

2022 - 2023 GH Approved Skill Based Methods Courses Guide

Our goal as a Department is to strengthen your capacity to be an effective change agent when working in the global public health arena. To this end, we have identified a set of skill-based methods courses that will apply qualitative or quantitative methods to inform the design or implementation of global health research or practice. Listed below are the courses that have been approved by our faculty as meeting this criterion.

Course	Cr	Course Description	Area	Career Trajectory
GH 502: Intro to Quantitative Data Collection	2	Fall. This course provides an introduction to the collection of quantitative data. Taking an applied approach, we learn the entire process of designing a study, including instrument design, sampling methods, budgeting and training, fieldwork components, and data management. Special focus is given to research in less-developed countries and to cross-cultural research. Participants develop their own studies, including survey instruments and method protocols.	Research Methods, Surveys	M&E, Programs, Research
GH 503: Quantitative Data Collection	3	Spring. This course provides an introduction to the collection of quantitative, representative data. Taking an applied approach, we cover the entire process of designing a study, including instrument design, sampling methods, budgeting and training, fieldwork components, and coding and editing of data. The focus is on collecting data in less-developed countries. Students develop their own surveys and accompanying methods proposals, which they may use for their Applied Practice Experience or other projects.	Research Methods, Surveys	M&E, Programs, Research
GH 509: Translation & Implementation Sciences	2	Spring. The course aims to introduce students to methods for translating scientific knowledge into real-world practice and policy. The course covers topics around identifying and appraising the evidence base, assessing and addressing barriers that impede implementation of proven interventions, designing innovative solutions and studies to test these, and concepts of decision science to promote implementation and sustainability of proven interventions. Throughout the course, students are exposed to case studies of global health interventions which illustrate implementation science concepts while evoking discussion and critical thinking.	Research Methods	M&E, Programs, Research
GH 510: Epidemiological Methods in Humanitarian Emergencies	2	Spring. This course covers epidemiologic methods used in complex humanitarian emergencies such as rapid assessment, surveillance, survey design (with a focus on cluster surveys) and analysis. In addition, the class includes other topics such as outbreaks in emergencies as well as practical sessions on anthropometry and field laboratory methods. Teaching methods combine lectures and case studies of recent humanitarian emergencies.	Complex Humanitarian Emergencies	Research (Focused Topic)
GH 513: Community Based Participatory Action Research	3	Fall/Spring. Provides an introduction to Community-based Participatory Action Research (CBPAR), and similar research approaches that are community-based and community-centered, participatory in their inclusion of community members as protagonists, and action-oriented in the sense that they explicitly seek to promote change. Students will develop familiarity with a range of classical and innovative research approaches, including assets-based approaches such as appreciative inquiry and critical approaches such as autoethnography.	CHD	Programs, Research
GH 514: Social and Behavior Change Communication	2	Spring. Serves as a practical introduction to the methods and theories used in the development, planning and implementation of communication interventions to promote healthy behavior and social change. Participants learn how to describe and analyze behaviors, conduct formative research, design an intervention strategically, write a creative brief to guide materials design, and develop and pretest materials. Case studies range from community-level group communication to mass media campaigns, and address a range of health issues, with particular focus on sexual and reproductive health, especially HIV/AIDS.	Health issues, from child survival to domestic violence Sexual and Reproductive Health, Health Communications, HIV/AIDS	Programs, Policy
GH 517/ EPI 517: Case Studies in Infectious Disease	2	Fall. Prerequisites/concurrent: EPI 504 or EPI 530 and BIOS 500 or permission of instructor. Provides training in the investigation, control, and prevention of infectious diseases by both descriptive and analytic epidemiological techniques. Students work with infectious diseases of national and international interest. Cross-listed with EPI 517.	Infectious Disease Epidemiology taught by a case study method	Research (Focused Topic)

GH 521: Program Management	3	<p>Fall. Second year global health students only. This course is specifically designed for those who will be working in developing countries and/or countries in economic and political transition-working in the public sector, the non-governmental sector, the community or international organizations. In this course, we focus on two primary resources in any organization or program-people and money-and the processes leading to high performance and quality. While derived from management theory and practice, the focus of this course is less on theory and more on application. This course focused on increasing your ability to analyze, explain and diagnose managerial and organizational dilemmas and generate solutions that are feasible. This will be done primarily through cases, group discussions and exercises. Lectures will provide background and theory.</p>	M&E, Programs	M&E, Programs,
