QuaMSS Quantitative Methods Course Information

College of Literature, Science and the Arts (LSA)					
Department	**Course #**	**Course Name**	**Course Description**	**Terms Taught**	**Instructor**
Econ	671	Econometric Analysis I (core) **Advisory Prerequisite:** A semester of statistics at the undergraduate level and minimal preparation in mathematics is adequate.	This course is the first in a two-course block which includes: the theory and practice of testing hypotheses, statistical estimation theory, the basic statistical theory underlying the linear model, an introduction to econometric methods, and the nature of the difficulties which arise in applying statistical procedures to economic research problems.	Fall	Kilian
Econ	672	Econometric Analysis II (core) **Advisory Prerequisite:** Demonstrated competence in the material covered in ECON 600 and ECON 671	This course is the second in a two-course block which includes: the theory and practice of testing hypotheses, statistical estimation theory, the basic statistical theory underlying the linear model, an introduction to econometric methods, and the nature of the difficulties which arise in applying statistical procedures to economic research problems.	Winter	Lee
Econ	678	Econometric Theory **Advisory Prerequisite:** MATH 417 and MATH 425/STATS 425 or ECON 600, 671 and 672	Accompanying with ECON 679, this course is designed for students planning to take the field exam in econometrics. Knowledge of linear algebra and graduate level of statistics and econometrics is essential. This course introduces the statistical foundation of the nonlinear and nonparametric models in econometrics. Recent developments in panel data models are also covered. The course involves a development of the asymptotic distribution theory in depth. Selected current research topics are also covered depending on time and interest.	Fall	Lee
Econ	679	Econometric Theory II **Advisory Prerequisite:** ECON 678	This course continues from ECON 678. Includes a thorough treatment of statistical problems in econometrics, cross section data, times series data, panel data, development of simultaneous equation techniques, generalized method of moments, and formulation and estimation of special models. Selected current research topics depend on time and interest.	Winter	Cattaneo
Econ	675	Applied Microeconometrics **Advisory Prerequisite:** ECON, ECON 671 and 672	The purposes of the course are (1) to discuss types of microeconometric models likely to be useful in dissertation (and subsequent) research and (2) to provide some supervised experience in applied econometric research. The course's topics vary from year to year, but they typically include models for discrete and limited dependent variables and methods for analysis of longitudinal data.	Fall	Smith
Econ	676	Macroeconometrics	The aim of this course is to equip students with a working knowledge of important econometric techniques used in monetary economics, financial economics, international	Winter	Kilian

		Advisory Prerequisite: ECON 671 and 672	economics, and econometric theory. The centerpiece of this course is the vector autoregressive model. The course is divided into six parts: (1) a review of the foundations of time series econometrics; (2) detrending methods; restricted and unrestricted estimation of stationary vector autoregressive and moving-average models; asymptotic, bootstrap and Bayesian inference; model selection and specification tests, forecasting; exogeneity and Granger causality; tests of forecast encompassing and tests of equal forecast accuracy; impulse response analysis, variance decompositions and historical decompositions; (3) estimation and inference in the presence of trends, structural change and unit roots in univariate models; (4) spurious regressions, unbalanced regressions and cointegration; (5) identification problems and the relationship between structural and reduced form models; and (6) estimation and inference for structural dynamic macroeconomic models and their relationship to vector autoregressive models.		
Polysci	599	Statistical Methods in Political Research I **Enforced Prerequisite:** Political Science Graduate Students **Advisory Prerequisite:** Graduate standing; concurrent election of POLSCI 514 is strongly recommended.	A first course in statistics for students with little or no previous exposure to the subject. Topics include probability theory, discrete and continuous sampling distributions, sampling theory, properties of estimators, confidence intervals, hypothesis testing, and nonparametric statistics. Some familiarity with calculus is helpful but not absolutely required. Often, a brief introduction to the ideas of differential and integral calculus is provided in the course. Although the emphasis is on application, sufficient emphasis is placed on statistical theory so that students doing well in PS 599 will be prepared to pursue advanced course work in econometrics.	Fall	John Jackson
Polysci	699	Statistical Methods in Political Research II (continues POLISCI 599) **Enforced Prerequisite:** Graduate **Advisory Prerequisite:** POLSCI 599 or equivalent and Graduate standing	A second course in statistics and data. The course is intended primarily to be an introduction to methods of analysis subsumed under the General Linear Model, including analysis of variance and covariance, simple and multiple regression, and correlation. Certain aspects of these topics are presented most efficiently through the use of matrix algebra; in addition, more advanced courses (e.g. PS 787-790) assume a working knowledge of matrix operations. Therefore, a brief introduction to matrix algebra is included in PS 699.	Winter	Titiunik
Polysci	787	Multivariate Analysis **Advisory Prerequisite:** POLSCI 699 or equivalent and Graduate standing	This is an extension of PS 699. Topics covered include Generalized Least Squares; the identification and estimation of simultaneous equation models; principal components, discriminant and factor analysis; models for limited dependent variables; and the general analysis of covariance structures (LISREL). Computer exercises are used extensively to illustrate the range of topics.	Fall	Walter Mebane
Psych	613	Advanced Statistical Methods I **Advisory Prerequisite:** One previous course in Statistics. Graduate standing and permission of instructor.	This is a two-term course (with PSYCH 614 in the Winter term). PSYCH 613 is a prerequisite for PSYCH 614. Students will gain experience by analyzing data and gain an appreciation for the rationale underlying the standard statistical procedures used in psychological research. The course consists of four hours of lecture; additional review sections will also be available. Topics covered throughout the year include analysis of variance, regression, factor analysis, multidimensional scaling, and clustering.	Fall	Kai Cortina

