

COURSE	TITLE	DESCRIPTION
A ED 502	Research in Art Education	Examination of past and present research in art education, an introduction to general methods of research, and critical evaluation of research in art education.
ACCTG 501	Research Methods in Accounting	
ADTED 550	Qualitative Research in Adult Ed	Introduction to the theory, principles, and practice of qualitative research.
ADTED 551	Qualitative Data Analysis	Students learn to analyze data qualitatively by engaging in, and continuously reflecting on the process.
AEE 520	Scientific Method in the Study of Ag & Extension Ed	Methods of procedure in investigation and experimentation in education, accompanied by a critical examination of studies made in agricultural education.
AEE 521	Basic Applied Data Analysis in Ag & Extension Ed	Continuation of AEE 520; emphasis upon stat techniques.
AEREC 510	Econometric I	General linear model, multicollinearity, specification error, autocorrelation, heteroskedasticity, restricted least squares, functional form, dummy variables, limited dependent variables.
AEREC 511	Econometric II	Stochastic regressors, distributed lag models, pooling cross-section and time-series data, simultaneous equation models.
ANTH 509	Research Design in Anthropological Fieldwork	A survey of research design, sampling strategies, potential biases, confounding problems, and the limits of inference in anthropological fieldwork.
APLING 597A	Making Cross-Cultural Comparisons with Qualitative Data (3)	This course covers theory and method in making systematic comparisons of qualitative data collected in two or more cultural contexts in two or more languages.
APLNG 578	Computational & Statistical Methods for Corpus Analysis	
APLNG 581	Discourse Analysis	CAS 581; Overview of theories and approaches to the analysis of spoken and/or written discourse.

BB H 505	Behavioral Health Research Strategies	Research strategies in behavioral health investigations are examined. Designs and data analytic models relevant to biobehavioral research are included..
CI 502 Pre-req: admission to a doctoral program	Qualitative Research in Curriculum & Instruction I	Presentation of theoretical and practical issues related to designing and proposing qualitative research concerning curriculum, teaching and/or learning.
CI 503	Qualitative Research in Curriculum & Instruction II	Considers forms of qualitative data, data analyses, procedures to generate data relationships, interpretation, and presentation of data.
CAS 507	Issues in Rhetorical Theory	Theoretical, analytical, philosophical, and critical problems in human communication, with application of humanistic and social scientific research framework.
CAS 561	Quantitative Research Methods	Introduces graduate students to principles, issues, and design considerations underlying social scientific methodology; material is applied to communication
CAS 562	Qualitative Research Methods	Introduces graduate students to principles, issues, and design considerations underlying social scientific methodology; material is applied to communication research
CE 563	Systems Optimization Using Evolutionary Algorithms	Comprehensive introduction to genetic and evolutionary computation: genetic algorithms, evolutionary strategies, multi-objective optimization, parallelization approaches, and fitness approximation..
CI 503 Pre-req: CI 502	Qualitative Research in Curriculum and Instruction I (3)	<p>Fall Course: This course is a continuation of CI 502 and is intended for students who are interested in pursuing a deeper understanding of qualitative methodology , theory and analysis. Its purpose is to allow students to reflect on the philosophical, methodological, and ethnical perspectives learned in the first part of the course and to advance their own research interests through systematic inquiry of the essential design components of qualitative research. This course is intended primarily for doctoral or master students who have a research focus, study, or proposal in mind and wish to pursue this focus through writing, discussion, and critical inquiry. Students registering for this course must have taken the prerequisite CIS02 or have gained permission from the instructor .</p> <p>Summer Course: Considers forms of qualitative data, data analyses , procedures to generate data relationships, interpretation, and presentation of data</p>