GH 522: Qualitative Methods for Research in Global Health	3	<p>Spring. This course will provide students with practical skills and theoretical principles for conducting and evaluating qualitative research. Weekly sessions will focus on different tasks in the process of conducting qualitative research. This course will include theory and concepts underpinning qualitative research, qualitative research design, ethical considerations and challenges, instrument design, key data collection methods used in public health (interviewing, group discussions and observations), and summarizing and presenting data. The course provides instruction on the challenges of applying qualitative methods in international settings and guidance on fieldwork planning and implementation to assist students in preparing for their practicum activities. This course uses a variety of approaches to foster the development of practical skills in qualitative research; formal lectures, interactive group sessions, discussions with experts, and task-based assignments. This course is a prerequisite for Qualitative Data Analysis (GH525).</p>	General Methods. Qualitative Methods	Research Methods Evaluation
GH 523: Quantitative Data Analysis	3	<p>Fall. Prerequisites: EPI 530 and BIOS 500. EPI 539, BIOS 501, and GH 503 strongly recommended. This course provides an introduction to the process of addressing research questions using quantitative data. The course emphasizes the technical skills required to transform a quantitative data set (exemplars: NHANES and Demographic and Health Surveys) into a reproducible analysis for global health applications. Students will receive guided, structured experience with quantitatively operationalizing research questions, data acquisition and management, data exploration, formal data description, conceptualization and construction of composite variables, analysis of statistical associations, and addressing common threats to valid inference. Exercises will be completed using SAS software with an emphasis on programming specific to complex survey designs. Students must register for both lecture and lab components.</p>	General Methods. Quantitative Methods	Research Methods Evaluation
GH 524: Health Systems Performance and Financing: Methods and Evidence	2	<p>Spring. Prerequisite: GH 501. Introduces the major policy issues in health care financing for developing countries and transition economies. Topics include models of health care financing used by countries; performance of the systems with respect to equity, efficiency, and effectiveness; evaluation of current financing and health sector reform proposals; and redefinition of the roles of government and the private sector. Investigates health care financing in the economic, political, and social contexts of the country-specific health system reform efforts and broader themes in international development.</p>	Health Care Financing, Programmatic Work, Community Health, Development	Research, Program (Focused Topic)
GH 525: Qualitative Data Analysis	3	<p>Fall. Prerequisite: GH 522 or equivalent. This course is designed to provide students with the theoretical principles and practical skills for analyzing qualitative data. The course will provide an overview of the theoretical principles of qualitative data analysis, and practical tasks of data preparation, data analysis, writing and presenting data. Students will develop skills in using MAXQDA software to analyze qualitative data through weekly lab sessions. During the course students will learn techniques for analyzing qualitative data through guided classroom activities, lab sessions, and structured assignments. The course is ideal for second year MPH students who collected qualitative data during their summer APE; students without their own data may use a class data set. Each student will work with their individual data in course assignments.</p>	General Methods. Qualitative Methods	Research, M&E

GH 529: Water and Sanitation in Developing Countries	2	Fall. Provides students with techniques needed to develop, evaluate, and sustain successful drinking water and sanitation interventions for developing countries. Focuses on practical field and laboratory tools needed for different stages of projects, including: assessment of perceived and actual need, alternative strategies for different environmental settings, assessing cost and financial sustainability of projects, laboratory and field techniques for assessing exposure to microbial and chemical agents, and measuring health outcomes (for baseline or effectiveness assessment). Includes lectures, extensive case studies, and field and laboratory exercises.	Environmental Health, Infectious Diseases, Water and Sanitation	Program (Focused Topic)
GH 530: The GEMMA Seminar: Global Elimination of Maternal Mortality from Abortion	2	Spring. Students will develop skills in abortion and maternal mortality measurement using WHO and CDC criteria in populations with safe or unsafe abortions. Students will also use case studies to evaluate the influence of political and legal decisions, ethics, human rights conventions, social justice, and religious approaches on abortion practice, contraception, post-abortion care, and abortion-related mortality. They will use Values Clarification and Attitudes Transformation (VCAT) techniques to clarify and inform their own values on abortion. They will learn to describe the impact of terminology and values on national and international abortion debates, describe/learn about clinical abortion services and treatment for unsafe abortion, develop grant proposals to support program activities that prevent abortion mortality, and develop well-articulated arguments to advocate for the global elimination of maternal mortality from abortion.	Research Methods, Surveys	Research, Program