Psych	614	Advanced Statistical Methods II **Advisory Prerequisite:** PSYCH 613, Graduate standing, and permission of instructor	This course is a continuation of PSYCH 613. Topics covered in this course include multidimensional scaling, cluster analysis, principal components, factor analysis, multivariate analysis of variance and canonical correlation. A brief introduction to reliability theory, structural equations modeling and hierarchical linear modeling will also be provided.	Winter	Kai Cortina
Sociology	510	Statistics **Advisory Prerequisite:** Graduate Standing	This is a course for first year graduate students in the social sciences. It is the first part of a two part sequence (SOC 510- 610), which form the core statistics sequence in the department of sociology. The role of SOC 510 in this sequence is: a) development of the background for probability distributions, estimators of summary statistics of those distributions, and inferential procedures from sample based estimators; b) introduction of the general linear model, which forms the basis of analysis of variance, simple and multiple regression; and c) experience in the use of a statistical computing package for the analysis of quantitative data. Soc 510 is only open to Sociology and Survey Methodology graduate students. If you are not classified under these academic groups and would like to request an override, please email mooretim@umich.edu.	Fall	David Harding
Sociology	610	Statistical Methods **Advisory Prerequisite:** SOC 510 or equivalent	Regression Techniques Soc 610 is only open to Soc and Survmeth grad students. If you are not classified under one of these academic groups and would like to add your name to the waitlist, please email dpaterno@umich.edu	Winter	Mizruchi
Sociology	619	Quantitative Analysis of Data **Advisory Prerequisite:** SOC 610 or equivalent; Graduate standing	This course teaches statistical methods for analyzing categorical data. Three classes of statistical models are covered: loglinear models for count data, logit/probit models for discrete dependent variables, and hazards models for studying transitions with longitudinal data.	Fall	Yu Xie
Stat	401	Applied Statistical Methods II **Advisory Prerequisite:** 115 and Stats 250/350, 400, or Econ 405, or Environ/NRE 438. No credit granted if completed or enrolled in Stat 413.	An intermediate course in applied statistics, covering a range of topics in modeling and analysis of data including: review of simple linear regression, two-sample problems, one-way analysis of variance; multiple linear regression, diagnostics and model selection; two-way analysis of variance, multiple comparisons, and other selected topics.	Fall/Winter	Nam Hee Choi
Stat	403	Introduction to Quantitative Research Methods **Advisory Prerequisite:** Math 115, one of Stats 250/350, 400, or 412	This course introduces methods for planning, executing, and evaluating research studies based on experiments, surveys, and observational datasets. In addition to learning a toolset of methods, students will read and report on recent research papers to learn how study design and data analysis are handled in different fields.	Fall	Kerby Shedden
Stat	406	Introduction to Statistical Computing **Enforced Prerequisite:**	Selected topics in statistical computing including basic numerical aspects, iterative statistical methods, principles of graphical analysis, simulation and Monte Carlo methods, generation of random variables, stochastic modeling, importance sampling, numerical and Monte Carlo integration.	Fall	Yves Atchade

