

Applied Statistics Program

Graduate Student Handbook

The University of Alabama

July, 2004

This Handbook is for graduate students and those considering graduate study in the Applied Statistics Program at The University of Alabama. It is intended as a supplement to the Graduate School Catalog which is available upon request. (See <http://www.cba.ua.edu/~apst/> and <http://www.ua.edu/graduate/>.)

Applied Statistics Graduate Student Handbook

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October 15, 2004

Dear Student:

This Handbook describes various aspects of the Applied Statistics Program at the University of Alabama. Please refer to the Graduate Catalog for more information and details on the requirements of the Graduate School.

The Faculty of the Applied Statistics Program has also included some practical advice, which should benefit you during your years in graduate school. You are encouraged to discuss any of your questions about your program with any of the Applied Statistics faculty.

The Statistics faculty work to provide the best possible environment for a sound graduate education in statistical theory and practice. We appreciate your involvement in the program and wish you much success.

Sincerely,

Michael D. Conerly
Director, Applied Statistics Program
E-Mail: mconerly@cba.ua.edu

P. S. In the spirit of continuous improvement, we encourage your input to improve this Handbook. Please offer suggestions or recommend other topics which need to be discussed for the benefit of our current and future students.

General Information

The Applied Statistics Program at The University of Alabama

The Graduate School and the Applied Statistics Program offer the degrees of Doctor of Philosophy and Master of Science in Applied Statistics. These degree programs are designed to afford maximum flexibility. Students are permitted to specialize in several areas of statistics and statistical applications. All students are encouraged to develop their own interests. The program of courses may vary from student to student depending on the student's interest, academic background, and career plans. The student's program is supervised by a committee of statisticians on the University faculty. Enrollment in advanced courses is small, and students work in close association with the faculty.

The Applied Statistics Program offers general courses in probability, mathematical statistics, Bayesian and classical statistical methods, and specialized courses in topics such as linear models, experimental design, nonparametric statistics, multivariate analysis, statistical computing, and quality control. Interdisciplinary fields of study may be chosen from various related subjects including econometrics, finance, marketing, management science, management information systems, mathematics, operations research, psychometrics, and computer science. The Masters degree has concentrations in data mining, actuarial science, biostatistics, and quality management. These will be discussed further in a later section of this handbook.

The University of Alabama

The 850-acre campus is itself a historic site. Established in 1831, the University was burned by Union troops in 1865. Four original structures were saved and are part of today's campus, where about 23,000 students are enrolled. A recent building program produced a sophisticated concert hall, an interdisciplinary research center, and a science research center. The University's goal is to grow, yet keep its historic flavor.

Although progress is our standard and academic excellence our strongest commitment, The University of Alabama has a strong institutional identity and many traditions. From our historic and beautiful campus to our winning football and women's gymnastics teams of national renown, the University gives its students and alumni many reasons to be proud.

Tuscaloosa

With a metropolitan statistical area of approximately 170,000, Tuscaloosa is the cultural, business, and industrial heart of West Alabama. Tuscaloosa offers modern recreational facilities, a variety of arts and entertainment, and a thriving business community that includes the first Mercedes-Benz plant in the United States. That community is also supported by close ties to business and industry in Birmingham, the largest city in Alabama; Mobile, an international seaport; and Huntsville, home of the U. S. Space and Rocket Center and its related technology. Tuscaloosa is also within a half-day's drive of such popular travel destinations as the Gulf Coast, Atlanta, New Orleans, and the Great Smoky Mountains.

Facilities

Business students and Applied Statistics students enjoy facilities in the Business School complex. Alston Hall houses administrative and faculty offices. Bidgood Hall contains state of the

art electronic, multimedia classrooms and graduate assistant offices. The Bruno Library and Bashinsky Computing Center are housed together in one new building. Setting a new regional standard, the impressive three-building complex offers access to student computer labs, an excellent library, and free on-line bibliographic, financial, and textual searches of more than 200 databases.

The Bashinsky Computer Center offers a broad range of technical resources for use by students, faculty, and staff. The lab maintains more than 200 personal computers for student use. These machines are part of a network that connects to the campus mainframe, the broadband, and the Internet. Network file servers provide access to dozens of powerful application programs. A staff of knowledgeable consultants is available at all times to provide technical support.

In addition, some offices and classroom space is available in the new Shelby Hall that was dedicated in May 2004. This space is primarily for students working on projects for the data mining classes or Transportation related research as well as projects for the Institute of Business Intelligence.

Application and Admission Information

Admission

Admission to the Applied Statistics Program is open to qualified individuals who hold undergraduate and/or graduate degrees from accredited colleges and universities, and satisfy the stated prerequisites.

Applicants are normally expected to have completed courses in mathematics equivalent to three semesters of undergraduate calculus, and to have a working knowledge of computer programming and matrix algebra. The verbal, quantitative, and analytical portions of the Graduate Record Examination (GRE) are required of all applicants to the Applied Statistics Program. International Students must submit scores on the Test of English as a Foreign Language (TOEFL).

We prefer that students begin their program in the fall semester. We encourage applicants to complete the application process by March 1st of the year in which they would like to be admitted. We accept applications into the summer, however, if available positions have not been filled.

Individuals seeking admission to the Applied Statistics Program should follow the application procedure outlined in the Graduate School Catalog. Applications must be submitted on-line at www.graduate.ua.edu/application/index.html. All application materials including transcripts, test scores must be submitted to The Graduate School, University of Alabama, Box 870118, Tuscaloosa, AL 35487-0118. Letters of reference may be sent directly to Michael Conerly, Program Director, The University of Alabama, Box 870226, Tuscaloosa, AL 35487-0226.

Financial Aid

A number of financial support packages are available for qualified applicants. The Graduate School offers Graduate Council Fellowships on a competitive basis for highly qualified applicants. These fellowships involve no work obligations and are generally awarded for the first year of the applicant's program. In 2004-05, these fellowships provide \$15,000 in support plus a full tuition waiver. The Graduate School also offers some fellowships for summers and subsequent years of the

student's program. This support is awarded on a competitive basis. Students in the Applied Statistics Program have been very successful in obtaining these awards.

Some students in the Applied Statistics Program receive support through departmental assistantships. The awards are approximately \$11,500 per year with a full tuition grant for a full-time student (.5 FTE award) in the program. These awards involve nine-month assignments as either a teaching and/or research assistant. Summer teaching assignments are often available. Advanced students have the opportunity to work as statistical consultants on campus or industry supported projects through the Institute of Business Intelligence, Alabama Productivity Center, University Transportation Center of Alabama, research grants or other sources.

Additional one-year recruiting fellowships are offered through the College of Commerce and Business Administration on a competitive basis. These fellowships range in amounts from \$500 to \$3,000 and are used to supplement the above-mentioned fellowships and assistantships. Students in Applied Statistics have been very successful in obtaining these fellowships.

Students accepted into the Applied Statistics Program are automatically considered for fellowships and assistantships. Students need not apply separately for these awards.

Housing

The University operates over 385 on-campus apartments. These facilities offer students the best of independent living, as well as the convenience of living on campus. Graduate and married students receive preference on these units. Applications are available from the Office of Housing and Residential Life, Box 870399, Tuscaloosa, AL 35487-0399. A deposit is required with each application. Because of the demand for apartments, it is recommended that applicants apply early.

The Tuscaloosa area offers a wide variety of apartments and condominiums. The Tuscaloosa Apartment and Condominium Guide is the best source of information on available housing in the area. It can be found in printed form at local realty offices and grocery stores. The Guide is also available at www.tuscaloosaapartmentguide.com.

Graduate Student Offices

Graduate teaching assistants (GTA's) and graduate research assistants (GRA's) in the College of Commerce and Business Administration are usually provided with office space on the third floor of Bidgood Hall. In addition, there is a graduate student lounge in Bidgood. Other Applied Statistics students may be provided office space in Shelby Hall.

General Academic Policies of the Applied Statistics Program

Prerequisites

Students entering the Applied Statistics Program must have mathematics courses equivalent to three semesters of undergraduate calculus and a working knowledge of matrix algebra and a computer programming language (*e.g.*, Fortran, C++ or Java).

Transfer Credit

Courses of full graduate-level credit with a grade of B or higher earned in an accredited institution where a student was enrolled in the graduate school may be submitted for review for inclusion in a degree program. Evaluation of credit for transfer will not be made until the student has enrolled in the Graduate School of The University of Alabama. Acceptance of credit requires the approval of the program director and the dean of the Graduate School. Credit will not be accepted for transfer from any institution at which the student failed to achieve at least a "B" average on all graduate work attempted.

