Master of Epidemiology – Program Courses – All tracks

Number	Name	Catalog Description	Credit Hrs.
BIOE 800	Master's Thesis and Research	This course involves research and development of the thesis required for the master's degree.	1-9
BIOE 804	Master's Project	Students will work on their master's project in conjunction with advisor and master's committee. Research-based course.	1-6
BIOE 805	Using R for Biostatistics I	This course will introduce optional statistical software computing associated with topics discussed in Biostatistics I. The primary statistical software will be R. R is an extremely versatile and powerful statistical package that is becoming very popular among researchers in virtually every research realm. Topics will include but not limited to inputting data, calculation of descriptive statistics, t-tests, confidence intervals, chi-square test, analysis of variance (ANOVA), simple and multiple regression, and non-parametric methods. This course is designed to enrich computing skills. Simultaneous or past enrollment in Biostatistics for Health Sciences I is not required, but is highly recommended. Students should have a background in fundamental statistics. Students must provide their own notebook computer.	1
BIOE 806	Using R for Biostatistics II	This course will introduce optional statistical software computing associated with topics discussed in Biostatistics II. The primary statistical software will be R. R is an extremely versatile and powerful statistical package that is becoming very popular among researchers in virtually every research realm. Topics will include but not limited to inputting data, calculation of descriptive statistics, statistical graphics, correlation, simple and multiple linear regression, general linear models, experimental designs, logistic regression, factorial analysis of variance and repeated measures. This course is designed to enrich computing skills. Simultaneous or past enrollment in Biostatistics for Health Sciences II is not required, but is highly recommended. Students should have a background in fundamental statistics. Students must provide their own notebook computer.	1
BIOE 810	Independent Study	An in-depth study of some aspect of epidemiology in which the student has special interest. Study is done independently with faculty approval and supervision.	1-3
BIOE 811	Biostatistics for the Health Sciences I	This course provides students with an introduction to descriptive statistics, probability and probability distributions, estimation, and one and two sample hypothesis testing, including paired and unpaired situations, for normally distributed and ordinal data. Students will also be introduced to one-way analysis of variance, including multisample inference, one-way ANOVA, fixed-effect and random effects models, and intraclass correlation coefficients. This	4

		course also includes a mandatory statistical computing laboratory that uses SAS for data analysis throughout the semester. Hybrid didactic and online course. (48-16)	
BIOE 812	Fundamentals of Epidemiology	The course introduces the basic principles and methods of epidemiology and demonstrates their applicability in the field of public health. Topics to be covered include the historical perspective of epidemiology, measures of disease occurrence and of association, clinical epidemiology, disease screening, causal inference, and study design. Online course.	3
BIOE 813	Fundamentals of SAS for Epidemiology	This course provides the foundation computing skills for independent analysis of epidemiologic data. Topics to be covered include an introduction to SAS as a research tool; Operating with SAS for Windows environment; Reading internal and external data into SAS; Working with variables and SAS functions; Using logical statements; Introducing SAS procedures - especially those that produce descriptive statistics; Performing simple inferential tests and power analysis; combining datasets; Reshaping data; and Introducing macro language. This course consists of 2 hour lecture and 1 hour laboratory session per week. Didactic online course.	3
BIOE 821	Biostatistics for the Health Sciences II	Second semester content pertains to methods of regression for observational and experimental data. Methods of analysis and hypothesis testing for three or more treatments are presented for various experimental designs and treatment combinations for normally distributed and ordinal data. Instruction includes helping the students attain mastery-level skill in programming with the SAS software system for statistical analysis of data.	
BIOE 822	Advanced Epidemiology	This course provides the foundation skills for independent analysis of epidemiological data. Topics to be covered include the analysis of vital statistics data, statistical analysis of simple epidemiological measures, identification and control of confounders in epidemiological data, logistic regression, and proportional hazards modeling. At the end of the semester, students will be able to analyze data from matched and unmatched case-control studies, case cohort studies, and traditional cohort designs. The course includes a mandatory statistical computing laboratory (defined as SAS online presentation and associated activities to be completed each week). Online	4
BIOE 823	Randomized Clinical Trials	This course will allow the student to understand and analyze the many critical facets of the most precise design for clinical studies in humans: randomized clinical trials. Using a case-based approach, students will learn the importance of precise hypothesis description, selection of an at risk cohort for study, and the power of randomization in helping balance the study groups on a number of known and unknown confounding factors. Important issues with regard to subject recruitment, patient management, and data quality control will be emphasized. Students will learn to perform their own sample size calculations and use actual statistical packages to outline real clinical trial results data.	3

