Repeatable up to 3 credits.

organization of code
use of graphical displays to explore, understand, and present data, and on
importation, cleaning, graphing, and basic programming. Emphasis on

STAT 401. Introduction to statistical packages R or SAS, including data
PREREQUISITE: One of the following: STAT 217Q, STAT 332, or

STAT 216Q. Introduction to Statistics: 3 Credits (3 Lec)
PREREQUISITE: Level 3 Math Placement Test within the past 12 months,
or a C- or better in any 100 level or above M course. Traditional and
resistant estimators of location and spread, fundamentals of inference
using randomization and classical methods, confidence intervals, and tests of
hypotheses. This course is taught in the TEAL format. COMMON
EXAMS

STAT 217Q. Intermediate Statistical Concepts: 3 Credits (3 Lec)
PREREQUISITE: C- or better in STAT 216Q or STAT 332. One-
and two-sample tests and associated confidence intervals for means
and proportions; analysis of variance; F-tests, correlation, regression,
contingency tables. Statistical analysis using the computer. COMMON
FINAL ONLY.

STAT 226Q. Honors Introduction to Statistics: 3 Credits (3 Lec)
PREREQUISITE: Enrollment in the MSU Honors Program or consent
of instructor. Honors section of STAT 216Q. Topic coverage parallels
STAT 216Q but with greater emphasis on applications, data analysis and
interpretation, statistical computing, and statistics in the media
-Department of Mathematical Sciences.

STAT 290R. Undergraduate Research: 1-8 Credits (1 Other)
PREREQUISITE: Consent of department head. Directed undergraduate
research. Course will address responsible conduct of research. -
Repeatable up to 8 credits.

STAT 291. Special Topics: 1-4 Credits (1-4 Lec)
PREREQUISITE: None required but some may be determined necessary.
Courses not required in any curriculum for which there is a particular one-
time need, or given on a trial basis to determine acceptability and demand
before requesting a regular course number
Repeatable up to 12 credits.

STAT 332. Statistics for Scientists and Engineers: 3 Credits (3 Lec)
PREREQUISITE: M 172Q. Methods of estimation, data collection,
analysis and display of quantitative information, continuous and discrete
random variables, families of probability distributions, hypothesis testing,
regression, ANOVA

STAT 401. Applied Methods in Statistics: 3 Credits (2 Lec, 2 Lab)
PREREQUISITE: Graduate standing and STAT 216Q. This course is
intended for graduate students not majoring in mathematical sciences
and not ready for STAT 511. Graphical techniques, data collection plans,
populations, samples, sampling distributions, analysis of variance for one-way
classifications, multiple comparisons, simple linear regression

STAT 408. Statistical Computing and Graphical Analysis: 3 Credits (3 Lec)
PREREQUISITE: One of the following: STAT 217Q, STAT 332, or
STAT 401. Introduction to statistical packages R or SAS, including data
importation, cleaning, graphing, and basic programming. Emphasis on
use of graphical displays to explore, understand, and present data, and on
organization of code.
Repeatable up to 3 credits.

STAT 411. Methods for Data Analysis I: 3 Credits (2 Lec, 1 Lab)
PREREQUISITE: STAT 217Q or STAT 332, or equivalent and consent
of instructor. Introduction to statistical inference and design, t-tools, non-
parametric alternatives, one-way ANOVA, simple linear regression, multiple
linear regression, with an emphasis on statistical thinking, appropriate
inference, interpretation of results, and writing

STAT 412. Methods for Data Analysis II: 3 Credits (2 Lec, 2 Lab)
PREREQUISITE: STAT 411. Continuation of STAT 411/STAT 511
to cover principles of experimental design, multi-factor ANOVA,
repeated measures, logistic regression, Poisson log-linear regression, and
introductions to multivariate and time series analyses, with an emphasis on
statistical thinking, appropriate inference and interpretation, and writing.
Co-convened with STAT 512

STAT 421. Probability Theory: 3 Credits (3 Lec)
PREREQUISITE: M 273Q and M 242 Strongly recommended.
Fundamentals of probability; discrete and continuous random variables;
expected value; variance; joint, marginal, and conditional distributions;
conditional expectations; applications; simulation; central limit theorem;
order statistics

STAT 422. Mathematical Statistics: 3 Credits (3 Lec)
PREREQUISITE: STAT 421. Senior capstone course. Introduction to the
theory of point estimation, interval estimation, and hypothesis testing

STAT 425. Biostatistical Data Analysis: 3 Credits (3 Lec)
PREREQUISITE: STAT 421. Co-convened with STAT 525 Department of
Mathematical Sciences

STAT 431. Nonparametric Statistics: 3 Credits (3 Lec)
PREREQUISITE: One of the following: STAT 217Q, STAT 332,
STAT 401 or STAT 411/STAT 511. Goodness-of-fit tests, sign tests,
randomization and permutation tests, Wilcoxon and Mann-Whitney tests,
Kruskal-Wallis and Friedman’s tests, Spearman and Kendall’s measures of
association, bootstrap techniques, and other alternative nonparametric test
procedures. Emphasis on methods and interpretations rather than theory