A student initiates the request for evaluation of graduate credit obtained at another institution at the Office of the Graduate School. It is also the student's responsibility to assure that an official transcript of the credit concerned is received by the Office of the Graduate School.

With the approval of the program director and the dean of the Graduate School, the greater of 12 hours or 25% of the required coursework for a graduate degree may be transferred from another institution. All credit toward the master's degree, including transfer credit, must have been earned during the six years (18 fall, spring, and summer semesters) immediately preceding the date on which the degree is to be awarded.

Course Load

The typical course load for a graduate student in Applied Statistics is 9-12 hours per semester. Graduate assistants with 0.25 FTE assignments (10 hours per week) must enroll in at least 9 hours, but no more than 12 hours of coursework. International Graduate assistants with 0.5 FTE assignments (20 hours per week) must enroll in at least 6 hours but no more than 9 hours of coursework.

Academic Progress

A graduate student with regular status in a graduate program who drops below a "B" average (at any time after earning six semester hours) will be placed on probation. A student on probationary status must raise his or her overall average to a "B" or better during the next 12 hours of graduate work following the period in which the probation occurred. Failure to do so will result in the student's dismissal from the program.

A grade of "I" (incomplete) is evaluated as an "F," and must be removed within two weeks during the next term of enrollment if the student's grade point average drops below a "B" as a result of the incomplete grade. The evaluations of academic progress of students who register with "I" grades still on their records can result in academic probation or dismissal.

Courses may not be repeated for graduate credit. This includes courses initially taken on an audit basis. However, a course that is required in a student's curriculum in which a "D" or "F" is

earned may be repeated for credit, upon the recommendation of the major department or program area and the dean of the Graduate School. Both grades will be considered in the computation of the grade point average.

Graduation Requirements

The student must have a cumulative average grade of not less than "B" in graduate courses undertaken at The University of Alabama, and at least seventy-five percent of the hours taken must have been completed with grades of not less than "B." Grades below "C" are counted in computing grade point averages, but do not carry credit toward a degree.

A maximum of six semester hours of 400-level course credit may be accepted for a master's degree. Such credit must be approved by a faculty advisor, the instructor(s) of the course(s) in question, and the Graduate School. No 400-level credit (except the six hours accepted toward the master's degree) may be accepted for the doctoral degree.

Applied Statistics Course Descriptions

ST 521 Statistical Data Management. Three hours. Introduction to the management of data using SAS. The collection and management of data from business or scientific research projects are emphasized.

ST 522 Advanced Data Management. Three hours. Prerequisite: ST 521. Advanced topics for manipulating large data sets.

ST 531 Knowledge Discovery and Data Mining I. Three hours. Data Mining is the process of selecting, exploring and modeling large amounts of data to uncover previously unknown patterns of data. Techniques for accomplishing these tasks in a business setting will be discussed. Enterprise Miner (SAS) is used extensively in this course. Real examples are explored to illustrate the techniques discussed in class.

ST 532 Data Mining II. Three hours. Prerequisite: ST 521 and ST 531. In-depth study of data mining techniques including logistic regression, classification and regression trees, and neural networks.

ST 535. Nonparametric Statistics. Three hours. Prerequisite: ST 550, 560, or equivalent. Theory and applications of distribution-free statistical inference techniques in classical and nonparametric problems.

ST 552. Applied Regression Analysis. Three hours. Prerequisite: ST 450 or ST 560. Model development using multiple regression analysis. Analysis of residuals including plots and influence measures; variable transformations; biased estimation; variable selection.

ST 553. Applied Multivariate Analysis. Three hours. Prerequisite: ST 451 or ST 561. Methods and business applications of multivariate analysis, discriminant analysis, canonical correlation, factor analysis, and principal components.

ST 554. Mathematical Statistics I (same as MA 554). Three hours. Prerequisite: MA 227. Distributions of random variables, moments of random variables, probability distributions, joint distributions, and change of variable techniques.

ST 555. Mathematical Statistics II (same as MA 555). Three hours. Prerequisite: ST 554. Order statistics, asymptotic distributions, point estimation, interval estimation, and hypothesis testing.

ST 560. Statistical Methods in Research I. Three hours. Prerequisite: MA 126. Statistical methods for summarizing data; probability; common probability distributions; sampling and sampling distributions; estimation and hypothesis testing for means, proportions, and variances using parametric and nonparametric procedures; power analysis; goodness of fit; contingency tables; and simple regression and one-way analysis of variance.

ST 561. Applied Design of Experiments. Three hours. Prerequisite: one of the following - GES 400, GES 500, BER 540, CHS 425, CHS 525, ST 450, ST 550, or ST 560. An introduction to the design and analysis of experiments. Topics include factorial, fractional factorial, block, incomplete block, and nested designs. Other methods discussed include Taguchi methods, response surface methods, and analysis of covariance.

ST 565. Sampling Techniques. Three hours. Prerequisite: OM 300 or equivalent. Planning, execution, and evaluation of sample surveys. Simple, random, stratified, and cluster sampling;

multi-stage and systematic sampling; questionnaire design; cost functions; and optimal designs. Teams will plan, perform, and analyze actual sample surveys.

ST 570. Time Series Analysis. Prerequisite: ST 555 or EC 671 or consent of the instructor. Box-Jenkins modeling of both stationary and non-stationary Time Series. Autoregressive (AR) processes, moving average (MA) processes as well as mixed (ARMA) processes will be discussed. Model identification and estimation as well as forecasting procedures will be discussed.

ST 575. Statistical Quality Control. Three hours. Prerequisite: OM 300 or equivalent. Statistical methods useful in control of quality of manufactured products. Shewhart and cumulative sum control charts; process capability analysis; and acceptance sampling procedures by attributes and variables. Emphasis will be placed on understanding, design, implementation, and interpretation of these techniques.

ST 580. Analysis of Categorical-Level Data. Three hours. Prerequisite: ST 451 or ST 560. Logit and probit models, including dichotomous and multichotomous response functions. Discrete choice models. Log-linear models for multiway contingency tables. Procedures for analyzing ordinal level data.

ST 591. Independent Study in Statistics. Three hours.

ST 592. Internship in Statistics. Three hours.

ST 597. Special Topics in Statistics. Variable credit.

ST 598. Research in Statistics. Variable credit.

ST 599. Thesis Research in Statistics. Variable credit.

ST 603. Advanced Inference. Three hours. Prerequisite: ST 555 or equivalent. A continuation of ST 555 with emphasis on the theory of estimation and hypothesis testing, elements of decision theory, and large sample distribution theory, and miscellaneous topics in statistical inference.

ST 610. Linear Models. Three hours. Prerequisite: ST 555 or equivalent. Gauss-Markov Theorem, solution of linear systems of less than full rank, generalized inverse of matrices, distributions of quadratic forms, and theory for estimation and inference for the general linear model.

ST 611. Design and Analysis of Experiments. Three hours. Prerequisite: ST 610 or equivalent. General theory for analysis of block designs. Latin/Graeco-Latin/Youden Squares, analysis of factorial treatments in arbitrary block designs to include fractional factorials, confounding, and aliasing.

ST 615. Theory of Regression. Three hours. Prerequisite ST 610 or equivalent. Theory of general linear regression models and inference procedures. Variable selection procedures and alternate estimation methods including principal component regression, ridge regression, and nonlinear regression.

ST 635. Theory of Multivariate Analysis. Three hours. Prerequisite: ST 610 or equivalent. Multivariate normal distributions, inference, multiple and partial correlation, classification, multivariate analysis of variance, principal components, factor analysis, and canonical analysis.

ST 640. Statistical Computing. Prerequisites: ST 552 or its equivalent; MA 255 or its equivalent; experience with a computer programming language such as FORTRAN, C, Pascal, or Basic; or permission of the instructor. Topics include a survey of current statistical software, numerical

methods for statistical computations, nonlinear optimization, statistical simulation, and recent advances in computer-intensive statistical methods.

ST 675. Advanced Statistical Quality Control. Three hours. Prerequisite: ST 555 and ST 575 or equivalent. Theoretical approaches to statistical process control procedures and the design of experiments for quality improvement.

ST 698. Research and Consulting in Statistics. Three hours each semester. Open only to graduate students nearing completion of coursework. Independent study and investigation of specific problems for advanced students of statistics.

ST 699. Dissertation Research. Variable credit.