GH 535/ EPI 531: Field Epidemiology	2	Spring. Prerequisite: EPI 530. Uses a series of case studies to teach the principles and practice of epidemiology, ranging from surveillance and descriptive epidemiology to outbreak investigations and analytic methods. Focuses on the use of sound epidemiological judgment. Cross listed with EPI 531.	Surveillance and Descriptive Epidemiology	Research, M&E
GH 543: Fundamentals of Qualitative Data Analysis	2	Fall/Spring. This course will provide an intensive overview of qualitative data analysis including the use of MAXQDA software. On completing the course, students will be able to assess the quality of a qualitative data set, define objectives for a specific analysis project, develop and implement an approach using appropriate tools of analysis (e.g., segments, codes, memos, variables), and develop descriptive and comparative accounts of project findings. In addition to lectures and conceptual discussions, the course will incorporate applied exercises using secondary data and MAXQDA software in order to develop student skills in handling real-life textual data, implementing analysis procedures and techniques with software, and working in a team-based analysis setting.	Research Methods. Qualitative Methods	Research, M&E
GH 544: Field Trials and Intervention Studies	2	Fall. This course will develop understanding of design, conduct, and analysis of field trials and intervention studies. The course will focus on methods relevant to community and facility based trials in resource poor settings. However, several skills covered in this course will also be applicable to field and clinical trials in developed countries.	Methods to community and facility based trials in resource poor settings	Research, M&E
GH 545: Nutritional Assessment	3	Spring. Provides an overview of methods for assessing the nutritional status of both individuals and populations for purposes of etiologic research and disease prevention and control. Teaches the use of biochemical, anthropometric, and questionnaire methods for assessment of diet, body composition, physical activity, and biochemical characteristics. Research methods appropriate for measurement of any exposure in epidemiological or population studies are given special emphasis, including standardized data collection procedures, quality control, assessment of validity and reliability, and analytic methods to assess the effect of measurement error and to adjust for its effects when examining relations among variables. Covers methods for both acute and chronic disease	Nutrition Methods, Nutritionist Pro Diet (Diet assessment software)	M&E, Programs, Research
GH 555: Proposal Development	2	Spring. Over the course of the seven-week class, students will develop an NIH-style research proposal. Enrollees in the class will learn the following skills: identifying appropriate literature for designing and supporting your research questions; formulating aims and hypotheses for research; selecting appropriate methodologies to answer your research questions; planning field work, timelines, and simple budgets; clear and concise scientific grant writing; and peer review. Individual class projects can be used as the basis for seeking funding for research projects including APE.	Research Methods, Surveys	M&E, Programs, Research

GH 560: Monitoring & Evaluation of Global Public Health Programs	3	Fall/Spring. Provides students with the technical skills to conceptualize and design process and impact evaluations of international public health programs or projects. Helps students understand the role of monitoring and evaluation in policy analysis, planning, program design, and management.	Programmatic Work, community Metrics, Evaluation research	M&E, Programs, Research
GH 568: Community Engaged Food Security	3	Alternating Spring. Determinants of food choices are complex but a primary determinant is access. Limited access to healthy foods at individual, household, and community level is associated with a range of health outcomes including malnutrition, depression, exposure to infectious diseases and chronic disease. This course will explore the determinants and outcomes of access to healthy foods, evaluate the effectiveness and sustainability of existing food security strategies, and conduct community-engaged research in local communities on food access issues. State, national, and international policies and their influence on food access will be explored. Community-based strategies to ameliorate food access issues will be explored.	Nutrition, Community Health	Programs, Research
GH 569: Population Dynamics, International Development, and Health	2	Fall. This course provides an introduction to population dynamics and international development as important contexts of public health. Participants will learn about how issues such as economic growth, environmental change, international politics, and culture interact with population forces such as fertility, aging, mortality, and migration, in ways that affect health and public health practice. The course will provide an introduction to concepts and methods from demography to basic data analysis using Stata. Training will include lectures and structured debates, reading and discussion of published research and policies, and critical research and writing.	Populaion studies	Research