			(Stats 401 and Math 215) or (Stats 403 and Math 215) or Stats 412 or (Math 425 or Stats 425)			
Stat	415	Data Mining and Statistical Learning **Advisory Prerequisite:** MATH 215 and 217, and one of STATS 401, 406, 412 or 426	This course covers the principles of data mining, exploratory analysis and visualization of complex data sets, and predictive modeling. The presentation balances statistical concepts (such as over-fitting data, and interpreting results) and computational issues. Students are exposed to algorithms, computations, and hands-on data analysis in the weekly discussion sessions.	Winter	Long Nguyen
Stat	470	Introduction to the Design of Experiments **Prerequisite:** One of Stats 401, 412, 425 or Math 425	Introduces students to basic concepts for planning experiments and to efficient methods of design and analysis. Topics covered include concepts such as randomization, replication and blocking; analysis of variance and covariance and the general linear model; fractional factorial designs, blocked designs, and split-plot designs.	Fall	Shyamala Nagaraj
Stat	480	Survey Sampling Techniques **Prerequisite:** One of Stats 401, 412, 425 or Math 425	Introduces students to basic ideas in survey sampling, moving from motivating examples to abstraction to populations, variables, parameters, samples and sample design, statistics, sampling distributions, Horvitz-Thompson estimators, basic sample design (simple random, cluster, systematics, multiple stage), various errors and biases, special topics.	Winter	Ben Hansen
Stat	500	Applied Statistics I **Prerequisite:** Math 417 and Stat 350 or 426	Linear models; definitions, fitting, identifiability, collinearity, Gauss-Markov theorem, variable selection, transformation, diagnostics, outliers and influential observations. ANOVA and ANCOVA. Common designs. Applications and real data analysis are stressed, with students using the computer to perform statistical analyses.	Fall/Winter	Naisyin Wang and Ji Zhu
Stat	503	Applied Multivariate Analysis **Prerequisite:** Stat 500	Topics in applied multivariate analysis including Hotelling's T-squared, multivariate ANOVA, discriminant functions, factor analysis, principal components, canonical correlations, and cluster analysis. Selected topics from: maximum likelihood and Bayesian methods, robust estimation and survey sampling. Applications and data analysis using the computer is stressed	Winter	George Michailidis
Stat	531	Analysis of Time Series (Econ 677) **Prerequisite:** Stat 426	Decomposition of series; trends and regression as a special case of time series; cyclic components; smoothing techniques; the variate difference method; representations including spectrogram, periodogram, etc.; stochastic difference equations autoregressive schemes, moving averages; large sample inference and prediction; covariance structure and spectral densities; hypothesis testing and estimation and applications and other topics.	Winter	Shyamala Nagaraj
Stat	570	Design of Experiments (IOE 570) **Prerequisite:**	Basic topics and ideas in the design of experiments: randomization and randomization tests; the validity and analysis of randomized experiments; randomized blocks; Latin and Graeco-Latin squares; plot techniques; factorial experiments; the use of confounding and	Winter	Ananda Sen

		Stat 500 or background in regression. Graduate standing.	response surface methodology; weighing designs, lattice and incomplete block and partially balanced in complete block designs.		

Stephen M. Ross School of Business					
Department	Course #	Course Name	Course Description	Terms Taught	Instructor
Business Administration	BA 850	Empirical Research Methods **Advisory Prerequisites:** Doctoral Standing	Empirical Research Methods --- This course is intended as an introduction to the methods of the social sciences and to the particular issues raised by applied business research done outside the laboratory. In addition to covering issues around the design of particular research projects, we will focus on developing research streams, that is, related pieces of research that build around a common theme and that advance is theoretical agenda 1.5 credit hours	Fall	Ethiraj
Business Administration	BA 865	Asymmetric Information **Advisory Prerequisites:** Doctoral Standing	Asymmetric Information --- This course is designed to introduce students to the tools used in modeling asymmetric information and to expose them to applications in different areas. The course begins with an introduction to the main tools used in game theory, Bayesian Nash equilibrium and perfect Bayesian equilibrium. Adverse selection and moral hazard, the two main approaches to modeling asymmetric information is contract theory, are discussed. For much of the course, the focus is on applications of asymmetric information models drawn from different areas, including disclosure of information (accounting), external financing (finance), technology licensing (information technology), pricing (marketing), and auctions (of interest to several areas). 3 credit hours	Winter	Rajan
Business Administration	BA 870	Research Methods in the Behavioral & Social Sciences **Advisory Prerequisite:** Doctoral Standing	Cross-listed with SOCADMIN 870 Research Methods in the Behavioral and Social Sciences --- This course is designed to provide conceptual and operational skills needed to do and interpret basic and applied research in the behavioral, managerial, and social sciences. Particular focus will be on structural equation models (known also by such names as causal models, path analysis, analysis of covariance structures, simultaneous equation models with latent variables) with an aim to addressing measurement and hypothesis testing issues, as well as exploring the broader philosophical foundations and implications of the methods. We will cover such topics as reliability, validity, explanation, prediction, control, and understanding of individual, group, and organizational phenomena. Considerable emphasis will be placed on examination of assumptions, measurement, theory specification, theory operationalization, estimation of parameters, hypothesis testing, and interpretation of findings. In addition, such topics as questionnaire design, formative versus reflective indicators, confirmatory factor analysis, high order factor models, cross-sectional and longitudinal designs, recursive and non recursive models, survey and experimental research, multiple group analyses, and the role of cross-cultural inquiry will be considered. 3 credit hours	Fall	Bagozzi
Business Information Technology	BIT 512	Decision Support with Spreadsheets **Course Prerequisites:** No credit in BIT 311, 511	Decision Support with Spreadsheets --- Spreadsheets have advanced to the point of providing powerful, general-purpose functionality and are among the most widely used decision-support tools in business today. This course deals with decision support using spreadsheets, including: what if analysis; financial, statistical and time/date functions; graphical presentation of data; organizing, sorting, querying and extracting information from spreadsheet and external databases and the World Wide Web; cross-tabulation of data; data tables; creation and management of scenarios; use of a solver to find optimal	Fall/Winter	Schriber