CI 597	Educational Ethnography	This course is designed to encourage graduate-level students to learn key traditional ethnographic methods (e.g., fieldnotes, interviews, document analysis, videography, discourse analysis) as well as alternative and/or contemporary methods (e.g., blogging, mapping, and sensory analysis). Regular participation in and sharing of student experimentations with such methods will be held throughout the semester. We will read and view ethnographies, paying close attention to the theories of culture, learning, and education (within and beyond school contexts) that have been developed by those engaged in educational ethnography. Topics include disability, race, ethnicity, class, gender, language, and students will have a chance to read and analyze an ethnography related to their own interests. We will also examine aspects of ethnographic research design and the types of ethnographies (e.g., collaborative, critical, autobiographical, digital) that are employed in the field of education. Students will engage in several ethnographic methods assignments over the course of the semester.
CMPSC/MATH 455	Introduction to Numerical Analysis	Floating point computation, numerical rootfinding, interpolation, numerical quadrature, direct methods for linear systems. Students may take only one course for credit from CMPSC (MATH) 451 and CMPSC (MATH) 455.
COMM 506	Introduction to Mass Communications Research	The scientific method; survey of basic concepts of theoretical and empirical research; variety of methodology; criteria for adequate research..
COMM 511	Mass Communications Research Methods II	Problems of bibliographical research; evaluation of sources and materials in mass communications history, biography, structure, ethics, and other areas.
COMM 516	Introduction to Data Analysis in Communications	To understand and be able to use data analysis techniques common to research in communications..
COMM 517	Psychological Aspects of Communication Technology	Investigation of psychological aspects of human-computer interaction (HCI) and computer-mediated communication (CMC).
CS 597B	Language-Based Security	This course explores methods for using programming languages and language semantics to enforce security. We will cover the techniques (e.g., security type systems, runtime monitoring and Hoare logic) as well as their applications to enforcing security (e.g., information flow security, program verification, machine-code verification, hardware security, quantitative security measures, differential privacy). We will read papers for each topic in this course.
CSE 543	Computer Security	Specification and design of secure systems; security models, architectural issues, verification and validation, and applications in secure database management systems..

CSE 555 (MATH 555)	Numerical Optimization Techniques	Unconstrained and constrained optimization methods, linear and quadratic programming, software issues, ellipsoid and Karmarkar's algorithm, global optimization, parallelism in optimization.
CSE 557	Concurrent Matrix Computation	This course discusses matrix computations on architectures that exploit concurrency. It will draw upon recent research in the field.
CSE 565	Algorithm Design & Analysis	An introduction to algorithmic design and analysis..
CSE 586	Topics in Computer Vision	Discussion of recent advances and current research trends in computer vision theory, algorithms, and their applications..
CSE 597I	Data Privacy, Learning and Statistical Analysis	The course will cover a variety of topics in theoretical computer science through the lens of data privacy. The main goal of the course is to introduce students to study of methods for private data analysis - how can we publish useful statistical summaries about sensitive data without leaking individual information? Along the way, we will learn basic results in randomized algorithms, learning theory and statistics, and cryptography..
CSE 597K	Theoretical, Computational and Experimental Regularity on Interdisciplinary Large Data Sets	This is a course on computational methods for digital data, that is across scale, modality and application domains. Our methodology content is a unique mixture of theoretical and experimental bases drawn from group theory, pattern theory, statistical learning theory as well as human/animal/insect visual perception research. We aim at automatic pattern discovery, comparison and learning. The students are trained throughout the course to apply theory and algorithms to real world scientific data, with an emphasis on discovering hidden patterns automatically from large data sets, including imagery/video of human faces, urban scenes, zebra in the wild, crowds/cell videos, volumetric images of Zebrafish, C. elegans, neuroradiology images
EDLDR 581	Field Research in Educational Leadership	Field study and qualitative methods in research on educational organizations.
EDLDR 586	Qualitative Methods in Education Research	EDTHP 586/HI ED 586; Exploration of the theoretical framework undergirding qualitative research and its attendant practices and techniques.