Courses in the Math Department:

- MA 554 Mathematical Statistics I (same as ST 554)
- MA 555 Mathematical Statistics II (same as ST 555)
- MA 556 Mathematical Statistics III
- MA 557 Stochastic Processes
- MA 653 Probability Models I
- MA 659 Seminar - Probability Models

Courses in the Department of Education Research:

- BER 540 Statistical Methods in Education
- BER 545 Analysis of Variance in Education
- BER 546 Regression Methods in Education
- BER 640 The General Linear Model in Behavioral Research
- BER 645 Advanced Topics in Experimental Design

Courses in the Department of Industrial Engineering:

- IE 521 Reliability, Maintainability, and Total Productive Maintenance
- IE 525 Statistical Quality Control
- IE 526 Design and Analysis of Experiments
- IE 577 Analysis of Queueing Systems
- IE 622 Quality Engineering
- IE 628 Advanced Design of Experiments

Master's Degree in Applied Statistics

General Requirements

The general requirements for the M. S. degree in Applied Statistics are outlined in the Graduate School Catalog (see Interdisciplinary Programs). The coursework requirements are described below. The student must pass a written comprehensive field examination when the coursework is nearly completed. This usually occurs in January before the last semester begins. Typically, two academic years are required to complete all program requirements.

Candidates for the master's degree must earn a minimum of 36 semester hours of credit in coursework. There are five different tracks for the MS degree available. These will be outlined below.

Course Requirements:

Required Core Courses (18 hours)

ST 560 Statistical Methods	ST 561 Applied Design of Experiments
ST 554 Mathematical Statistics I	ST 555 Mathematical Statistics II
ST 552 Applied Regression Analysis	ST 553 Applied Multivariate Analysis

Additional Requirements

- choose 6 hours of Statistics Electives
- and one of following Tracks

Traditional Track

- ST 535, Nonparametric Statistics
- ST 575, Statistical Quality Control
- 6 hours of InterDisciplinary Field Courses

Biostatistics Track

- ST 535 Nonparametric Statistics
- ST 521 Statistical Data Management
- CHS 520, Introduction to Epidemiology
- CHS 625, Advanced Epidemiology

Actuarial Science Track

- ST 535 Nonparametric Statistics
- ST 575 Statistical Quality Control
- FI 443, Property and Liability Insurance
- FI 444, Life and Health Insurance

Data Mining Track

- ST 521, Statistical Data Management
- ST 522, Advanced Data Management
- ST 531, Data Mining I
- ST 532, Data Mining II
- 6 hours of InterDisciplinary Field Courses

* ST 531 and ST 532 satisfy the 6 hrs Statistics Electives in the Data Mining Track.

Quality and Six Sigma Track

- ST 575, Statistical Quality Control
- 3 hrs of Statistics Electives
- IE 521, Reliability, Maintainability and Total Productive Maintenance
- IE 622, Quality Engineering

Statistics Electives

The following list of courses or related coursework approved by the Applied Statistics Faculty can be used as suitable Statistical electives.

ST 521 Statistical Data Management
ST 522 Advanced Data Management
ST 531 Data Mining I
ST 532 Data Mining II
ST 535 Nonparametric Statistics
ST 575 Statistical Quality Control
ST 565 Sampling Techniques

ST 570 Time Series Analysis
ST 591 Independent Study
ST 597 Special Topics
ST 603 Advanced Inference
ST 610 Linear Models
ST 640 Statistical Computing
ST 698 Statistical Consulting

InterDisciplinary Field Courses (6 hours)

M. S. students in Applied Statistics must complete six (6) hours in an approved interdisciplinary field of study. Approved courses and interdisciplinary fields are shown below. For some tracks these are specific courses listed above. In rare cases, an exception might be made to allow a student to take one course in each of two interdisciplinary fields. An advisor should be consulted about these and other possible fields of specialization.

Finance

FI 510 Financial Management
FI 514 Investments
FI 512 Money and Capital Markets

Management Science

MGS 500 Management Science I
MGS 501 Management Science II

Economics

EC 570 Mathematical Economics
EC 571 Econometrics

Computer Science

CS 511 Introduction to Computing
CS 512 C Programming under Unix
CS 513 Introduction to Computing (6 hrs)

Community Health Sciences

CHS 625 Advanced Epidemiology
CHS 520 Basic Epidemiology

Industrial Engineering

IE 521 Reliability, Maintainability, and
Total Productive Maintenance
IE 522 Quality Engineering

Mathematics

MA 510 Numerical Linear Algebra
MA 557 Stochastic Processes

Marketing

MKT 674 Research Methods II
MKT 679 Causal Modeling

Other Areas

By approval of Applied Statistics faculty

Suggested Sequence of Study

Trad	Six Sigma	Data Mining	Actuarial Science	Biostat	Trad	Six Sigma	Data Mining	Actuarial Science	Biostat
FIRST YEAR									
FALL					SPRING				
ST 554	ST 554	ST 554	ST 554	ST 554	ST 555	ST 555	ST 555	ST 555	ST 555
ST 560	ST 560	ST 560	ST 560	ST 560	ST 561	ST 561	ST 561	ST 561	ST 561
ST 575	ST 575	ST 521	ST 521	ST 521	ST 552	ST 552	ST 552	ST 552	ST 552
									CHS 520
SECOND YEAR									
FALL					SPRING				
ST 553	ST 553	ST 553	ST 553	ST 553	IDF	IE 521	IDF	FI 444	ST 522
ST 535	IE 622	ST 531	ST 535	ST 535	Elective	Elective	ST 522	Elective	Elective
IDF	Elective	IDF	FI 443	CHS 625	Elective	Elective	ST 532	Elective	Elective

Master's Program Worksheet for Applied Statistics

A worksheet for M. S. students in Applied Statistics is included at the end of this section. At the end of each semester, each student should give an updated copy of this worksheet to the program committee chair for the student's file.

Transfer Credit

With the approval of the student's advisory committee and the dean of the Graduate School, a graduate student may transfer up to one-half of the required coursework from an accredited institution toward his/her degree in Applied Statistics. (Other requirements for transferring credit are discussed under Transfer Credit in the General Academic Policy section.) Any transfer of credit should be discussed with the advisor or program committee. In addition to a valid transcript for such coursework, the syllabus and or the textbook used may have to be provided.

Field Exam

The student must give satisfactory performance on a comprehensive examination to demonstrate his/her competence in statistics. This examination is offered each January by the Applied Statistics Faculty and is normally taken after completing three semesters of coursework. Students are given a second opportunity to pass this exam if initially unsuccessful.

Residency Requirements

A student's program at the Master's level must provide sufficient association with the resident faculty to permit individual evaluation of the student's capabilities and achievements. Normally, such association is exhibited by the student's engaging in full-time continuous residence for a minimum of two semesters, one semester and one summer session, or two summer sessions. It should be noted that graduate courses in statistics are not usually offered in the summer sessions.

Time Limitations

All requirements for the Master's degree must be completed during the six calendar years immediately preceding the date on which the degree is to be awarded.

Ph.D. Degree in Applied Statistics

General Requirements

The general requirements for the Ph.D. degree in Applied Statistics are outlined in the Graduate School Catalog (see Interdisciplinary Programs). Students must complete a minimum of 57 hours of coursework and 24 hours of dissertation research. The Ph.D. course requirements include the requirements for the Masters degree. After completing most of the M.S. level coursework, the student must pass a written examination covering this coursework. This exam is also the M.S. comprehensive exam. For students receiving Masters degrees at other institutions, the timing of when to take this exam is worked out on an individual basis. This examination is usually given in January of each year. In addition, when most of the Ph.D. coursework has been completed, the student must pass a written comprehensive examination. This usually occurs after six or seven semesters in the program for students entering without an advanced degree in Statistics.

The interdisciplinary field coursework requirement can be fulfilled by taking twelve (12) hours of coursework in a maximum of two fields from a list of approved courses in mathematics, computer science, management science, industrial engineering, finance, and other areas.

An original research dissertation must be written, with the supervision of a faculty advisor and approval of the student's dissertation committee chaired by the faculty advisor, which furthers knowledge in the theory and application of statistics.

Students typically take four to five years beyond an undergraduate degree to obtain a Ph.D. in Applied Statistics, usually obtaining the M. S. degree in Applied Statistics along the way.

Required Core Courses (36 hours)

ST 560 Statistical Methods

ST 561 Applied Design of Experiments

ST 554 Mathematical Statistics I

ST 555 Mathematical Statistics II

ST 535 Nonparametric Statistics

ST 552 Applied Regression Analysis

ST 553 Applied Multivariate Analysis

ST 575 Statistical Quality Control

ST 603 Advanced Inference

ST 610 Linear Models

ST 640 Statistical Computing

One of the following:

- ST 615 Theory of Regression, or
- ST 635 Theory of Multivariate Analysis

Additional Degree Requirements (45 hours)

Statistics Electives (9 hours)

In addition to the required 36 hours of statistics coursework, a Ph. D. student in Applied Statistics must complete an additional nine (9) hours in statistics electives from the following list of courses or other courses approved by the Applied Statistics Faculty:

ST 565 Sampling Techniques	ST 675 Advanced Quality Control
ST 570 Time Series Analysis	ST 597 Special Topics
ST 615 Theory of Regression	ST 591 Independent Study
ST 635 Theory of Multivariate Analysis	ST 698 Statistical Consulting

Interdisciplinary Field Courses (12 hours)

Ph. D. students in Applied Statistics must complete twelve (12) hours in approved interdisciplinary field(s) of study. A student may choose to specialize in a single field with 12 hours of coursework or may choose coursework in two separate fields. Approved courses and interdisciplinary fields are shown below. Other possible fields of specialization or courses may be used subject to approval by an advisor.