				solutions to problems; the design to macros to support spreadsheet applications; and data maps. An expert level of spreadsheet use is achieved. Lecture-demonstrations illustrate relevant features of spreadsheet software. Students do assigned cases on a computer to reinforce and extend conceptual and operational aspects of the material. Windows-based spreadsheet software (such as Excel) is used. 1.5 credit hours		
Business Information Technology	BIT 513	Spreadsheet Modeling and Applications **Course Prerequisites:** No credit in BIT 511 or CIS 511 or OMS 564 **Advisory Prerequisites:** BIT 311, 512, or permission of instructor	Spreadsheet Modeling and Applications --- This course, a continuation of CIS512, emphasizes problem solving using spreadsheet software. Extensive use is made of a spreadsheet solver (such as Solver in Excel) to formulate and solve practical optimization problems from such mathematical programming areas as linear, integer, and nonlinear programming, and multiple-objective decision making. Probabilistic modeling to support risk analysis in the context of spreadsheets is also studied, using native spreadsheet capabilities alone and then supplementing these capabilities with spreadsheet problem analysis, model formulation, implementation, execution and interpretation. Students do assigned computer word to reinforce and extend conceptual and operational aspects of the material. 1.5 credit hours	Fall/Winter	Schriber
Finance	FIN 875	Empirical Methodology in Finance **Advisory Prerequisites:** Doctoral Standing	Empirical Methodology in Finance --- This seminar course will expose graduate students to the more commonly used empirical methods in the financial literature. As this is an application-oriented course, it is assumed that students have had exposure to both finance and econometrics as the graduate level. This course will study the important applications of empirical methodology to financial problems over the past two decades. The course will not deal with either finance or econometrics, but important applications of the latter in testing basic financial models. 1.5 credit hours	Winter	Dittmar
Marketing	MKT 618	Marketing Research Design and Analysis **Course Prerequisites:** No credit in MKT 619 or 620 **Advisory Prerequisites:** MKT 501 or 503	Marketing Research Design and Analysis --- This course focuses on managing the marketing research process which provides information as an input to marketing decision-making. This requires an understanding of the components of the marketing research process, how to utilize it effectively to obtain relevant information, and how to integrate such information into the marketing decision-making process. We will discuss both the "production" and "consumption" of information for marketing decisions. 3 credit hours	Fall	Aribarg
Marketing	MKT 630	Marketing Engineering **Advisory Prerequisites:** MKT: 501/503/591	Marketing Engineering --- The structure and content of those employed in marketing is rapidly changing due to vast increases in desktop computer power and exploding volumes of marketing data. Professions such as marketing manager, account manager, market researcher and Marketing (research) consultant are evolving rapidly in the new technology intense marketing environment. New approaches to marketing are heavily dependent upon analytical tools, and the effectiveness of the new use of those tools depends on the knowledge and skills of the users. The new marketing looks like marketing engineering and is in need of people with marketing engineering skills. This course develops those skills. 2.25 credit hours	Winter	Feinberg
Marketing	MKT 899	Special Topics in Marketing (Quantitative)	Special Topics in Marketing: Quantitative --- This Doctoral-level course covers special areas of current research in Marketing that draw on the tools and techniques of microeconomics, econometrics, multivariate statistics, game theory, or other relevant source disciplines. Offerings of the course could cover topics such as New Product Models,	Winter	Aribarg

		Advisory Prerequisites: Permission of instructor	Marketing Strategy, Services Marketing, etc., depending on the interests of the instructor. Publications from academic journals are discussed and critiqued by seminar participants, paying attention to theoretical and methodological issues. A student paper is required at the end of the course. 1.5 credit hours		
Operations and Management Science	OMS 501	Applied Business Statistics **Course Prerequisites:** No credit in OMS 502 **Advisory Prerequisites:** College algebra	Applied Business Statistics --- Evening MBA Core Course. Mathematics review; descriptive statistics, and the graphical description of data. Calculation of even probabilities, random sampling, and assessing personal probabilities. Normal, binomial, and Poisson distributions. Sampling distributions and the tabular analysis of large data sets. Confidence intervals and tests of hypotheses. The computer will be used to demonstrate these topics. Decision trees and expected value of information. Quality control charts; simulation models. Correlation and regression analysis with diagnostics. Framing hypotheses based on large data sets; survey sampling concepts. 3 credit hours	Fall/Winter	Lenk, Morgan
Operations and Management Science	OMS 502	Applied Business Statistics **Course Prerequisites:** No credit in OMS 501 **Advisory Prerequisites:** College algebra	Applied Business Statistics --- This course covers probability, sampling distributions, confidence intervals, hypothesis testing, correlation, and simple and multiple regression analysis. Business applications are used to illustrate these concepts. The course requires familiarity with the statistical analysis package of MS Excel. 2.25 credit hours	Fall	Lovejoy, Sinha
Operations and Management Science	OMS 518	Linear Programming I **Advisory Prerequisites:** MATH 217, 417 or 419	Linear Programming I --- Formulation of problems from the private and public sectors using the mathematical model of linear programming. Development of the simplex algorithm; duality theory and economic interpretations. Postoptimality (sensitivity) analysis application and interpretations. Introduction to transportation and assignment problems; special purpose algorithms and advanced computational techniques. Students have opportunities to formulate and solve models developed from more complex case studies and to use various computer programs. Cross-listed with MATH 561, IOE 510 2.25 credit hours	Fall/Winter	Epelman
Operations and Management Science	OMS 551	Introduction to Operations **Course Prerequisites:** OMS 501 and No credit in OMS 552	Introduction to Operations --- This course prepares students to think managerially and analytically about operations processes, and to use the results of analysis to make things work better, faster and cheaper. Operations management studies the value-creating processes by which inputs of materials, labor, capital and information are transformed into products and services which customers want and are willing to play for. These processes can be managed well or poorly. Knowledge introduced in this course will help you understand the reasons for both. 3 credit hours	Fall/Winter	Svaan
Operations and Management Science	OMS 566	Applied Regression & Data Analysis **Advisory Prerequisites:** OMS 502 or equivalent	The course considers procedures for data collection, effective analysis, and interpretation for management control, planning, and forecasting. The course stresses the capabilities and limitation of statistical methods together with the considerations necessary for their effective application and correct interpretation. The course focuses primarily on multiple regression models, which includes weighted least squares, analysis of variance, and analysis of covariance. Readings, cases, examples and exercises are drawn from diverse	Winter	Lenk