EDLDR 588/ EDTHP 588/ HI ED 588 Pre-req: EDLDR/EDTHP/ HI ED 586	Qualitative Methods in Educational Research II (3)	The course will provide practical experience with methods of qualitative data collection, data management, and preliminary data analysis that extends and deepens students' understanding of qualitative research in education. The class, limited to 15 students, will take as the focus with inquiry a common "site" around which projects of individual and group interest will be designed. Sessions will take place in "workshop" blocks during which students will present and critique the work of the project. Readings will be interspersed with the practicing of methods. The final project for the course will be the compilation of a synthesized data set that could serve as the basis of further analysis.
EDPSY 576	Research Methods in Teacher Education	A basis in theory, findings from research, research design, and methodologies related to teacher education.
EDSGN 548	Interaction Design	Strategies in user-centered design, ergonomic product analysis, statistical data analysis, low and high fidelity prototyping, and innovative design techniques.)
EE 556	Graphs, Algorithms, and Neural Networks	General machine-learning course; examining neural networks by exploiting graph theory for offering alternate solutions to classical problems in signal processing and control
GEOG 597A	Visual Analytics: Leveraging GeoSocial Data	Conceptual and project-based seminar on visual analytics and its applications to geo-social data analysis and Big Data Social Science research.
HDFS 516	Methods of Research in Human Development	Review of basic research methods and statistics as applied to human development and family studies.
HDFS 534	Person-specific Data Analysis	This course covers statistical dynamic systems modeling of multivariate psychological time series obtained with single and multiple subjects.
HDFS 565	Developmental Behavioral Genetics	3) Theories and methods of developmental behavioral genetics and their application to human life-span development.

HDFS 575	Applied Longitudinal Data Analysis	The purpose of this course is to facilitate formulation of research questions, design of studies, measurement devices, and methods of analysis suitable for the types of empirical data obtained in intensive longitudinal studies (e.g., diary/ experience sampling/ ecological momentary assessment) being used in the social sciences. Students will gain skills useful in the study of developmental or other change-based processes. In particular, students will gain abilities related to research conceptualization, research design, data analysis, results interpretation, and the presentation and critique of longitudinal research. The course will (1) highlight general issues regarding the link between process-oriented research questions and longitudinal study designs, (2) survey a selection of intraindividual change and variability concepts, (3) provide step-by-step instruction on data manipulation, graphing, and the analysis of intensive repeated measures data (univariate and multivariate), and (4) develop students' skill in effectively communicating the features of longitudinal data and results of longitudinal analysis. Specific topics include the use of intraindividual variability metrics, multilevel models, generalized multilevel models, multivariate multilevel models, and P-technique factor analysis for measurement and modeling of dynamic characteristics and dynamic processes; the design and implementation of multiple time-scale studies; and how new technologies are shaping both the collection and analysis of intensive longitudinal data in the social sciences.
HDFS 597	Applied Longitudinal Data Analysis	
IE 511	Experimental Design in Engineering	Statistical design and analysis of experiments in engineering; experimental models and experimental designs using the analysis of variance.
IE 512	Graph Theory and Networks in Management	Graph and network theory; application to problems of flows in networks, transportation and assignment problems, PERT/CPM, facilities planning.
IE 516	Applied Stochastic Processes	Study of stochastic processes and their applications to engineering and supply chain and information systems..
IE 520	Multiple Criteria Optimization	Study of concepts and methods in analysis of systems involving multiple objectives with applications to engineering, economic, and environmental systems.
IE 558	Engineering of Cognitive Work	Information processing and decision making models of the human in the modern workplace, emphasizing visual inspection and other industrial applications..

INSYS 574 Pre-req: any introductory research design course or instructor permission	Applied Qualitative Research for Work Practice, Innovation, and Systems Design (3)	Applied Qualitative Research for Work Practice, Innovation, and Systems Design (3). Investigates qualitative research paradigms and methodologies; develops skills in use of ethnographic methods in work practice, innovation and systems design.
INSYS 575	Designing Experimental Research in Instructional Systems	Designing research studies in Instructional Systems of a quantitative and experimental nature. Will result in a research proposal..
IST 503 (for PhD)	Foundations for IST Research	Study of major methodological, normative, and theoretical issues in philosophy of science related to research in information sciences and technology)
IST 504 (for PhD)	Foundations of Theories and Methods of Information Sciences and Technology Research	
IST 515	Information Security & Assurance	This course covers theoretical, conceptual, and methodological foundations of information security and assurance..
IST 516	Web & Internet Information Retrieval	The course addresses aspects of searching, retrieving and modeling the Web/ Internet as information repositories using mathematical and probabilistic treatments..
IST 525	Computer-Supported Cooperative Work	Introduces theories, empirical findings, evaluation methods, and design frameworks in computer-supported cooperative work.
IST 526	Development Tools & Visualizations for Human-Computer Interaction	addresses concepts and tools for developing working user interface software and prototypes to provide effective information visualizations.
IST 532	Organizational Informatics	Researching Information and Information Systems in Organizations.
IST 541 Pre-req: IST 501	Qualitative Research in IST (3)	Assists IST researchers in their efforts to learn about and employ appropriate qualitative methods in their research.
IST 552	Data & Knowledge Management	Introduces the computational foundations, methodologies and tools for data and knowledge management.
IST 554	Network Management & Security	Essential skills and knowledge for effectively utilizing networks and Internet technologies to facilitate, manage and secure data communications and applications.

