The 2012–2013 university catalog was published online in February 2011. You can access it at [http://catalog.iastate.edu](http://catalog.iastate.edu). Previous catalogs can be found at [http://catalog.iastate.edu/previouscatalogs](http://catalog.iastate.edu/previouscatalogs).

Course changes for the 2013 – 2014 university catalog were submitted in April. Thanks to all of you who sent in changes to courses that you usually teach. Thanks to all of you who worked on revising the graduate program and special thanks to Mark Kaiser for providing me with the descriptions for the new/revised courses in the graduate program.

Below is a summary of the descriptions for new/revised courses and former experimental courses that will be in the next catalog.

### Undergraduate Courses

**STAT 201. Introduction to Applied Statistics.** (3-2) Cr. 4. S. Prereq: Credit or enrollment in Math 165. Statistical thinking; display and summary of data; comparing data distributions. The Normal model. Association, correlation and simple linear regression. Re-expressing data. Collecting data. Sampling distribution models. Inference for proportions; inference for means. Comparison of proportions, comparison of means. Credit for only one of the following courses may be applied toward graduation: Stat 101, 104, 105, 201, 226.

**STAT 301. Intermediate Applied Statistics.** (3-2) Cr. 4. F, S. Prereq: STAT 101 or STAT 104 or STAT 105 or STAT 201 or STAT 226. Statistical methods for analyzing and interpreting numerical data. Statistical models for numerical responses; estimation; hypothesis testing with continuous and discrete data; simple linear and multiple linear regression and correlation; residuals; outliers; leverage; influential points; multicollinearity. Model fitting. Credit for only one of the following courses may be applied for graduation: Stat 301, 326, 401.

**STAT 410. Statistical Methods for Mathematics Teachers.** (6-0) Cr. 6. SS. Prereq: STAT 341 or equivalent. Descriptive statistics; data collection through experimentation and sampling; univariate statistical inference; contingency tables; design of experiments and ANOVA; simple linear regression; logistic regression; multiple linear regression; statistical pedagogy. Non-major graduate credit.

**STAT 444. Bayesian Data Analysis.** (3-0) Cr. 3. S. Prereq: STAT 301, STAT 326 or STAT 401 and STAT 447 or credit or enrollment in STAT 342. Probability models and prior distributions; updating priors through the likelihood function. Computational and simulation-based methods for deriving posterior distributions and for estimating parameters. Basic statistical and hierarchical models. Model adequacy and posterior predictive checks. Markov Chain Monte Carlo methods and introduction to WinBUGS or similar software. Emphasis on applications and examples from the social, biological and physical sciences. Non-major graduate credit.
**Statistical Methods I.** (3-2) Cr. 4. Prereq: STAT 447 or credit or enrollment in Stat 542; knowledge of matrix algebra. Analysis of data from designed experiments and observational studies. Randomization-based inference; inference on groups’ means; nonparametric bootstrap; pairing/blocking and other uses of restricted randomization. Use of linear models to analyze data; least squares estimation; estimability; sampling distributions of estimators; general linear tests; inference for parameters and contrasts. Model assessment and diagnostics; remedial measures; alternative approaches based on ranks.

**Statistical Methods II.** (3-0) Cr. 3. S. Prereq: STAT 500, STAT 447 or credit or enrollment in STAT 543. Model selection and collinearity in linear regression. Likelihood analysis for general models and models with non-normal random components; linear model results in the context of likelihood; linear mixed models and their application; estimation, inference, and prediction. Computational issues in iterative algorithms; expectation maximization algorithm and its use in mixed models. Case studies of applications including problem formulation, exploratory analysis, model development, estimation and inference, and model assessment.

**Statistical Methods III.** (3-0) Cr. 3. F. Prereq: STAT 510, STAT 447 or STAT 543. Nonlinear regression; generalized least squares; asymptotic inference. Generalized linear models; exponential dispersion families; maximum likelihood and inference. Designing Monte Carlo studies; bootstrap; cross-validation. Fundamentals of Bayesian analysis; data models, priors and posteriors; posterior prediction; credible intervals; Bayes factors; types of priors; simulation of posteriors; introduction to hierarchical models and Markov Chain Monte Carlo methods.


Ph.D. Level Graduate Courses

STAT 601. Advanced Statistical Methods. (3-0) Cr. 3. S. Prereq: STAT 520, STAT 543 and Math 414 or credit or enrollment in STAT 641. Methods of constructing complex models including adding parameters to existing structures, incorporating stochastic processes and latent variables. Use of modified likelihood functions; quasi-likelihoods; profiles; composite likelihoods. Asymptotic normality as a basis of inference; Godambe information. Sample reuse; block bootstrap; resampling with dependence. Simulation for model assessment. Issues in Bayesian analysis.

STAT 602. Modern Multivariate Statistical Learning. (3-0) Cr. 3. Alternate S 2013. Prereq. STAT 520, STAT 543, and STAT 579. Statistical theory and methods for modern data mining and machine learning, inference, and prediction. Variance-bias trade-offs and choice of predictors; linear methods of prediction; basis expansions; smoothing, regularization, and reproducing kernel Hilbert spaces; kernel smoothing methods; neural networks and radial basis function networks; bootstrapping, model averaging, and stacking; linear and quadratic methods of classification; support vector machines; trees and random forests; boosting; prototype methods; unsupervised learning including clustering, principal components, and multi-dimensional scaling; kernel mechanics.