Department	Course #	Course Name	Course Description	Terms Taught	Instructor
			areas of business, including finance, marketing research, accounting, economics and general management. 1.5 credit hours		
Operations and Management Science	OMS 572	Applied Business Forecasting I **Advisory Prerequisites:** OMS 552	Applied Business Forecasting I --- Students acquire hands-on experience with building and applying forecasting models to actual data on sales, inventories, income, earnings per share, and other variables widely encountered in business. Understanding practical issues of data acquisition, data analysis, and presentation to management in both oral and written form are emphasized. Problems of trend and seasonal forecasting in marketing, production and finance (other fields are considered, as is short-term forecasting with exponential smoothing.) The course features problem sets, cases, and a capstone case at the end of the term, done by teams. 1.5 credit hours	Fall	Lenk
Operations and Management Science	OMS 595	Applied Business Statistics **Advisory Prerequisites:** Global MBA student only	Applied Business Statistics --- This course covers probability, sampling distributions, confidence intervals, hypothesis testing, correlation, and simple and multiple regression analysis. Business applications are used to illustrate these concepts. The course requires familiarity with the statistical analysis package of MS Excel. 2.25 credit hours	Winter	Ahn
Operations and Management Science	OMS 899	Doctoral Seminar in Operations and Management Sciences **Advisory Prerequisites:** PhD student only, permission of instructor required	Doctoral Seminar in Operations and Management Sciences --- The Doctoral Seminar in Policy and Control examines critically the alternative integrative theories of the firm, and the various research methodologies used to support and advance these theories, through assigned readings and group discussions. 3 credit hours	Fall	Kapuscins-ki

School of Education

Department	Course #	Course Name	Course Description	Terms Taught	Instructor
EDUC	799	Categorical and Limited Dependent Variable Modeling	Advanced course addresses how to remedy the statistical and analytic problems that arise when researchers are faced with categorical and limited dependent variables. Emphasis on learning the statistical properties of these models and interpreting how the results produced can be used to inform educational decision-making.	Fall	Steve DesJardins
EDUC	793	Introduction to Quantitative Methods in Educational Research **Advisory Prerequisites:** Doctoral standing	Surveys quantitative methods of inquiry as they are currently used in the study of the contexts, processes, and effects of education. Introduces students to elementary statistics, exploratory data analysis, research design, and computer-based data analysis methods.	Fall	Bahr
EDUC	795	Quantitative Methods for Non-Experimental Research **Advisory Prerequisites:** Educ.794 or equivalent	A field-based intermediate-level course in research methods that focuses on non-experimental research. Emphasizes application of statistical concepts to current educational problems. Students will examine non-experimental data using SPSS-X software. The course focuses on regression-based methods, including path analysis and analysis of covariance. Recommended for all students planning a quantitative study for the dissertation.	Winter	Brian McCall
EDUC	817	Interdisciplinary Seminar in Quantitative Social Science Methodology (STATS 817, SOC	Considers methodological issues that arise in research in the social sciences. Themes for each meeting will arise from on-going research projects at U-M. Visiting researchers will provide a brief account of their aims and data before defining the methodological challenge for which they desire discussion.	Fall/Winter	Almirall

Department	Course #	Course Name	Course Description	Terms Taught	Instructor
		810, PSYCH 817) **Advisory Prerequisites:** Graduate standing, and Graduate-level courses in STAT 500 and 501.			
EDUC	890	Multi-level Analysis of Survey Data **Add Consent:** Instructor Consent Required **Advisory Prerequisites:** At least one graduate-level course in statistics or quantitative methods, and experience with multivariate regression models, including both analysis of data and interpretation of results	In this course, students are introduced to an increasingly common statistical technique, hierarchical linear modeling (HLM). Multi-level methods and the HLM software can be used to analyze nested data and multi-level research questions. Although the course demonstrates multiple uses of the HLM software, including growth-curve modeling, the major focus is on the investigation of organizational effects on individual-level outcomes.	Fall	Valerie Lee