Finance

FI 510 Financial Management
FI 512 Money and Capital Markets
FI 514 Investments
FI 515 Quantitative Investment Analysis
FI 519 Financial Engineering

Management Science

MGS 500 Management Science I
MGS 501 Management Science II
MGS 502 Management Science III
MGS 522 Production Scheduling
MGS 523 Inventory Management
MGS 531 Multiple Criteria Decision Making
MGS 534 Nonlinear Programming

Community Health Sciences

CHS 520 Basic Epidemiology
CHS 625 Advanced Epidemiology

Computer Science

CS 511 Introduction to Computing
CS 512 C Programming under Unix
CS 513 Introduction to Computing (6 hrs)

Economics

EC 570 Mathematical Economics
EC 571 Econometrics

Industrial Engineering

IE 521 Reliability, Maintainability, and Total Productive Maintenance
IE 522 Quality Engineering

Mathematics

MA 510 Numerical Linear Algebra
MA 511 Numerical Analysis I
MA 512 Numerical Analysis II
MA 520 Optimization Theory I
MA 521 Optimization Theory II
MA 557 Stochastic Processes
MA 580 Real Analysis I
MA 682 Real Analysis II

Marketing

MKT 674 Research Methods II
MKT 679 Causal Modeling

Other Areas

By approval of Applied Statistics faculty

Dissertation Research Credit Hours (24 Hours)

In addition to coursework, a Ph. D. student in Applied Statistics must take 24 hours of dissertation research (ST 699). These credit hours are taken on a pass/fail basis during the dissertation phase of the program of study. Generally, students enroll for ST 699 only after successfully completing the PhD Comprehensive Exam.

Suggested Program of Study

	Fall Semester	Spring Semester
Year 1	ST 560 Statistical Methods	ST 561 Applied Design of Experiments
	ST 554 Mathematical Statistics I	ST 555 Mathematical Statistics II
	ST 575 Statistical Quality Control	ST 552 Applied Regression Analysis
Year 2	ST 553 Applied Multivariate Analysis	ST 603 Advanced Inference
	ST 535 Nonparametric Statistics	Statistics Elective (3 hours)
	Interdisciplinary Field Course	Interdisciplinary Field Course
Year 3	ST 610 Linear Models	ST 640 Statistical Computing
	Statistics Elective (3 hours)	ST 615 Theory of Regression
	Interdisciplinary Field Course	Interdisciplinary Field Course
Years 4-5	Statistics Elective (3 hours) ST 699 Dissertation Research (24 hours)	

Doctoral Program Worksheet for Applied Statistics

A worksheet for Ph. D. students in Applied Statistics is included at the end of this section. At the end of each semester, each student should give an updated copy of this worksheet to the chair of their program committee for the student's file. After the student has selected a dissertation advisor and committee, the student's file will be transferred from the chair of the program committee to the dissertation advisor.

Transfer Credit

Courses of full graduate-level credit with a grade of B or higher earned in an accredited institution where a student was enrolled in the graduate school may be submitted for review for inclusion in a degree program. Evaluation of credit for transfer will not be made until the student has enrolled in the Graduate School of The University of Alabama. Acceptance of credit requires the approval of the program director and the dean of the Graduate School. Credit will not be accepted for transfer from any institution at which the student failed to achieve at least a "B" average on all graduate work attempted.

A student initiates the request for evaluation of graduate credit obtained at another institution at the Office of the Graduate School. It is also the student's responsibility to assure that an official transcript of the credit concerned is received by the Office of the Graduate School.

With the approval of the program director and the dean of the Graduate School, the greater of 12 hours or 25% of the required coursework for a graduate degree may be transferred from another institution. All credit toward the Ph.D. degree, including transfer credit, must have been earned during the seven years immediately preceding the date on which the degree is to be awarded.

Preliminary Exam

The Preliminary Exam is an evaluation of mastery of the first two years of coursework used to determine if a student is ready to proceed with the program of study. This exam, given each January, covers the Masters coursework. This exam is required of all students seeking a Ph.D., even those who already have a Master's degree from some other institution. The exact day and time of the exam is announced each Fall and all eligible students should receive a written notice. Students are given a second opportunity to pass this exam if initially unsuccessful.

Comprehensive Exam

After completing all (or almost all) coursework, the student is ready to take the comprehensive examination. This exam covers all coursework that a student has completed and all required courses. It is intended to cover a wide range of areas in statistics so that the student can demonstrate his/her readiness to pursue research in statistics.

The exam is given in early January. An exact date is announced in the Fall semester prior to the exam. This closed-book examination extends over two eight-hour periods with a one-day break in between. For example, the exam days may be Wednesday and Friday.

Any student interested in taking this exam should notify the Applied Statistics Program Director in the Fall semester before the exam. Students are given a second opportunity to pass this exam if initially unsuccessful.

Admission to Candidacy

A student may apply to the Dean of the Graduate School for admission to candidacy in the Ph.D. program in Applied Statistics after meeting the following requirements:

- Completion of the program of coursework approved by the student's program committee.
- Passing the Comprehensive Exam.
- Successfully defending a dissertation proposal (as described below).

Dissertation Information

The subject must be approved by the Graduate Faculty of the Applied Statistics Program and the Dean of the Graduate School, and the student must have earned 24 hours of dissertation credit under ST 699 to fulfill requirements for the degree.

Choosing a Dissertation Topic

The candidate should choose a dissertation advisor whose research interests coincide with his or her intended area of research. Typically, the student must spend a great deal of time reading the current research literature and working in a particular area of interest to know what has and has not been done in the area. Only then is the student in a position to propose a research topic. The dissertation advisor usually offers considerable advice in this regard.

This process can take up to several months, but is a great learning opportunity. Unlike the coursework experience in the program, the early stages of work on a dissertation tend to be unstructured and require more independent effort on the part of the student. With patience and diligent effort, a student will be successful. When a student is having difficulty in making progress, he/she should seek out his/her advisor for assistance, even if just for moral support.

Ph. D. students are strongly encouraged to read (and re-read from time to time) "The Neophyte Researcher's Miscellany" and the "New Researcher's Survival Guide" included in the Appendix of this Handbook.

Dissertation Committee

Together with the advisor, the candidate must choose a dissertation committee consisting of the dissertation chairman and four other graduate faculty, at least one of whom must be outside the Applied Statistics Program and the Department of Management Science and Statistics.

Dissertation Proposal

Prior to writing a dissertation, a student must present a proposal to his/her dissertation committee. The proposal process is intended to enable the candidate to lay out his or her ideas for a research topic, demonstrate familiarity with the relevant literature and spell out explicitly how he or she intends to pursue this research. The dissertation committee is expected to offer helpful suggestions and enhancements that should improve the quality of the research or, if necessary, to modify the proposed research plan. The candidate must furnish copies of a written proposal (typically 20-30 pages in length) to the committee members at least two weeks prior to the scheduled proposal date. The candidate presents a brief overview of the intended research and answers questions from the committee. If the committee consents to the proposed research then the candidate is ready to embark on completing the dissertation.

Manuscript for Final Dissertation Defense

The candidate must submit a written manuscript to his or her dissertation committee at least two weeks prior to a scheduled defense date. This manuscript must comply with the regulations in the publication *A Manual for Students Preparing Theses and Dissertations* which is available from the Graduate School Office (102 Rose Administration). This publication contains specific guidelines for preparing dissertations and includes samples of the acceptance page and abstract. Deadlines and other useful information are also available in this booklet. Dissertations in Applied Statistics may follow the *American Statistical Association Style Guide* which is available from the ASA website (www.amstat.org/publications/index.cfm?fuseaction=style-guide).

Dissertation Defense

The student should find a date, time and place for the final oral defense agreeable to all members of the Dissertation Committee. It is the candidate's responsibility to notify the Director of the Applied Statistics Program of the arrangements made so that he or she may notify the departmental faculty and the Graduate School (which must be notified at least two weeks before the final oral dissertation defense date). The Dean of the Graduate School then sends a Final Ph.D. Oral Form to the dissertation chairman to be signed by all committee members.