IST 556 or IST 597J	Web Analytics: Research Approaches for Online Data	The course will provide the theoretical and methodological foundations of web data with the major focus on the application of web analytics methods and data. Jansen
IST 557	Data Mining: Techniques and Applications	Introduction of data mining field, including why data mining, what is data mining, what kinds of data can be mined, what kinds of patterns can be mined, an overview of technologies, the major issues in data mining, and a brief history of data mining community..
IST 558	Data Mining II	Advanced datamining techniques: temporal pattern mining, network mining, boosting, discriminativemodels, generative models, datawarehouse, and choosing mining algorithms.
IST 562	Theoretical Foundations of Info Sci	Introduces the theoretical foundations of information science, with applications in communication, signal processing, machine learning, and pattern recognition.
IST 597A	Software Security and Analysis	The latest research and development in software security and analysis, such as ROP, overflow, and injection attacks, will be studied. Dinghao Wu Sp 15
IST 597D	Big Data Fundamentals	Foundations and applications of big data science: complexity, cyberinfrastructure, search, security, processing, analytics, visualization, mining, governance and management. Should be familiar with databases and statistics.
IST 597G	Computer and Information Security: Economic and Psychological Considerations	Surveys theories, methods and key results of modern security research to understand the economic robustness of systems, and the behavior of users and attackers. Jens
IST 597K	Principles of Machine Learning	Algorithmic, statistical, and information-theoretic foundations of learning and discovery. Scalable algorithms for learning descriptive and predictive models from big data. Applications.
LING 520	Seminar in Psycholinguistics	Consideration of theoretical and research issues relevant to psychological aspects of language sounds, syntax and semantics, and other cognitive support.
LING 525	Experimental Research Methods in Psycholinguistics	Consideration of theoretical and research issues relevant to psychological aspects of language sounds, syntax and semantics, and othercognitive support).
MGMT 538	Seminar in Organization Theory	Current theoretical and research issues applicable to the study of design and management of complex organizations.
MGMT 591	Organizational Research Design	Experience in designing research for organizational science, to maximize the validity of eventual conclusions; methodological choices, constraints, and compromises

MGMT 592 Pre-req: admission to a PSU doctoral program	Qualitative Research Methods (3)	Provides students with an introduction to and experience with qualitative research methods employed in organizational. contexts
NURS 585	Qualitative Methods in Health Research	Provides an overview of advanced qualitative research methodologies useful in the conduct of social and behavioral health research.
NURS 586	Qualitative Methods in Health Research	An overview of methodological considerations specific to
PL SC 502	Statistical Methods for Political Research	Basic concepts of statistics and their use in political research; data analysis, causal inference, regression analysis, computer applications.
PL SC 583	Modern Political & Social Theory	Research on major developments and issues in modern political and social theory, such as critical theory, modernism, and postmodernism.
R SOC 597C	Qualitative Research Methods (3)	This course aims to increase graduate students' knowledge and abilities in: 1. understanding and critically discussing both theoretical issues and practical concerns related to various qualitative approaches in social research; 2. planning and implementing qualitative data collection procedures, particularly ethnographic observation and in-depth interviewing, and analyzing the resulting data; 3. developing a well- planned and cogently argued proposal to conduct qualitative social research addressing an important question in their fields; and 4. evaluating the quality and appropriateness of qualitative research studies reported in the literature. Rural social science applications are emphasized.
SC & IS 505	Management Info Systems Research	Research problems and issues in supply chain and information systems.
SOC 513	Sociological Research Methods	Critical review of methodological issues; research designs; analysis and interpretation of findings.
SOC 518	Survey Methods I: Survey Design	Research design for social, behavioral and health surveys.
SOC 579	Spatial Demography	This graduate course will expose students to spatial analysis tools and analytical methods applied to demographic research.)