Institute for Social Research (ISR)

Department	Course #	Course Name	Course Description	Terms Taught	Instructor
SurvMeth	600	Fundamentals of Survey Methodology **Add Consent:** Department Consent Required **Advisory Prerequisites:** Graduate level status, or upper-level undergraduate with permission of instructor, required.	The course is intended as an introduction to the field, taught at the graduate level. It introduces a set of principles of survey design that are the basis of standard practices in the field. The course examines research literatures that use both observational and experimental methods to test key hypotheses about the nature of human behavior that affect the quality of survey data. It also presents statistical concepts and techniques in sample design, execution, and estimation, and models of behavior describing errors in responding to survey questions. The course uses total survey error as a framework to discuss coverage properties of sampling frames; alternative sample designs and their impacts on standard errors of survey statistics; alternative modes of data collection; field administration operations; the role of the survey interviewer; impacts of nonresponse on survey statistics; the effect of question structure, wording and context on respondent behavior; models of measurement error; postsurvey processing; and estimation in surveys.	Fall	Couper, Brenner
SurvMeth	612	Methods of Survey Sampling **Add Consent:** Department Consent Required **Advisory Prerequisites:** PSYCH, Two graduate level courses in statistical methods	Methods of Survey Sampling is a moderately advanced course in applied statistics, with an emphasis on the practical problems of sample design, which provides students with an understanding of principles and practice in skills required to select subjects and analyze sample data. Topics covered include stratified, clustered, systematic multi-stage sample designs; unequal probabilities and probabilities proportional to size, area, and telephone sampling; ratio means; sampling errors; frame problems; cost factors; and practical designs and procedures.	Winter	Lepkowski
SurvMeth	613	Analysis of Complex Sample Survey	This introductory course on the analysis of data from complex sample designs covers the	Fall	Heeringa

		Data **Add Consent:** Department Consent Required **Advisory Prerequisites:** Survey Methodology 612	development and handling of selection and other compensatory weights; methods for handling missing data; the effect of stratification and clustering on estimation and inference; alternative variance estimation procedures; methods for incorporating weights, stratification, clustering, and imputed values in estimation and inference procedures for complex sample survey data; and generalized design effects and variance functions.		
SurvMeth	617	Methods and Theory of Sample Design **Advisory Prerequisites:** None	Methods and Theory of Sample Design is concerned with the theory underlying the methods of survey sampling widely used in practice. It covers the basic techniques of simple random sampling, stratification, systematic sampling, cluster and multi-stage sampling, and probability proportional to size sampling. It also examines methods of variance estimation for complex sample designs, including the Taylor series expansion method, balanced repeated replications, and jackknife methods.	Fall	Lepkowski
SurvMeth	618	Inference from Complex Samples **Add Consent:** Department Consent Required **Advisory Prerequisites:** BIOSTAT 602/STAT 511, SURVMETH 612 and 617	Inference from complex sample survey data covers the theoretical and empirical properties of various variance estimation strategies (e.g., Taylor series approximation, replicated methods, and bootstrap methods for complex sample designs) and how to incorporate those methods into inference for complex sample survey data. Variance estimation procedures are applied to descriptive estimators and to analysis techniques such as regression, analysis of variance, and analysis of categorical data. Generalized variances and design effects are presented. Methods of model-based inference for complex sample surveys are also examined, and the results are contrasted with the design-based type of inference used as the standard in the course. The course will use real survey data to illustrate the methods discussed in class. Students will learn the use of computer software that takes account of the sample design in estimation. Students will carry out a research and analysis project, using techniques and skills learned during the course. A paper describing the student's research will be submitted at the end of the course, and each student will give a short presentation of his/her findings.	Winter	Valliant, Fay III
SurvMeth	619	Topics in Survey Sampling **Add Consent:** Department Consent Required **Advisory Prerequisites:** Survey Methodology 612	This course is an advanced course in selected topics in survey sampling. Topics to be covered include: estimation and imputation approaches, small area estimation, and sampling methods for rare populations. A selection of additional topics, chosen by the instructor, will also be covered. Examples of such additional topics include: sample designs for time and space, panel and rotating panel survey designs, maximizing overlap between samples, controlled selection and lattice sampling, sampling with probabilities proportionate to size without replacement, multiple frame sampling, adaptive cluster sampling, capture-recapture sampling, sampling for telephone surveys, sampling for establishment surveys, and measurement error models. Both applied and theoretical aspects of the topics will be examined.	Winter	
SurvMeth	623	Data Collection Methods **Add Consent:** Department Consent Required **Advisory Prerequisites:**	This course reviews alternative data collection methods used in surveys, focusing on interviewer-administered methods. It concentrates on the impact of these techniques on the quality of survey data, including measurement error properties, nonresponse, and coverage errors. The course reviews the literature on data collection methods, focusing on comparisons of major modes (face-to-face, telephone, and mail) and alternative methods	Fall and Summer	Couper, Conrad