GH 586: Community Health Assessment	3	□ Fall. Pre/co-requisite: GH 503, GH 522, GH 525, or GH 543. The purpose of this course is to provide learners with theoretical background, technical skills and practical experience to conduct a health-related community assessment in a "Global" context and through a community engaged process. The Community Health Assessment (CHA) is a vital planning tool to identify priority health assets, capacities and needs, target resources to address health inequalities and meaningfully involve stakeholders at the level of families, communities and/or populations in the assessment process.	Community Assessment	
BIOS 501: Statistical Methods II	4	Spring. Prerequisites: BIOS 500 or permission of instructor. This course is the follow-up to Biostatistical Methods I (BIOS 500). Students will apply many of the concepts learned in BIOS 500 in a broader field of statistical analysis: model construction. Topics covered include Linear Regression, Analysis of Variance, Logistic Regression, and Survival Analysis. Students who successfully complete this course will have a deep understanding of many analytical methods used by public health researchers in daily life. BIOS 501 Lab is a component of this course.	Statistical Methods	Research, M&E
BIOS 502: Statistical Methods III	2	Fall. Prerequisites: BIOS 500 & BIOS 501 or permission of instructor. We start with data analytic methods not covered in BIOS 500 & BIOS 501 (Statistical Methods I & II): two-way ANOVA, polynomial regression, count regression, Kaplan-Meier analysis, multiple imputation, propensity scores. After the first exam, we focus on multilevel modeling of intra- and inter-individual change. Other hierarchical models will also be examined to analyze other types of clustered data. As in the prerequisite courses, we will learn how to specify an appropriate model so that specific research questions of interest can be addressed in a methodologically sound way. Students will use SAS to perform statistical analyses.	Statistical Methods	Research
BIOS 522: Survival Analysis	2	Fall. Prerequisites: BIOS 508, BIOS 509, BIOS 512, and BIOS 513 or permission of instructor. This course aims to develop basic understanding of statistical concepts and methods related to the analysis of survival data. The concepts to be introduced include survival functions, hazard rates, types of censoring and truncation. Methods of focus are life table, Kaplan-Meier and Nelson-Aalen estimates, log-rank tests, Cox regression. models, and parametric regression models. Students will learn how to implement standard survival analysis methods using SAS or R and appropriately interpret results. Examples and homework assignments based on real life data will give students the opportunity to analyze survival data and produce reports of their methods, results and conclusions.	Statistical Methods	Research

BIOS 544: Introduction to R (Non BIOS Students)	2	Fall and Spring. For non-BIOS Students Only. The goal of the course is to will provide an introduction to R in organizing, analyzing, and visualizing data. Once you've completed this course you'll be able to enter, save, retrieve, summarize, display and analyze data.	Statistical Methods	Research, M&E
BIOS 550: Sampling Applications	2	Spring. Prerequisites: BIOS 500, BIOS 501 or BIOS 506 or permission of the instructor. How to select probability samples and analyze data using simple random sampling, stratified random sampling, cluster sampling and multistage sampling. The software package PC-SUDAAN is used for data analysis.	Complex sample design	Research, M&E
EH 515: Air Quality in the Urban Environment	2	Spring, every other year (odd years). The link between the air we breathe and human health affects millions globally, placing urban air quality as a leading contributor to the global burden of disease. This course examines ways to characterize urban air pollution as well as its public health implications based on recent clinical, epidemiological, and toxicological research. The course will be highly interactive and will provide instruction on conducting basic, applied air quality research in academic, governmental, and grassroots settings.	Environmental Health, General environmental exposures, Air quality research	Research (Focused Topic)
EH 524: Risk Assessment I	2	Fall, Surveys the general principles and practices of environmental health risk assessment for toxic exposures in the environment and interactions with other factors contributing to human health risks. A variety of case studies will be used to demonstrate the basic methods and results of risk assessment, including estimation/evaluation of potential risk based on empirical evidence (e.g., laboratory animal studies, epidemiological studies), hazard and dose-response assessment for regulatory decisions, and uncertainty analysis and risk communication. Students will be introduced to and use key tools used in quantitative risk assessment.	Environmental Health, Risk assessment methods	Research (Focused Topic)
EH 527: Biomarkers and Environmental Public Health	2	Spring. This course presents the fundamental concepts of biomarkers of exposure to environmental chemicals including relevant clinical markers (e.g., inflammation or injury markers). The course introduces students to both quantitative and qualitative biomarker measurements and presents and interpretive framework for using biomarker data. Students will develop proficiency in applying the principles of exposure science to characterize and quantify environmental exposures.	Methods in EH.	
