280] OR QAC380 OR ECON300 OR GOVT367 OR PSYC200**

QAC313 Latent Variable Analysis
The course is an introduction to latent variable modeling. Students will learn the fundamental statistical methods for structural equation modeling (SEM), including principal component analysis, confirmatory factor analysis, path analysis, and SEM for both quantitative and binary observed variables. In addition, students will learn the basic components of SEM, such as assumptions, testing model fit and indices of fit, testing competing models, estimation methods, and issues in model identification. Students will learn to develop structural equation models using AMOS, R, and/or Mplus statistical software.
Offering: **Host**
Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **[QAC201 or GOVT201 or PSYC280 or NS&B280] OR QAC380 OR ECON300 OR GOVT367 OR PSYC200**

QAC314 Survival Analysis
Survival or event history analysis focuses on modeling and analysis of time-to-event data--such as onset of a disease; duration of a strike; failure of a biological, physical, or social system; or recidivism). This course introduces students to survival and hazard functions, the analysis of censored data using parametric and non-parametric estimation methods; compares survival curves for different groups; and discusses competing risk models. The emphasis is on the applications of the different methods with the objective of broadening computational skills in R and/or SAS and to reinforce statistical writing and communication. These skills will be applied to a variety of problems in political science, public health, engineering, and medicine.
Offering: **Host**
Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **[QAC201 or GOVT201 or PSYC280 or NS&B280] OR QAC380 OR ECON300 OR GOVT367 OR PSYC200**

QAC320 Applied Time Series Analysis
Understanding and modeling the past allows us to extract insights in our areas of study that are not possible to extract without time series data. This course is an introduction to the theory and practice of time series analysis. We will learn to identify and model the components of a time series process, and to properly model relationships among variables over time. By emphasizing the practical applications of time series analysis, the course will give students an opportunity to further develop computational skills and learn how to develop forecasting models, and to make inference using time series data.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **SBS-QAC**
Prereq: **ECON300 OR QAC201**

QAC323 Bayesian Data Analysis: A Primer
This course introduces the applied principles of Bayesian statistical analysis. The Bayesian paradigm is particularly appealing in research where prior research and historical data are available on parameters of interest. This course will teach students appropriate techniques for analyzing data of this nature as well as broaden computational skills in R. The course will lay the foundation for Bayesian data analysis that students can use to further develop skills in decision making.
Offering: **Host**
Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Identical With: **CIS323**
Prereq: **MATH132 OR ECON300 OR GOVT367**

QAC356 Advanced R: Building Open-Source Tools for Data Science
An in-depth exploration of the R programming language and development environment; from syntax and data structures, to data analysis and visualization, report writing, project management, and software development. Students will work in teams to create open-source data science applications that can be used to manage and prepare data, perform statistical analysis, and create compelling visualizations and reports. Students will also have an opportunity to contribute to a shared Wesleyan R package that contains datasets and functions that are useful for teaching introductory and advanced data science courses.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **QAC201 or MATH132 or ECON300 or QAC302 AND COMP112 AND QAC156 or QAC211 or QAC251**

QAC378 DeltaLab: Computational Media Analysis
The content of this course focuses on Wesleyan Media Project media data, including advertising and local television news, and exposes students to a variety of computational ways of making that data more accessible through computational analyses and visualization. Projects are often but not exclusively group-based and draw upon the range of different disciplinary perspectives. Students will engage with the instructors and other lab members once a week for updates on their projects, will attend skill demonstration meetings and smaller group sessions to facilitate lab knowledge transfer, and will engage regularly in hands-on work with the data.
Offering: **Host**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **SBS-QAC**
Identical With: **GOVT381**
Prereq: **None**

QAC380 Introduction to Statistical Consulting
In this course, students will be exposed to realistic statistical and scientific problems that appear in typical interactions between statisticians and researchers. The goal is for students to apply what they have learned in their basic statistics and data analysis courses to gain greater experience in the areas of research collaboration, data management and analysis, and writing and presenting reports on the results of the analyses. An important objective of the course is to help develop communication skills, both written and verbal, as well as the professional standards and interpersonal skills necessary for effective statistical consulting.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **MATH132 OR ECON300 OR PSYC200 OR [QAC201 or GOVT201 or PSYC280 or NS&B280]**

QAC381 QAC Praxis Service Learning Lab
As a service learning lab, this course provides students with an opportunity to further develop their abilities to analyze data and apply their knowledge and statistical computing skills as they work closely with nonprofit community partners on data analytic projects. Students in the course will identify research

questions of interest to the community partner, gather and manage data, conduct statistical analyses, and interpret and summarize results. The service component involves providing statistical consulting to community partners by formulating and completing data analytic projects, the results of which may be used to improve services, identify areas requiring increased services and areas in which services can be made more efficient, as well as improving data collection, data reporting, and organizational functioning.
Offering: **Host**
Grading: **A-F**
Credits: **1.25**
Gen Ed Area: **SBS-QAC**
Prereq: **MATH132 OR ECON300 OR PSYC200 OR QAC201 OR SOC257 OR GOVT201 OR PSYC280 OR NS&B280**

QAC385 Applications of Machine Learning in Data Analysis
The course provides a broad overview of machine learning algorithms and focuses on their application in data mining. Building on a basic background of regression analysis, and following a learning-by-doing approach, students are introduced to data mining tools and techniques that are used to identify patterns and relationships in large and complex data. While the emphasis is on intuition and application rather than theoretical results, through different case studies, students are introduced to the fundamentals of the different methods and learn how to conceptualize a problem, analyze it using appropriate tools, and communicate their results.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Prereq: **QAC211 OR PHYS221 OR ECON300 OR GOVT367 OR MATH231 OR MATH232**

QAC386 Quantitative Textual Analysis: Introduction to Text Mining
We encounter computerized processing of text in almost every field of life. Google tries to infer the meaning of our search queries, online review engines try to extract information about what products are popular with the users, and across different fields scholars analyze text for insights into the processes and phenomena they study. This course will introduce you to the skills necessary to mine text for information and knowledge. You will learn how to use Python to retrieve text from a variety of sources, how to use regular expressions to identify which pieces of text are useful to your study, and how to use techniques from data mining to analyze the processed text to extract information and for classification and prediction.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **SBS-QAC**
Prereq: **COMP112 OR QAC155 OR QAC239 OR QAC305 OR QAC385**

QAC387 Generative AI -- LLM Tools for Data Analysis
The goal of this course is to educate students in the techniques of doing data analysis with the assistance of artificial intelligence. The course will cover the use of Generative AI -- Large Language Models (LLMs) and consider the ethical dimensions in the development of AI tools and their applications. Through hand-on exercises and a term project students will develop the understanding and the skills for development, application, and appropriate use of AI tools in data analysis to advance empirical research and evidence-based decision making.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **None**
Prereq: **None**

QAC401 Individual Tutorial, Undergraduate
Topic to be arranged In consultation with the tutor.
Offering: **Host**
Grading: **OPT**

QAC402 Individual Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

QAC409 Senior Thesis Tutorial
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

QAC410 Senior Thesis Tutorial
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

QAC419 Student Forum
Student-run group tutorial, sponsored by a faculty member and approved by the chair of a department or program.
Offering: **Host**
Grading: **Cr/U**

QAC420 Student Forum
Student-run group tutorial, sponsored by a faculty member and approved by the chair of a department or program.
Offering: **Host**
Grading: **Cr/U**

QAC492 Teaching Apprentice Tutorial, Undergraduate
The teaching apprentice program offers undergraduate students the opportunity to assist in teaching a faculty member's course for academic credit.
Offering: **Host**
Grading: **OPT**