		Current registration in a Program in Survey Methodology degree program OR previous completion of Fundamentals of Survey Methodology (SURVMETH 600).	of data collection (diaries, administrative records, direct observation, etc.). Students outside of the Program in Survey Methodology must have taken SurvMeth 600 (Fundamentals) prior to enrolling in SurvMeth 623. Contact Jill Esau (jesau@umich.edu) with questions.		
SurvMeth	630	Questionnaire Design **Add Consent:** Department Consent Required **Advisory Prerequisites:** None	This course focuses on the development of the survey instrument, the questionnaire. Topics include wording of questions (strategies for factual and non-factual questions), cognitive aspects, order of response alternatives, open versus closed questions, handling sensitive topics, combining individual questions into a meaningful questionnaire, issues related to question order and context, and aspects of a questionnaire other than questions. Questionnaire design is shown as a function of the mode of data collection such as face-to-face interviewing, telephone interviewing, mail surveys, diary surveys, and computer-assisted interviewing. Please contact Jill Esau (jesau@umich.edu) for permission to enroll in this course.	Winter and Summer	Kreuter
SurvMeth	632	Cognition, Communication, and Survey Measurement **Add Consent:** Department Consent Required **Advisory Prerequisites:** Background in Psychology is helpful, but not required	Survey data are only as meaningful as the answers that respondents provide. Hence, the processes that underlie respondents' answers are of crucial importance. This course draws on current theorizing in cognitive and social psychology pertaining to issues such as language comprehension, information storage and retrieval, autobiographical memory, social judgment, and the communicative dynamics of survey interviewing, to understand how respondents deal with the questions asked and how they arrive at an answer.	Fall	Tourange-au
SurvMeth	660	Survey Management **Add Consent:** Department Consent Required **Advisory Prerequisites:** None	This course describes modern practices in the administration of large-scale surveys. It reviews alternative management structures for large field organizations, supervisory and training regimens, handling of turnover, and multiple surveys with the same staff. Practical issues in budgeting of surveys are reviewed with examples from actual surveys. Scheduling of sequential activities in the design, data collection, and processing of data is described.	Winter	
SurvMeth	670	Survey Design Seminar **Add Consent:** Department Consent Required **Advisory Prerequisites:** SurvMeth 612, SurvMeth 623	This is a wide-ranging graduate seminar in which several program faculty members join with the students in attempting to solve design issues presented to the seminar by clients from the private, government, or academic sectors of research. Readings are selected from literatures not treated in other classes, and practical consulting problems are addressed.	Fall	Conrad

SurvMeth	672	Survey Practicum: Data Collection **Add Consent:** Department Consent Required **Advisory Prerequisites:** None	This is the first course in the two semester sequence that constitutes the practicum in survey research. This practicum provides students with a working knowledge of the strengths and weaknesses of the survey method. Class time will be devoted to instruction and practice in questionnaire development, pretesting, blocklisting, sampling, coding, and interviewer training. The skills taught during class periods are preparation for out-of-class fieldwork that culminates in the conduct of a household interview survey.	Winter	Lepkowski & Brenner
SurvMeth	673	Survey Practicum: Data Analysis **Add Consent:** Department Consent Required **Advisory Prerequisites:** SURVMETH 672	This course is the second in the series of courses comprising the survey research practicum. The course focuses on lectures and readings on most of the following issues: data cleaning and file preparation; classification systems and recodes; descriptive statistics and hypothesis testing; sums of squares and the analysis of variance; data reduction through factor and/or cluster analysis and the development of indices; cross-classification of categorical data and the measurement of association; multivariate linear regression tools; dummy-variable regression and multiple classification analysis; the logic of causal analysis and multiple dependent variables; multiple indicators, measurement errors and statistical analysis; report writing, graphics and the presentation of data.	Fall	Lepkowski & Brenner
SurvMeth	685	Statistical Methods I **Add Consent:** Department Consent Required **Advisory Prerequisites:** TWO COURSE SEQUENCE IN PROBABILITY & STATS OR EQ.	This is the first in a two term sequence in applied statistical methods covering topics such as regression, analysis of variance, categorical data, and survival analysis. This course is for students enrolled in the Program in Survey Methodology. Students must have department permission to enroll in this course. Contact Jill Esau at jesau@umich.edu.	Fall	Lee
SurvMeth	686	Statistical Methods II **Add Consent:** Department Consent Required **Advisory Prerequisites:** SURVMETH 685	This builds on the introduction to linear models and data analysis provided in Statistical Methods I. Topics include: Multivariate analysis techniques (Hotelling's T-square, Principal Components, Factor Analysis, Profile Analysis, MANOVA); Categorical Data Analysis (contingency tables, measurement of association, log-linear models for counts, logistics and polytomous regression, GEE); and lifetime Data Analysis (Kaplan-Meier plots, logrank test, Cox regression).	Winter	
SurvMeth	699	Directed Research **Advisory Prerequisites:** Graduate standing and permission of instructor	Directed research on a topic of the student's choice. An individual instructor must agree to direct such research, and the requirements are specified when approval is granted.	Fall/Winter	
SurvMeth	720	Total Survey Error I **Add Consent:** Department Consent Required	These courses review the total error structure of sample survey data, reviewing current research findings on the magnitudes of different error sources, design features that affect their magnitudes, and interrelationships among the errors. Coverage, nonresponse, sampling, measurement errors, interviewer effects, questionnaire effects, and mode of	Fall	Tourange-au