EH 530: Environmental and Occupational Epidemiology	3	Spring. Environmental and Occupational Epidemiology is a course for students in the Environmental Health Department who have successfully completed EPI 530 and BIOS 500. Students will gain experience reading, evaluating, and interpreting epidemiologic studies on the impact of both workplace and environmental exposures, and thinking through practical considerations. The course aims to strengthen each student's ability to read epidemiological literature critically. This aim will be realized through in-depth exploration of major study designs including cross-sectional studies, cohort studies, and case-control studies; and through the weekly readings and case studies. Although some data analysis is required, the focus of the class is on conceptual issues common in environmental and occupational epidemiology research and on the interpretation of findings. Successful completion of the course will also contribute to a richer appreciation of how the environment affects public health.		
EH 548: Research Methods for Studies of Water and Health	2	Spring. GH 529 (Water and Sanitation in Developing Countries) or equivalent recommended as background. This hands-on course covers methods needed to carry out field studies focused on water and health. Through lecture and laboratory exercises, students will learn critical skills in measuring water quality exposure assessment and waterborne disease health outcomes that will enable them to conduct their own field studies and analyze the resulting data. The focus will be on issues of microbiological contamination in developing countries, but chemical contamination and domestic cases will also be covered.	Methods in EH. WASH	M&E, Programs, Research (Focused Topic)

EHS 750: The Environmental Determinants of Infectious Disease	3	<p>Spring. This course covers the many different ways that the environment influences the transmission and spread of infectious diseases in humans. We take a broad definition of "the environment", considering air, water, soil, animal, and human influences, with case studies on each of these environmental factors. The course will also cover a variety of methods used in the study of infectious diseases, including epidemiology, mathematical modeling, risk analysis, social science, ecology, and molecular biology. The theme of this course is "Think like a pathogen"— students will learn to think from the perspective of a pathogen trying to maximize its fitness over both short- and long-term time scales. This course is an elective, and can be taken at any time in the program. There are no prerequisites, but it is helpful if students have at least some background in biology.</p>		
EHS 760: Advanced Risk Assessment	2	<p>Spring. Prerequisite: EH 524 or EHS student. This course provides students with experience in quantitative methods used in environmental health risk assessment. The course will focus on areas such as: types of models used in estimation of health risks, quantification of variabilities and uncertainties in model-based estimates, Benchmark Dose (BMD) modeling for estimating reference doses, physiologically-based toxicokinetic (PBTK) modeling for internal exposure estimation and in vitro assay-based approach for chemical safety assessment. The course is taught at a PhD level and assumes familiarity with basic concepts of risk assessment as taught in EH 524.</p>		
EPI 533: Programming in SAS	1	<p>Spring. Required for epidemiology majors. This is an applied computer course that provides an introduction to the SAS programming environment and instructs students in the techniques needed to enter data into a database and to properly organize and edit data into a final dataset that is ready for epidemiologic analysis.</p>	Research (SAS)	
EPI 536: Applied Data Analysis	2	<p>Fall. Prerequisites: EPI 504 or EPI 530, BIOS 500. The purpose of this course is to prepare the student for analysis of epidemiologic data from various study designs including cross-sectional, case-control, and follow-up studies. The student will have the opportunity to apply the methods taught in the epidemiology methods sequence to actual data sets. After completion of the course, the student will be prepared to do the data analysis for their thesis. The course will use the statistical program, Stata, for all analyses and therefore some time will be spent in learning the fundamentals of Stata. We will analyze multiple data sets and apply epidemiologic and statistical methods such as exact tests for 2x2 tables, stratified analysis, logistic regression, and survival techniques appropriate for epidemiologists. The course will be applied and will emphasize the use of Stata to solve various epidemiologic problems using a wide range of data sets.</p>	EPI methods (STATA)	Research
EPI 565: Data Sources and Methods in MCH	2	<p>Spring. Prerequisites: EPI 530 and BIOS 500. This course introduces students to data sources and methods commonly used by epidemiologists in state or provincial health departments. Data sources include: vital statistics, census, population-based surveillance, and surveys (e.g. PRAMS). Methods include record linkage, trend analysis, bias in MCH research, cluster investigation, small area analysis, and secondary data analysis. Although an introductory course, EPI 530 and BIOS 500 are prerequisites. Because students learn hands-on techniques, laboratory exercises will be used to supplement class sessions.</p>	Maternal Child Health; General applied EPI methods. Applicable to record linkage	Research (Focused Topic)