Dissertation Title Card

The Dissertation Title Card may be obtained from the Graduate School. This card indicates the dissertation title and major and must be signed by the dissertation chair. The approved card must be submitted to the Graduate School six weeks before graduation.

Dissertation Forms to be Submitted to the Graduate School

- After successful defense of the dissertation, and at least six weeks before graduation, the student must deposit in the Graduate School two copies of the dissertation in the form specified by the Graduate School and approved by the dissertation committee.
- The dissertation acceptance page must be typed in triplicate with original signatures on each page.
- The dissertation must be accompanied by a receipt for the binding fee.
- The student must also deposit with the Dean of the Graduate School two copies of an abstract of the dissertation, consisting of not more than 350 words, approved by the dissertation advisor.
- The student must satisfy publication requirements by having the dissertation microfilmed by University Microfilms of Ann Arbor, Michigan, and by publishing the abstract in University Microfilms' Dissertation Abstracts. The charge for these services is paid to the University Treasurer, and a receipt for payment must be delivered to the Graduate School.
- A copyright may be obtained through University Microfilms for a nominal fee, but is not required.
- When submitting the dissertation to the Graduate School, the student must identify the style format used for preparing the dissertation. (The ASA Style Guide has been approved by the Graduate School.)
- Approval of the dissertation by the Dean of the Graduate School is necessary before graduation.
- The Graduate School will send the dissertation to a proofer. When proofing is complete, if any corrections or changes are to be made, both copies of the dissertation and all forms will be returned to the dissertation advisor for transmission to the student with a statement describing what changes are needed.

Application for Degree

The student must apply for the Ph. D. degree in Applied Statistics with the Graduate School no later than the registration period of the semester or the first term of the summer session in which requirements are to be completed. The form *Application for Advanced Degree* is required for this purpose and must be completed in duplicate.

Residency Requirements

The University requirement is that the minimum period in which a Ph.D. degree can be earned is three full academic years of graduate study. The student must spend either the second or third academic year in continuous residence as a full-time student in the Graduate School of the University of Alabama. This requirement can be satisfied only by enrolling in coursework. Dissertation or thesis research cannot be used for this purpose. Instructors, fellows and assistants who teach more than three hours should expect to spend more than the minimum period in residence.

Once a student has been admitted to candidacy for a doctoral degree, the student is expected to pursue completion of the dissertation without interruption by enrolling each semester for at least three (3) hours of dissertation research.

Time Limitations

A Ph.D. student in Applied Statistics must complete all requirements for the degree within six years of the date of admission to the program.

GTA and GRA Policies

Many students in the Applied Statistics Program receive support through departmental assistantships. The awards are currently in the \$11,500 range with a full tuition waiver for a full-time student in the Program. These awards involve nine-month assignments as either a teaching and/or research assistant. By accepting these positions, students agree not to hold any other job during the academic year. Summer teaching assignments are often available.

Graduate teaching assistants (GTA's) are assigned either to teaching one to two sections of introductory statistics for undergraduate students (ST 260) or to assisting a faculty member in his or her teaching duties. A GTA must complete 18 hours of graduate study in statistics to be eligible to teach undergraduate classes. In the first year of the program, GTA's are assigned to a professor who is teaching an undergraduate statistics course (ST 260). A GTA is required to attend each lecture in preparation for teaching the course on his or her own in the following year. A GTA assists in grading homework, preparing and grading exams, conducting problem sessions with small groups of students, and helping with other administrative duties associated with the course.

Graduate research assistants (GRA's) are assigned to one or more professors to provide research assistance. This work typically involves library research and computer programming.

GTA and GRA support is awarded on a year-to-year basis. A GTA or GRA is usually reappointed subject to satisfactory completion of his or her duties and satisfactory progress in the Applied Statistics Program. Support is not usually awarded more than two years for M.S. students or more than five years for Ph.D. students.

Guidelines for Graduate Teaching Assistants

The teaching policy for GTA's is primarily the same as that for faculty members in the Department of Management Science and Statistics. Some of the specific duties are:

Office Hours -- All instructors must maintain regular office hours to answer questions from students. A GTA should maintain at least four (4) office hours per week. The schedule of office hours is determined by the faculty member and GTA's at the beginning of each semester and posted in the bulletin board in the basement of Alston Hall. A schedule should also be posted outside the GTA office.

Syllabus -- The supervising faculty member is in charge of developing the common syllabus used in ST 260. The GTA is expected to meet each class for the entire class period and cover the material as described in the syllabus.

Class Attendance -- The GTA is expected to conduct his/her classes regularly as scheduled and to meet each class for the entire class period. In the event of illness or necessary absence from the campus, the GTA must notify the faculty member in charge and arrange for a suitable substitute for missed classroom time. Any arrangements must be reported to the faculty member and the departmental chairperson.

Exams -- The exam schedule is given in the daily syllabus for the course. All exams are expected to be closed-book, except for formula sheets which are allowed. The supervising faculty member can approve all exams and offer advice for improving exams. Different versions of exams should be given in separate sections. If the classroom is crowded, two versions of the exam should be used. Classes should be monitored closely to ensure academic honesty.

Class Records -- GTA's are expected to maintain adequate grade records for all registered students. All grade records should be left with the department chairperson when you leave the University.

Above all, do not hesitate to discuss any problems or issues with the faculty supervisor or any other faculty member.

The *Graduate Assistant Guide* published by the Graduate School is an excellent source for additional information on the role and duties of graduate teaching assistants.

Faculty Profiles

B. Michael Adams, Associate Professor of Statistics,
Ph. D., University of Southwestern Louisiana

Research Interests: Quality Control, Statistical Process Control, Statistical Problem Solving, Process Optimization, and Educational Programs in Statistics.

Recent Publications:

Dyer, John, B. Michael Adams and Michael D. Conerly, (2003) "The Reverse Moving Average Control Chart for Monitoring Autocorrelated Processes," *Journal of Quality Technology*, 35, no. 2.

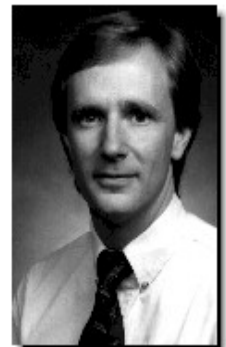
Dyer J.N., Conerly M.D., and Adams B.M. (2003). "A Simulation Study of the Impact of Forecast Recovery for Control Charts Applied to Various ARMA Processes," *Journal of Modern Applied Statistical Methods*, Vol. 11, No. 2, pp 343-353.

Dyer, John, Michael D. Conerly and B. Michael Adams, (2003) "A Simulation Study and Evaluation of Multivariate Forecast Based Control Charts Applied to ARMA Processes", *Journal of Statistical Computation and Simulation*, vol. 73, no. 10, p. 689-696.

Dyer, Adams, Conerly and Barrett (2002), Multivariate Forecast Based Monitoring Schemes. *Journal of Business, Industry and Economics*.

Dyer, J.N., Adams, B.M., Conerly, M.D., and Barrett, B.E. (2002) "Multivariate Forecast Based Monitoring Schemes," *Journal of Business, Industry and Economics*.

Niraj, Prasad, B. M. Adams and D.W. Arnold, (1999), "Optimization of Two Step Process for Remediation of Sucarnoochee Soil with Petroleum Coke." *Advances in Environmental Research*, 3(2), 189-201.



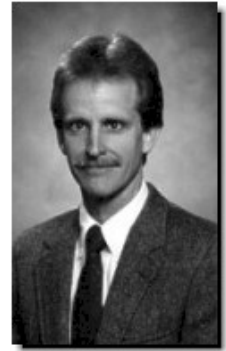
Bruce E. Barrett, Associate Professor of Statistics,
Ph. D., Clemson University

Research Interests: Regression, Regression Diagnostics, Multivariate Methods,
Exploratory and Graphical Data Analysis, Resampling Methods, and Statistical
Computing.

Recent Publications:

Barrett, Bruce E., (2003) "Understanding Influence in Multivariate
Regression," *Communications in Statistics, Theory and Methods*. 32:
667-680.

Barrett, B.E. and J.B. Gray(1997)"Leverage, Residual, and Interaction Diagnostics for Subsets of
Cases in Least Squares Regression," *Computational Statistics and Data Analysis*, 26, 39-52.



Robert G. Batson, Professor of Industrial Engineering,
Ph. D., University of Alabama, P. E. (California)

Research Interests: Industrial Engineering, Statistical Quality Control, Industrial
Statistics, Systems Engineering, and Operations Research.