BIOE 824	Genetic Epidemiology	This course will provide an overview of the rapidly advancing field of genetic epidemiology and genomics. It is designed for a broad audience and targets students, fellows, residents and faculties with diverse backgrounds in the health sciences. The course will start with an introduction to molecular genetics, genome organization, and principles of inheritance and quantitative genetics. This will be followed by a series of lectures on human genome diversity, linkage mapping, genome-wide association studies (GWAS), and the technological advances driving genome research. Topics covered will also include epigenetics and gene expression, gene x environment and gene x gene interactions, personalized genomics, and ethical implications.	3
BIOE 834	Epidemiology of Childhood Diseases	This seminar will provide an overview of the epidemiology of selected conditions and diseases affecting children as well as demonstrate the childhood origins of some adult chronic disease. For most of these conditions, information about the pattern of occurrence, data about risk factors and effectiveness of various preventive or therapeutic interventions will be discussed. Public use sources of information such as the National Health and Examination Survey (NHANES), National Ambulatory Medical Care Survey (NAMCS), CDC "Pink Book", Child and Adolescent Health Measurement Initiative (CAHMI) and Youth Risk Behavior Surveillance System (YRBSS) will be introduced and discussed. Additionally, some of the unique and challenging aspects of research in pediatric epidemiology such as issues of childhood growth and development, maternal (intrauterine) origins of disease and parental role in disease diagnosis and treatment will be introduced. In the last weeks of course students will be asked to synthesize the information presented in the course by identifying, presenting and evaluating the available epidemiological information on a childhood disease or condition of their choice.	2
BIOE 847	Advanced SAS Programming	This course provides advanced programming techniques in SAS/SQL, MACRO languages, and SAS Graphics. The natural flow of the course is intended to start with an introduction to simple SQL programming using a single dataset followed by discussions on how to work with multiple datasets with common primary key variables. Upon completing the SQL component, a smooth transition is planned to simple MACRO programming in SAS, which will be gradually advanced to more efficient yet complicated MACRO programming. This class is taught in a hybrid setting where we will have onsite review lectures in the SAS-laboratory in the Department of Preventive Medicine, and the students will be required to have a laptop with SAS access where they will work on hands-on practice of exercises from SAS SQL and MACRO Programing as well as SAS Graphics.	2
BIOE 848	Professional Experience and Prior Learning Assessment	This course recognizes that work experience can provide valuable learning experiences that can complement learning acquired through formal education. This course offers an	1-3

		assessment of experiential learning, performed through the construction of a portfolio, that emphasizes the connection between learning from work experience, practice skills, continuing education, clinical investigatory knowledge, and its translational application to research.	
BIOE 850	Categorical Data Analysis	This course begins by an introduction and review of most common discrete random variables and their probability distributions, followed by a brief discussion of 'parameter estimation' as a general concept in Theoretical Statistics. Then, we introduce the concept of inferential statistics by discussing one sample confidence interval and hypothesis testing for one- and two-sample designs, which includes the definition of and testing for statistical independence through the most commonly used chi-squarebased tests for 2x2, Rx2, 2xC, and RxC contingency tables and sets of (stratified) contingency tables. Then, the generalized linear model is introduced as the backbone for model building that focuses on the estimation of effects of one or more predictors on a binary response variable or on a count variable, including model inference and model diagnostics checking. Specific topics for the modeling of categorical data include logistic regression for dichotomous and polytomous response, conditional logistic regression, generalized estimating equations, and generalized linear mixed modeling for models with random effects. In addition, the course will explore log-linear modeling for count data. The relation of the various approaches and procedures using SAS will be demonstrated. The course focuses on application of the above approaches to observational and clinical trial designs.	2
BIOE 864	Data Science II – Statistical Methods for Observational Studies	This second course in data science *Data Science 2: Statistical Methods for Observational Studies* focuses on statistical approaches in data science, especially those relating to observational studies. This course can also be chosen independently for those students that wish to learn about observational studies in general. Students will learn about the distinction of causal analysis vs. association studies and the consequences for appropriately choosing statistical methods for data analysis. Sources of bias in observational studies and statistical methods to tackle these are discussed. This 1 credit course is taught with hands-on exercises and the student is expected to be comfortable with algorithmic approaches and computer programming.	1
BIOE 865	Linear Regression Methods for the Health Sciences	In this course, students will learn how multiple linear regression models are derived, use software to implement them, learn what assumptions underlie the models, learn how to test whether data meet those assumptions and what can be done when those assumptions are not met, and develop strategies for building and understanding useful models.	2
BIOE 866	Linear Mixed Models	This course provides the advanced skills necessary for independent statistical analysis of epidemiologic and clinical data containing clustered observations and random effects. Topics	2

		to be covered include unrestricted and restricted maximum likelihood estimation, Akaike's information criterion, standard general linear models, linear random effects models, linear covariance pattern models, and linear random coefficient models. The course focuses on applications requiring flexible modeling of variance and covariance structures for clustered data when observations from a common cluster are correlated. The approaches covered in the course are particularly relevant for analysis of hierarchical and longitudinal data having Gaussian distributed error.	
BIOE 867	Data Science I – Using Electronic Medical Record Data for Clinical Research	This first course in data science *Data Science 1: Using Electronic Medical Record Data for Clinical Research* is an opportunity to gain 'hands-on' experience analyzing data to answer specific research questions. Methods and theoretical issues introduced in earlier courses will be covered, but with a focus on practical analysis issues with actual data. Students work in small groups (2-3) on separate research topics, with each group using a different dataset that we provide. Data will come from CERNER Health Facts, the UTHSC Enterprise Data Warehouse and other data sources. This 2 credit course is taught with hands-on exercises and the student is expected to be comfortable with computer programming.	2
BIOE 868	Survival Analysis	Survival analysis refers to the statistical approach to analyze the occurrence and timing of events. Students will gain familiarity with the characteristics of time-to-event data such as the presence of censoring and time-varying covariates, and will learn to master the necessary statistical techniques to design and analyze studies with survival data, including the construction and interpretation of Kaplan-Meier estimates and the Cox proportional hazards model. This course also extends the standard Cox model by introducing time-varying covariates and stratification as a way of dealing with non-proportionality of hazards. The course utilizes the software SAS and especially PROC LIFETEST and PROC PHREG. This 2 credit course is taught with hands-on exercises and the student is expected to bring his/her own computer with a fully functional SAS installation.	2