EPI 591L: Methods in Nutrition Epidemiology	2	<p>Fall. Prerequisites: EPI 530 or EPI 504 or instructor permission. This course is designed for students interested in studies of diet and health outcomes. The course provides an overview of methods for estimating dietary intakes. Issues related to the collections, processing, analysis and manipulation of dietary data in relation to foods dietary patterns, nutrients, and dietary supplements will also be addressed. Students will also have the opportunity to apply methods for manipulating dietary data including variation in diet, comparing methods for energy adjustment, manipulating raw data to create food grouping variables for dietary pattern analysis and calculating a dietary score</p>	Nutrition Methods	M&E, Programs, Research

EPI 591S: Social Epidemiology	2	Fall and Spring. Prerequisites: EPI 504 or EPI 530. This course will focus on the contribution of social factors to health and disease in human populations. With an emphasis on both theory and methods, seven topics of contemporary interest to public health research will be covered in depth: (1) social status; (2) race, ethnicity and racism; (3) geography/place; (4) immigration; (5) health literacy; (6) stress; and (7) social support.	EPI Methods	
HPM 510: Financial and Managerial Accounting	3	Fall. Introduces the basic accounting concepts, analytical techniques, decision-making tools, and vocabulary needed for effective management of health care organizations. The first part of the course is devoted to the fundamentals of accounting, including preparation and analysis of financial statements. The second part covers the generation, use, and interpretation of accounting information for making managerial decisions.	Programmatic work. Basic accounting concepts	M&E, Programs, Research
HPM 522: Economic Evaluation of Health Care Programs	4	Spring. Prerequisite: HPM 521 or permission of instructor. Prerequisites: HPM 500 or HPM 501, and HPM 521. Examines the theory, methods, and applications of economic evaluations (cost-effectiveness, cost-benefit, cost-utility) of health care programs, using examples from both developing and developed countries. A focus is decision analytic modeling. Applications range from economic evaluations of medical procedures to economic evaluations of intervention programs in developing countries	Programmatic Work, Economics	Research
INFO 521: Databases Using SQL	2	Fall/Spring. Prerequisites: BIOS 500 or permission of instructor. In this course, you'll learn about the basic structure of relational databases and how to read and write simple and complex SQL statements and advanced data manipulation techniques. By the end of this course, you'll have a solid working knowledge of structured query language. You'll feel confident in your ability to write SQL queries to create tables; retrieve data from single or multiple tables; delete, insert, and update data in a database; and gather significant statistics from data stored in a database. This course will teach key concepts of Structured Query Language (SQL), and gain a solid working knowledge of this powerful and universal database programming language. This course provides a comprehensive introduction to the language of relational databases: Structured Query Language (SQL). Topics covered include: Entity-Relationship modeling, the Relational Model, the SQL language: data retrieval statements, data manipulation and data definition statements. Homework will be done using databases running in MySQL which students install on their machines and proc SQL in SAS. Students develop a real-world database project using MySQL during the course.		
INFO 530: Introduction to Geographical Information Systems	2	Fall/Spring. The course introduces the use of geographic information systems (GIS) in the analysis of public health data. We develop GIS skills through homework, quizzes, and a case study. Specific skills include map layouts, visualization, and basic GIS operations such as buffering, layering, summarizing, geocoding, digitizing and spatial queries.		
INFO 532: Advanced Geographical Information Systems	2	Fall/Spring. Prerequisites: INFO 530 or permission of the instructor. The course continues the use of geographic information systems (GIS) in the analysis of public health data and adds more advanced features. We develop GIS skills through homework, quizzes and a final project, and particularly build upon the skills learned in INFO 530 such as map layouts, visualization, basic spatial statistics, and basic GIS operations such as buffering, layering, summarizing, geocoding, digitizing and spatial queries. We add new topics such as raster analysis open source GIS, (qgis), geo databases, story maps, and making maps in R.		

INFO 550: Data Science Toolkit	2	<p>Fall. Prerequisites: BIOS 544 or BIOS 545, R programming experience needed or permission of the instructor. This course is an elective for Masters and PhD students interested in learning some fundamental tools used in modern data science. Together, the tools covered in the course will provide the ability to develop fully reproducible pipelines for data analysis, from data processing and cleaning to analysis to result tables and summaries. By the end of the course students will have learned the tools necessary to: develop reproducible workflows collaboratively (using version control based on Git/GitHub), execute these workflows on a local computer (using command line operations, RMarkdown, and GNU Makefiles), execute the workflows in a containerized environment allowing end-to-end reproducibility (using Docker), and execute the workflow in a cloud environment (using Amazon Web Services EC2 and S3 services). Along the way, we will cover a few other tools for data science including best coding practices, basic python, software unit testing, and continuous integration services.</p>		
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