SOSC 481 (Penn State - Harrisburg) Pre-req: permission of program	Qualitative Research Methods	Students in this course will gain a working understanding of the philosophy, conceptualization and application of qualitative and participatory research methods in the behavioral and social sciences including such methods as ethnographic research and participant observation, conceptual mapping and interviewing techniques and explore their applications in participatory and action research. Students will also learn how to analyze and write up the results of such research endeavors according to the standards of the field including the use of computerized qualitative data analysis packages (such as NUD*IST or the Ethnograph) and mastery of APA style.
STAT 500	Applied Statistics	Descriptive statistics, hypothesis testing, power, estimation, confidence intervals, regression, one- and 2-way ANOVA, Chi-square tests, diagnostics.
STAT 501	Regression Methods	Analysis of research data through simple and multiple regression and correlation; polynomial models; indicator variables; step-wise, piece-wise, and logistic regression.
STAT 502	Analysis of Variance & Design of Experiments	Analysis of variance and design concepts; factorial, nested, and unbalanced data; ANCOVA; blocked, Latin square, split-plot, repeated measures designs.
STAT 503	Design of Experiments	Design principles; optimality; confounding in split-plot, repeated measures, fractional factorial, response surface, and balanced/partially balanced incomplete block designs.
STAT 504	Analysis of Discrete Data	Models for frequency arrays; goodness-of-fit tests; two-, three-, and higher- way tables; latent and logistic models.
STAT 506	Sampling Theory & Methods	Theory and application of sampling from finite populations.
STAT 507	Epidemiologic Research Methods	Research and quantitative methods for analysis of epidemiologic observational studies. Non-randomized, intervention studies for human health, and disease treatment.
STAT 509	Design and Analysis of Clinical Trials	An introduction to the design and statistical analysis of randomized and observational studies in biomedical research.
STAT 510	Applied Time Series Analysis	Identification of models for empirical data collected over time. Use of models in forecasting.
STAT 512	Design & Analysis of Experiments	AOV, unbalanced, nested factors; CRD, RCBD, Latin squares, split-plot, and repeated measures; incomplete block, fractional factorial, response surface designs; confounding.
STAT 513	Theory of Statistics I	Probability models, random variables, expectation, generating functions, distribution theory, limit theorems, parametric families, exponential families, sampling distributions.
STAT 514	Theory of Statistics II	Sufficiency, completeness, likelihood, estimation, testing, decision theory, Bayesian inference, sequential procedures, multivariate distributions and inference, nonparametric inference.
STAT 515	Stochastic Processes and Monte Carlo Methods	Conditional probability and expectation, Markov chains, Poisson processes, Continuous-time Markov chains, Monte Carlo methods, Markov chain Monte Carlo.

STAT 518	Probability Theory	Measure theoretic foundation of probability, distribution functions and laws, types of convergence, central limit problem, conditional probability, special topics.
STAT 540	Statistical Computing	Computational foundations of statistics; algorithms for linear and nonlinear models, discrete algorithms in statistics, graphics, missing data, Monte Carlo techniques.
STAT 544	Categorical Data Analysis I	Two-way tables; generalized linear models; logistic and conditional logistic models; loglinear models; fitting strategies; model selection; residual analysis.
STAT 557	Data Mining I	This course introduces data mining and statistical/machine learning, and their applications in information retrieval, database management, and image analysis.
STAT 561	Statistical Inference I	Classical optimal hypothesis test and confidence regions, Bayesian inference, Bayesian computation, large sample relationship between Bayesian and classical procedures.

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