Recent Publications:

"Development of a Risk Identification Expert System for the International
Space Station Project," with two co-authors, *International Journal of Risk
Assessment and Management* (refereed journal of Inderscience Enterprises
Ltd.), Vol. 1, No. 1, pp. 90-104, Summer 2000.

"Impact of Maintenance Function on Plant Safety," with six co-authors, *Professional Safety*,
(refereed journal of American Society of Safety Engineers), pp. 45-48, August 2000.

"Application of Total Quality Management Techniques to Safety Analysis in Software Product
Development," with three co-authors, *International Journal of Technology Management*
(refereed journal of Inderscience Enterprises Ltd.), Vol. 21, Nos. 3/4, pp. 353-361, 2001.

"Constrained Multivariate Loss Function Minimization," with one co-author, in *Quality
Engineering* (referred journal of ASQ), Vol. 13, No. 3, pp 475-484, 2001.

"Program for Retrospective Change-Point Analysis of Individual Observations," with three co-
authors, *Journal of Quality Technology* (refereed journal of ASQ), Vol. 33, No. 2, pp. 242-
257, April 2001.

"Development of an Expert System to Diagnose and Analyze Surface Defects in Castings," with
three co-authors, *AFS Transactions* (refereed journal of the AFS), Paper No. 01-002, Summer
2001.

"A Nested Experimental Design for Gage Gain in Steel Tube Manufacturing," with one co-author,
accepted for publication in *Quality Engineering*, Fall 2002.

"A Visually-Oriented Quality Improvement Data Management System," with one co-author,
accepted for publication in the *International Journal of Automotive Technology and
Management*, Spring 2003.



Subhabrata Chakraborti, Professor of Statistics,
Ph. D., State University of New York at Buffalo

Research Interests: Robust Statistical Inference, Survival Analysis

Recent Publications:

- Chakraborti, S., Van der Laan, P. and Van de Wiel, M. (2003): "A class of distribution-free control charts." *Journal of the Royal Statistical Society, Series C*.
- Olivier, K.N., Weber, D.J., Faiz, A.R., Lee, J.H., Chakraborti, S. and Knowles, M.R. (2003): "Prevalence of nontuberculous mycobacteria in persons with cystic fibrosis: multicenter study of a potential pathogen in a susceptible population." *American Journal of Respiratory and Critical Care Medicine*, 167, 828-834.
- Chakraborti, S., van der Laan, P. and Bakir, S. T. (2001): "Nonparametric Control Charts: an overview and some Results." *Journal of Quality Technology*, 33, 304-315.
- Van der Laan, P. and Chakraborti, S. (2001): "Precedence tests and Lehmann alternatives." *Statistical Papers*, 42, 301-312
- Chakraborti, S. and P.K. Sen (2001): "Control median type tests and contiguity: an appraisal." *Journal of the Indian Statistical Association*, 38, 187-207.
- Chakraborti, S. (2000): "Run length, average run length and false alarm rate of Shewhart X-bar chart: exact derivations by conditioning." *Communications in Statistics, Simulation and Computation*, 29, 61-81.
- Chakraborti, S. and van der Laan, P. (2000): "Precedence probability and prediction intervals." *Journal of the Royal Statistical Society, Series D*, 49, 219-228.
- Buening, H. and S. Chakraborti (1999): "Power comparison of several two-sample tests for general alternatives." *Allgemeines Statistisches Archiv*, 83, 190-210.



Michael D. Conerly, Professor of Statistics and Director,
Ph. D., Southern Methodist University

Research Interests: Regression Analysis, Statistical Computing, Generalized Linear Models, Quality Control, Data Mining and Multivariate Data Analysis.

Recent Publications:

- Dyer, John, B. Michael Adams and Michael D. Conerly, (2003) "The Reverse Moving Average Control Chart for Monitoring Autocorrelated Processes," *Journal of Quality Technology*, 35, no. 2.
- Dyer J.N., Conerly M.D., and Adams B.M. (2003). "A Simulation Study of the Impact of Forecast Recovery for Control Charts Applied to Various ARMA Processes," *Journal of Modern Applied Statistical Methods*, Vol. 11, No. 2, pp 343-353.
- Wang, Daniel and Michael Conerly (2003) "Evaluation of three Lack of Fit Tests in Linear Regression Models," *Journal of Applied Statistics*, 30, no. 6, p. 683-696.
- Dyer, John, Michael D. Conerly and B. Michael Adams, (2003) "A Simulation Study and Evaluation of Multivariate Forecast Based Control Charts Applied to ARMA Processes", *Journal of Statistical Computation and Simulation*, vol. 73, no. 10, p. 689-696.



- Dyer, Adams, Conerly and Barrett (2002), Multivariate Forecast Based Monitoring Schemes. *Journal of Business, Industry and Economics*.
- Mayo, Matthew S. and Conerly, Michael D. (1999) "Evaluating Overall Significance Levels in Multifactor Anova," *Journal of BioPharmaceutical Statistics*, vol. 9, no. 1, p. 129-143.
- Jones, Allison; Woodall, William and Conerly, Michael (1999) "Exact Properties of Demerit Control Charts," *Journal of Quality Technology*, vol. 31, no. 2, p. 207-216.

Stephen Rocky Durrans, Professor, Civil and Environmental Engineering

Research Interests: development and application of probabilistic and statistical methods for civil and environmental engineering problems. His specific focus has been on statistical modeling of hydrologic and meteorologic extremes, including floods, low-flows (droughts), and extreme precipitation. Additional work has dealt with univariate and multivariate modeling of hydrologic time series. Research projects and public service activities have dealt with hydrologic and meteorologic extremes, with prediction of flood frequency relationships downstream of regulating structures (such as dams), and with assessment of the potential effects of climatic change and climatic variability.



Recent Publications:

- Durrans, S.R., Maximum Likelihood Estimators for Quantized Data, Submitted to *Water Resources Research*, 2001.
- Supriyasilp, T., A.J. Graettinger, and S.R. Durrans, Quantitative Uncertainty Analysis in Water Quality Modeling, *ASCE Journal of Water Resources Planning and Management*, 2001.
- Durrans, S.R., L.T. Julian, and M. Yekta, Estimation of Depth-Area Relationships Using Radar-Rainfall Data, Submitted to *ASCE Journal of Hydrologic Engineering*, 2001.
- Durrans, S.R., and K.R. Odom, Trends in Daily Rainfall Frequencies in Tennessee, Submitted to *Journal of the American Water Resources Association*, 2001.
- Durrans, S.R., and S.J. Nix, Scaling Characteristics of Alabama Low-Flows, Submitted to *Water Resources Research*, 2001.
- Tomic, S., S.R. Durrans, S.J. Burian, and S.J. Nix, Transformation of a Flood Frequency Distribution Through a Detention Pond, *Water Resources Research*, 2001.
- Liang, Y., S.R. Durrans, and J.W. Lightsey, A Revised Version of PnET-II to Simulate the Hydrologic Cycle in Southeastern Forested Areas, *Journal of the American Water Resources Association*, 2001.
- Graettinger, A.J., T. Supriyasilp, and S.R. Durrans, Real Time Evaluation of Site Characterization to Direct and Conclude Exploration, *Transportation Research Record*, 2001.
- McFadden, J., W-T. Yang, and S.R. Durrans, Application of Artificial Neural Networks to Predict Speeds on Two Lane Rural Highways, *Transportation Research Record*, 2001.
- Durrans, S.R., and P.A. Brown, Estimation and Web-Based Dissemination of Extreme Rainfall Information, *Transportation Research Record*, 2001.
- Durrans, S.R., and S. Tomic, Comparison of Parametric Tail Estimators for Low-Flow Frequency Analysis, *Journal of the American Water Resources Association*, 2001.