STAT 436. Introduction to Time Series Analysis: 3 Credits (3 Lec)
PREREQUISITE: STAT 411/STAT 511 or consent of instructor. An
introduction to time series analysis considering time series regression,
autoregressive, moving average, and ARIMA models, time series model
building, estimation, and forecasting, and basic frequency domain methods.
Co-convened with STAT 536

STAT 437. Introduction to Applied Multivariate Analysis: 3 Credits (3 Lec)
PREREQUISITE: STAT 411 or STAT 511 or consent of instructor. Classic
multivariate methods, including but not limited to principal components
analysis, canonical correlation analysis, factor analysis, discrimination and
classification methods, cluster analysis, and other topics may depend on
instructor

STAT 439. Introduction to Categorical Data Analysis: 3 Credits (3 Lec)
PREREQUISITE: STAT 412/STAT 512. Contingency table analysis,
Poisson regression, logistic regression, log-linear models, multivariate logit
models

STAT 441. Experimental Design: 3 Credits (3 Lec)
PREREQUISITE: STAT 411/STAT 511 and M 221 or M 333 or M 441
or consent of instructor. An introduction to the design and analysis of
experiments: topics include analysis of variance methods, matrix forms,
multiple comparisons, fixed and random effects, factorial designs, balanced
complete and incomplete blocking designs, designs with nested effects, and
split plot designs
STAT 446 Sampling: 3 Credits (3 Lec)
PREREQUISITE: One of the following: STAT 217Q, STAT 332, STAT 401, STAT 411, or STAT 511. Probability sampling, sources of bias and uncertainty, survey design, methods for the natural sciences, simple random sampling, stratified random sampling, systematic sampling, cluster sampling

STAT 448 Mixed Effects Models: 3 Credits (3 Lec)
PREREQUISITE: STAT 411/STAT 511 or consent of instructor. In-depth analysis of random, fixed and mixed effects models including use of statistical software and interpretation of results. Emphasis on observations correlated in time (repeated measures) and space, and on random coefficients models (growth curves)

STAT 490R Undergraduate Research: 1-6 Credits (1 Other)
PREREQUISITE: Junior standing in statistics and consent of department head. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated. Repeatable up to 12 credits.

STAT 491 Special Topics: 1-4 Credits (1-4 Lec)
PREREQUISITE: Course prerequisites as determined for each offering. Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requiring a regular course number. Repeatable up to 12 credits.

STAT 492 Independent Study: 1-3 Credits (1-3 Other)
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis. Repeatable up to 6 credits.

STAT 494 Seminar: 1 Credits (1 Other)
PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting material. Repeatable up to 4 credits.

STAT 498 Internship: 2-12 Credits (2-12 Other)
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. Repeatable up to 12 credits.

STAT 501 Intermediate Probability and Statistics: 3 Credits (3 Lec)
PREREQUISITE: STAT 422 or consent of instructor. Families of probability distributions, distributions of functions of random variables, limiting distributions, order statistics. Cross-listed with M 501

STAT 502 Intermediate Mathematical Statistics: 3 Credits (3 Lec)

STAT 505 Linear Models: 3 Credits (3 Lec)
PREREQUISITE: STAT 412 or STAT 512. Special matrix theory for statistics, multivariate normal distribution, distributions of quadratic forms, estimation and testing for the general linear model, one-way and two-way classification models, contrasts (main effect, simple effect and interaction), multiple comparison techniques

STAT 506 Advanced Regression Analysis: 3 Credits (3 Lec)
PREREQUISITE: STAT 505. Applications of linear models using statistical packages; detecting and dealing with violations of assumptions including nonconstant variance, nonnormality, and collinearity; mixed effects models

STAT 509 Stochastic Processes: 3 Credits (3 Lec)
PREREQUISITE: STAT 421. Conditional probability theory, discrete and continuous time markov chains including birth and death processes and long run behavior; Poisson processes; queuing systems; system reliability. Cross-listed with M 509

STAT 510 Statistical Consulting Seminar: 1 Credits (1 Other)
PREREQUISITE: Graduate standing in statistics. Seminar discussions of issues and cases in statistical consulting. Supervised practice in consulting with researchers from various disciplines. Repeatable up to 6 credits.

STAT 511 Methods of Data Analysis I: 3 Credits (2 Lec, 1 Lab)
PREREQUISITE: Graduate standing, STAT 216Q or STAT 401, and consent of instructor. This course targets non-statistics graduate students. Introduction to statistical inference and design, t-tools, non-parametric alternatives, one-way ANOVA, simple linear regression and multiple linear regression, with an emphasis on statistical thinking, appropriate inference, interpretation of results and writing. Semester project required.