Department	Course #	Course Name	Course Description	Term Taught	Instructor
		Advisory Prerequisites: SurvMeth 612 and SurvMeth 623, SurvMeth890	data collection effects are reviewed. Statistical and social science approaches to the error sources are compared.		
SurvMeth	721	Total Survey Error II **Add Consent:** Department Consent Required **Advisory Prerequisites:** SURVMETH 720	These courses review the total error structure of sample survey data, reviewing current research findings on the magnitudes of different error sources, design features that affect their magnitudes, and interrelationships among the errors. Coverage, nonresponse, sampling, measurement errors, interviewer effects, questionnaire effects, and mode of data collection effects are reviewed. Statistical and social science approaches to the error sources are compared.	Winter	
School of Public Health					
Department	Course #	Course Name	Course Description	Term Taught	Instructor
BIOSTAT	601	Probability and Distribution Theory **Prerequisites**: Three terms of calculus	Fundamental probability and distribution theory needed for statistical inference. Probability, discrete and continuous distributions, expectation, generating functions, limit theorems, transformations, sampling theory.	Fall	Lu Wang, John Chen
BIOSTAT	602	Biostatistical Inference **Prerequisites**: Biostat 601	Fundamental theory that is the basis of inferential statistical procedures. Point and interval estimation, sufficient statistics, hypothesis testing, maximum likelihood estimates, confidence intervals, criteria for estimators, methods of constructing test and estimation procedures.	Winter	Min Zhang
BIOSTAT	650	Applied Statistics I: Linear Regression **Prerequisites**: BIOSTAT601	Graphical methods, simple and multiple linear regression; simple, partial and multiple correlation; estimation; hypothesis testing, model building and diagnosis; introduction to nonparametric regression; introduction to smoothing methods (e.g., lowess) The course will include applications to real data.	Fall	Douglas Schaubel
BIOSTAT	651	Applied Statistics II: Extensions for Linear Regression **Prerequisites**: BIOSTAT601 and BIOSTAT650	Introduction to maximum likelihood estimation; exponential family; proportion, count and rate data; generalized linear models; link function; logistic and Poisson regression; estimation; inference; deviance; diagnosis. The course will include application to real data.	Winter	Douglas Schaubel
BIOSTAT	653	Applied Statistics III: ANOVA and Linear Mixed Models **Prerequisites**: BIOSTAT650 and concurrent enrollment in BIOSTAT651	One-way layout, two-way and higher-way layouts; fixed effects and random effects; multiple comparisons; matching and blocking; balanced and unbalanced designs; weighted least squares; repeated measures; longitudinal and clustered data; linear mixed models; variance components; BLUP; REML. The course will include applications to real data.	Winter	Harkenri-der

BIOSTAT	675	Survival Time Analysis **Prerequisites**: Biostat 602 and Biostat 650	Concepts and methods for analyzing survival time data obtained from following individuals until occurrence of an event or their loss to follow-up. Survival time models, clinical life tables, survival distributions, mathematical and graphical methods for evaluating goodness of fit, comparison of treatment groups, regression models, proportional hazards models, censoring mechanisms.	Fall	Alexander Tsodikov
BIOSTAT	682	Applied Bayesian Inference **Prerequisites**: Biostat 602, Biostat 650 and Biostat 651	Introduction to Bayesian Inference. Bayesian large sample inference, relationship with maximum likelihood. Choice of model, including prior distribution. Bayesian approaches to regression generalized linear models, categorical data, and hierarchical models. Empirical Bayes methods. Comparison with frequentist methods. Bayesian computational methods. Assessment of sensitivity to model assumptions. Emphasis on biomedical applications.	Winter	Timothy Johnson
BIOSTAT	685	Elements of Nonparametric Statistics **Prerequisites**: Biostat 602 or STAT 511, and Biostat 650 or Perm. Instr	First half covers theory and applications of rank and randomization tests: sampling and randomization models, randomization t-test, Wilcoxon rank sum and signed rank tests, Kruskal-Wallis test, asymptotic result under randomization, relative efficiency; second half covers theory and applications of nonparametric regression: smoothing methods, including kernel estimators, local linear regression, smoothing splines, and regression splines, methods for choosing the smoothing parameter, including unbiased risk estimation and cross-validation, introduction to additive models.	Winter	Thomas Braun
BIOSTAT	695	Analysis of Categorical Data **Prerequisites**: Biostat 602 and Biostat 660	Regression models for the analysis of categorical data: logistic, probit and complementary log-log models for binomial random variables; log-linear models for cross-classifications of counts; regression models for Poisson rates; and multinomial response models for both nominal and ordinal responses. Model specification and interpretation are emphasized, and model criticism, model selection, and statistical inference are cast within the framework of likelihood based inference.	Fall	Peter Xuekun Song