- Durrans, S.R., and P.A. Brown, Development of an Internet-Based Rainfall Atlas for Alabama, *Water Science and Technology*, 2001.
- Hamza, A., T.B.M.J. Ouarda, S.R. Durrans, and B. Bobée, Développement de Modèles de Queues et d'Invariance d'Échelle pour l'Estimation Régionale des Débits d'Étiage (Development of Simple Scaling Tail Models for Regional Estimation of Low-Flows), *Revue Canadienne de génie Civil*, Vol. 8, pp. 291-304, 2001.
- Burian, S.J., S.R. Durrans, S.J. Nix, and R.E. Pitt, Training Artificial Neural Networks to Perform Rainfall Disaggregation, *ASCE Journal of Hydrologic Engineering*, Vol. 6, No. 1, pp. 43-51, 2001.
- Burian, S.J., S.J. Nix, R.E. Pitt, and S.R. Durrans, Urban Wastewater Management in the United States: Past, Present and Future, *Journal of Urban Technology*, Vol. 7, No. 3, pp. 33-62, 2000.
- Chang, H-c., D.C. Kopaska-Merkel, H-C. Chen, and S.R. Durrans, Lithofacies Identification Using Multiple Adaptive Resonance Theory Neural Networks and Group Decision Expert System, *Computers & Geosciences*, Vol. 26, pp. 591-601, 2000.
- Burian, S.J., S.R. Durrans, S.Tomic, R.L. Pimmel, and C.N. Wai, Rainfall Disaggregation Using Artificial Neural Networks, *Journal of Hydrologic Engineering, ASCE*, Vol. 5, No. 3, pp. 299-307, 2000.
- Durrans, S.R., S.J. Burian, A. Hajji, S.J. Nix, R.E. Pitt, C-Y. Fan, and R. Field, Polynomial-Based Disaggregation of Hourly Rainfall for Continuous Hydrologic Simulation, *Journal of the American Water Resources Association*, Vol. 35, No. 5, pp. 1213-1221, 1999.
- Burian, S.J., S.R. Durrans, S.J. Nix, R.E. Pitt, C-Y. Fan, and R. Field, Historical Development of Wet Weather Flow Management, *ASCE Journal of Water Resources Planning and Management*, Vol. 125, No. 1, pp. 3-13, 1999.
- Durrans, S.R., T.B.M.J. Ouarda, P.F. Rasmussen, and B. Bobée, Treatment of Zeroes in Tail Modeling of Low-Flows, *ASCE Journal of Hydrologic Engineering*, Vol. 4, No. 1, pp. 19-27, 1999.

Matthew Elam, Assistant Professor of Industrial Engineering
Ph. D. Oklahoma State University.

Research Interests: Regression Analysis, Exploratory Data Analysis, Regression Diagnostics, Statistical Graphics, and Statistical Computing.

Recent Publications:

J. Brian Gray, Associate Professor of Statistics
Ph. D., Clemson University

Research Interests: Regression Analysis, Exploratory Data Analysis, Regression Diagnostics, Statistical Graphics, and Statistical Computing.

Recent Publications:

Fan, G. and Gray, J. B. (2004), "Regression Tree Analysis Using TARGET," *Journal of Computational and Graphical Statistics*, forthcoming.



- Brooks, R. E. and Gray, J. B. (2004), "History of the Forecasters: An Assessment of the Semi-Annual U.S. Treasury Bond Yield Forecast Survey as Reported in *The Wall Street Journal*," *Journal of Portfolio Management*, forthcoming.
- Mayo, M. S. and Gray, J. B. (2001), "The Robustness and Efficiency of Trimmed Elemental Estimation in Regression Analysis: A Monte Carlo Simulation Study," *Probabilistic Engineering Mechanics*, 16, 323-330.
- B. E. Barrett and J. B. Gray (1997), "Leverage, Residual, and Interaction Diagnostics for Subsets of Cases in Least Squares Regression," *Computational Statistics and Data Analysis*, 26, 39-52.

J. Michael Hardin, Professor of Statistics

Ph. D., University of Alabama

Research Interests: Data Mining, Credit Scoring, Business Intelligence.

Recent Publications:

- Burgio, L.D., Fisher, S. E., Fairchild, J. K., Scilley, K., & Hardin, J. M. (in press). Quality of care in the nursing home: Effects of staff assignment and work shift. *The Gerontologist*, to appear.
- Roff, L.L., Burgio, L.D., Gitlin, L., Nichols, L., Champlin, W., and Hardin, J.M. (in press). Positive Aspects of Alzheimer's Caregiving: The Role of Race", *Journal of Gerontology: Psychological Sciences*, to appear.
- Berner, E.S., McGowan, J.J., Hardin, J.M., Spooner, S.A., Raszka, W.V., Berkow, R.L., "A Model for Assessing Information Retrieval and Application Skills of Medical Students," *Academic Medicine*, 77: 547-551, 2002.
- Wall, T.C., Marsh-Tootle, W., Hammack, G., Hardin, J.M., Evans, H.H. Compliance with Vision Screening Guidelines among a National Sample of Pediatricians, *Ambulatory Pediatrics*, (2), 449-455, 2002.
- Hill, A.E., Jones, W.T., Hyatt, R.M., and Hardin, J.M. Parallel Automated Knowledge Acquisition of Case-Based Semantic Networks from Relational Databases. *Journal of Integrated Design and Process Science*, 10, 375-394, 2001.
- Burgio, L.D., Scilley, K., Hardin, J.M., and Hsu, C. Temporal Patterns of Disruptive Vocalization In Elderly Nursing Home Residents. *International Journal of Geriatric Psychiatry*, 16, 1-9, 2001.



Edward R. Mansfield, Professor of Statistics and Department Head

Ph. D., Southern Methodist University

Research Interests: Regression Analysis and Applications of Statistical Methods, Using Multimedia Techniques in Mass Lectures, Classroom and Building Design.

Recent Publications:

- "Exercise Intensity Increased by Addition of Handheld Weights to Rebounding Exercise," J. F. Smith, P. A. Bishop, L. Everett, E. R. Mansfield, and M. D.



Conerly, *Journal of Cardiopulmonary Rehabilitation*, Vol. 15, pp. 34-38, 1995.

"Development of Design Guidelines for Local Area CSMA/CD Networks," J. Mellichamp, R. Cobb, and E. R. Mansfield, *Simulation*, Vol. 58, No. 4, pp. 270-279, 1992.

"Strength, Muscle Symmetry, and Flexibility in Young Female Idiopathic Scoliosis," E. R. Mansfield, *Journal of Orthopedic and Sports Physical Therapy*, Vol. 14, No. 4, pp. 144-148, 1991.

James Leeper, Professor, Rural Programs Director of Education and Evaluation, and Charter Senior Investigator in the Institute for Rural Health Research an adjunct faculty member in the Department of Health Behavior, University of Alabama at Birmingham School of Public Health.

Ph. D., University of Iowa

Research Interests: Dr. Leeper has been very active in the American Public Health Association, serving on the Program Development Board (chair from 1994-97), Joint Policy Committee (co-chair from 1994-97), Science Board (1997-2000), Education Board (1999-2003) and Governing Council (2000-2001). He was chair of the Section on Teaching Statistics in the Health Sciences in the American Statistical Association during 2003. He has published over 50 referred articles, co-authored four book chapters, and co-authored more than 90 paper presentations/posters. Much of his work deals with rural health issues, including community-based program evaluation. Statistical methodology work has dealt with missing data problems in longitudinal analysis and spatial/temporal analysis. He directs the Rural Medicine rotation for third-year medical students, during which the students do community health assessments and investigate specific rural health issues with the goal of suggesting solutions to the communities.



Richard G. Lomax, Professor of Educational Research

Ph.D. University of Pittsburgh.

Research Interests: The application of multivariate research methodologies to the solution of educational research problems. These methodologies include structural equation modeling, factor analysis, statistical graphics, and statistics in sports.

Recent Publications

Lomax, R. G. & Moosavi, S. A. (2002). Using humor to teach statistics: Must they be orthogonal? *Understanding Statistics: Statistical Issues in Psychology, Education, and the Social Sciences*, 1, 113-130.

Shumow, L. & Lomax, R. G. (2002). Parental efficacy: Predictor of parenting behavior and adolescent outcomes. *Parenting: Science and Practice*, 2, 127-150.

Green, J. M., Bishop, P. A., Muir, I. H. & Lomax, R. G. (2001). Lactate-sweat relationships in younger and middle-aged men. *Journal of Aging and Physical Activity*, 9, 67-77.

Muir, I. H., Bishop, P. A., Lomax, R. G. & Green, J. M. (2001). Prediction of rectal temperature from ear canal temperature. *Ergonomics*, 44, 962-972.



- Lomax, R. G. (2001). Using statistical methods to evaluate hockey players. *The Hockey Research Journal*, 5, 43-45.
- Shumow, L. & Lomax, R. G. (2001). Predicting perceptions of school safety. *The School Community Journal*, 11, 93-112.
- Green, J. M., Bishop, P. A., Muir, I. H. & Lomax, R. G. (2000). Gender differences in sweat lactate. *European Journal of Applied Physiology*, 82, 230-235.
- Lomax, R. G. & Hahs, D. L. (2000). Portfolios in teacher education assessment courses. *The Professional Educator*, 23, 49-56.
- Donovan, C. A., Smolkin, L. B. & Lomax, R. G. (2000). Beyond the independent-level text: Considering the reader-text match in first graders' self-selections during recreational reading. *Reading Psychology*, 21, 309-333.

**Recent Graduates of the Applied Statistics Program
Doctoral Program**

Guangzhe Fan, MS(2001), Ph.D. (2004)

Dissertation Title: Regression and Survival Tree Analysis Using TARGET

Advisor: J. Brian Gray

Current Position: Assistant Professor, Dept. of Statistics and Actuarial Science, University of Waterloo, Canada.