STAT 512 Methods of Data Analysis II: 3 Credits (2 Lec, 2 Lab)
PREREQUISITE: STAT 411/STAT 511 (co-convened). Continuation of STAT 411/STAT 511 to cover principles of experimental design, multi-factor ANOVA, repeated measures, logistic regression, Poisson log-linear regression, and introductions to multivariate and time series analyses, with an emphasis on statistical thinking, appropriate inference and interpretation, and writing. A semester project is required. Co-convened with STAT 412

STAT 520 Topics in Applied Statistics: 3 Credits (3 Lec)
PREREQUISITE: STAT 422 and consent of instructor. Current topics selected from computational statistics, time series and spatial statistics, decision theory, sampling, linear and mixed models, and multivariate statistics.

STAT 525 Biostatistics: 3 Credits (3 Lec)
PREREQUISITE: STAT 411 or STAT 511. Statistical methodology applicable to vital statistics, life tables and survival curves, clinical trials, epidemiologic investigations, and cause-effect studies. Co-convened with STAT 425

Department of Mathematical Sciences.

STAT 528 Statistical Quality Control: 3 Credits (3 Lec)
PREREQUISITE: STAT 421 or an equivalent transfer course in probability theory. Modeling process quality, traditional SQC tools, control charts for variable and attribute data, CUSUM and WMA charts, process capability analysis, reliability statistics, accelerated testing

STAT 532 Bayesian Data Analysis: 3 Credits (3 Lec)
PREREQUISITE: STAT 422 or STAT 402 or M 502 and STAT 506 recommended. Fundamentals of Bayesian inference, methods of Bayesian data analysis, computational methods for posterior simulation, fundamentals of hierarchical modeling

STAT 534 Spatial Data Analysis: 3 Credits (3 Lec)
PREREQUISITE: STAT 412, STAT 512, and STAT 422, or equivalent, or consent of the instructor. Statistical methods of spatial data analysis, stationary and nonstationary random fields, covariance structures, geostatistical models and analysis, spatial point process models and analysis, spatial lattice models and analysis

STAT 536 Time Series Analysis: 3 Credits (3 Lec)
PREREQUISITE: STAT 411, STAT 511, or consent of the instructor. An introduction to time series analysis considering time series regression, autoregressive, moving average, and ARIMA models, time series model building, estimation, and forecasting, and basic frequency domain methods. Co-convened with STAT 436

Department of Mathematical Sciences.
STAT 537  Multivariate Analysis I: 3 Credits (3 Lec)
PREREQUISITE: STAT 505. Multivariate regression, principal components analysis, exploratory and confirmatory factor analysis, discriminant and classification analysis, cluster analysis, classification and regression trees, basic structural equation modeling, along with bagging and boosting methods

STAT 538  Multivariate Analysis II: 3 Credits (3 Lec)
PREREQUISITE: STAT 537. Special topics in multivariate analysis including general latent variable methods, analysis of covariance structures, common principle components, robust and distribution free multivariate analysis

STAT 539  Generalized Linear Models: 3 Credits (3 Lec)
PREREQUISITE: STAT 422 and STAT 411/STAT 511. Analysis of categorical data including logistic regression, log-linear models, analysis of deviance, extrabinnomial variation, quasi-likelihood

STAT 541  Experimental Design: 3 Credits (3 Lec)
PREREQUISITE: STAT 411/STAT 511 and M 221 or M 333 or M 441. An introduction to the design and analysis of experiments: topics include analysis of variance methods, matrix forms, multiple comparisons, fixed and random effects, factorial designs, balanced complete and incomplete blocking designs, designs with nested effects, and split plot designs

STAT 550  Advanced Mathematical Statistics: 3 Credits (3 Lec)
PREREQUISITE: STAT 502 or M 502 and either M 384, M 505, or M 547. Sufficiency, completeness, ancillary statistics, invariance, likelihood-based inference, large sample theory, Edgeworth and saddlepoint approximations

STAT 575  Professional Paper and Project: 1-4 Credits (1-4 Lec)
PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee
Repeatable up to 6 credits.

STAT 576  Internship: 1-12 Credits (1-12 Other)
PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field
Repeatable up to 99 credits.

STAT 578  Response Surface Methodology: 3 Credits (3 Lec)
PREREQUISITE: STAT 541 or STAT 505. Diagnostics; fractional-factorial designs; method of steepest ascent; canonical analysis; response optimization; ridge analysis; response surface design including central composite designs, orthogonal designs, rotatable designs, and optimal designs; mixture designs

STAT 589  Graduate Consultation: 3 Credits (3 Other)
PREREQUISITE: Master’s standing. This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time

STAT 590  Master’s Thesis: 1-10 Credits (1-10 Other)
PREREQUISITE: Master’s standing
Repeatable up to 99 credits.

STAT 591  Special Topics: 1-4 Credits (1-4 Lec)
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability
Repeatable up to 12 credits.