Bo "Bonnie" Hong, MS(2002), Ph.D. (2004)

Dissertation Title:

Advisor: J. Michael Hardin

Current Position: post doctoral position with ???

Eric Howington, MS(2001), Ph.D. (2004)

Dissertation Title: A Genetic Algorithm for Computing the minimum Volume Ellipsoid Estimator

Advisor: J. Brian Gray

Current Position: Assistant Professor, Department of Mathematics and Statistics, Coastal Carolina University.

Cali Davis, M.S. (1999), Ph.D. (2002)

Dissertation Title: A diagnostic tool for traditional mean and range control charts

Advisor: B. Michael Adams

Current Position: Enrollment Research and Assessment Analyst, University of Alabama

Christa Pettway Carter, M.S. (1998), Ph.D. (2002)

Dissertation Title: A Bayesian approach to control charting attribute data exhibiting process variability

Advisor: B. Michael Adams

Current Position: Statistician, Wachovia Bank, Charlotte, NC

Joseph Thomas, M.S. (1996), Ph.D. (2002)

Dissertation Title: Interpretation of multivariate control chart signals

Advisors: Michael D. Conerly and B. Michael Adams

Current Position: Statistician, Bell South Inc. Atlanta, GA

Sreelatha Meleth, M.S. (2001) Ph.D. (2001)

Dissertation Title: Analyzing data sets with a mixture of MAR and NINR missing data : assessing the impact of sample size and proportion missing on the estimates

Advisor: James Leeper

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Lei Wang, M.S. (1999), PhD (2001)

Dissertation Title: Longitudinal ecologic study with temporal-spatially correlated data : comparison of alternative models

Advisor: James Leeper

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Kevin Busby, M.S. (1999), Ph.D. (2001)

Dissertation Title: Interpreting out-of-control signals from Hotelling's T^2 chart

Advisor: Michael D. Conerly

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Mawia Kaddoura, M. S. (1996), Ph. D. (2000)

Dissertation Title: Density estimation through kernel estimation-based empirical characteristic function

Advisor: Michael D. Conerly

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Xiaohong (Daniel) Wang, M.S. (1996), Ph.D. (1999)

Dissertation Title: Performance of lack of fit tests in linear regression models

Advisor: Michael D. Conerly

Current Position: Assistant Professor, Central Michigan University, Mount Pleasant, MI

Kenneth W. Linna, Jr., M.S. (1998), PhD (1999)

Dissertation Title: Control chart performance under linear covariate measurement processes

Advisor: William H. Woodall

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Ramaswamy "B. G." Balgopal, Ph. D. (1997)

Dissertation Title: "Applications of the Frobenius Norm in Multivariate Analysis"

Advisors: Michael D. Conerly and J. Brian Gray

Current Position: Silicon Valley, CA

John N. Dyer, M. S. (1995), Ph. D. (1997)

Dissertation Title: "Evaluation of Control Charting Techniques for Monitoring Autocorrelated Processes"

Advisors: B. Michael Adams and Michael D. Conerly

Current Position: Assistant Professor of Information Systems, Department, Georgia Southern University, Statesboro, GA

L. Allison Jones, M. S. (1996), Ph. D. (1997)

Dissertation Title: "Topics on Data Intensive and Computationally Intensive Control Charting Methods"

Advisor: William H. Woodall

Current Position: Assistant Professor of Marketing, Auburn University, Auburn, AL

Matthew S. Mayo, Ph. D. (1996)

Dissertation Title: "Elemental Subsets: The Building Blocks of Regression"

Advisor: J. Brian Gray

Current Position: Director of Biostatistics, University of Kansas Medical Center, Kansas City, KS

Gary Randall Tucker, Ph. D. (1996), M. S. (1993)

Dissertation Title: "Quality Control Charts for Ordinal Categorical Data"

Advisors: William H. Woodall and Kwok Tsui (Georgia Tech)

Current Position: Atlanta, GA

J. Douglas Barrett, Ph. D. (1995), M. S. (1992)

Dissertation Title: "A Probabilistic Alternative to Fuzzy Logic Controllers"

Advisor: William H. Woodall

Current Position: Assistant Professor of Quantitative Methods, Department of Economics and Finance, University of North Alabama, Florence, AL

Robert E. Davis, Ph. D. (1995)

Dissertation Title: "A Markov Chain Representation of the Shiriyayev-Roberts Procedure"

Advisor: William H. Woodall

Current Position: Senior Associate, Coopers and Lybrand Consulting, Jacksonville, FL and Dallas, TX

Li-Hua "Nancy" Kao, Ph. D. (1995), M. S. (1992)

Dissertation Title: "Some Nonparametric Procedures for Testing Against the Simple-Tree Alternatives in a Two-Way Layout"

Advisor: Subhabrata Chakraborti

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Show-wen "Winnie" Lin, Ph. D. (1995), M. S. (1991)

Dissertation Title: "The Use of Combined Control Charts with Forecast-Based Quality Monitoring Schemes"

Advisor: B. Michael Adams

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Ed Pappanastos, Ph. D. (1995), M. S. (1993)

Dissertation Title: "Robust Control Charts for Location"

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David Redden, Ph. D. (1995)

Dissertation Title: "A Comparison of Fuzzy Linear Regression Methods and Statistical Regression Models"

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Iou-Tsyr "Sarah" Tseng, Ph. D. (1995), M. S. (1991)

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Joe E. Sullivan, Ph. D. (1994), M. S. (1993)

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Claude Superville, Ph. D. (1994), M. S. (1991)

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Habib Ismail, Ph. D. (1993)

Dissertation Title: "Nonparametric Comparison of Treatments with a Control: Procedures Based on the Sign Test"

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Mark Wade, Ph. D. (1993), M. S. (1990)

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Zainul Abedin, Ph. D. (1991)

Dissertation Title: "Classical and Bayesian Estimators of Exponential Reliability Function"

Advisor: Badrig Kurkjian

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Larry Bowen, Ph. D. (1990)

Dissertation Title: "Comparing Estimators of the Exponential Reliability Function Using Pitman's Measure of Closeness"

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Current Position: Associate Director, Center for Teaching and Learning, University of Alabama, Tuscaloosa, AL

Suming Chang, Ph. D. (1990)

Dissertation Title: "An Investigation of the Random-Effects Model for Analysis of Linear Growth Curves in Incomplete-Data Small-Sample Situations"

Advisor:

Current Position:

Thomas Margavio, Ph. D. (1990)

Dissertation Title: "Multivariate Moving Average Control Charts for the Process Mean"

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Aparna Munshi, Ph. D. (1990)

Dissertation Title: "Misclassification in Logistic Regression"

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Terry Pittman Obert, Ph. D. (1990)

Dissertation Title: "X Charts with Zone Tests"

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Masters Program

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Current Position: Statistician, 3M Corporation, Austin TX

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Current Position: Statistician, Protective Life

David Lawson, M.S. (1998)

Current Position: Statistician

Mary Helen Tate, M.S. (1998)

Current Position: Statistician

Ivey Johnson, M. S. (1997)

Current Position: Statistician, Protective Life

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Current Position: Risk Management Analyst, Providian Corporation, San Francisco, CA

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Current Position: Quality Engineer, Behr Heat Transfer Systems, South Carolina

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Current Position:

Jennifer Caveny, M. S. (1991)

Current Position:

Fe Lorica, M. S. (1991)

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Current Position:

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Current Position:

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Current Position: Ph. D. in Educational Research (1996), University of Alabama, Tuscaloosa, AL

Hsu-Ling Tsay, M. S. (1990)

Current Position:

Advice on Finding a Job

Job markets are tight in all fields now, so it pays to be prepared. The following is some advice which should help you in your job search.

General Advice

1. Save your teaching evaluations and, if possible, obtain a few letters from your students describing your teaching ability.
2. In addition to working as a teaching or research assistant, it would benefit you to work in developing some practical experience in applying statistical methods. This could be done by working on projects with the Alabama Productivity Center or with a faculty member. Working as a data analyst or consultant for some group on campus, such the College of Education or the Center for Business and Economic Research (CBER), is also a possibility.
3. Check the *AMSTAT News* regularly for job openings as well as our job listings file kept in the department.
4. Have at least one faculty member review your resume and a sample cover letter.
5. Talk to your advisor about how to interview effectively. Some general tips include:
 - Overdressing is better than underdressing.
 - Don't bring up the issues of salary and benefits unless asked. This topic usually comes up late in the interview or after the interview.
 - Always practice your presentation (if one is required) before the interview. Make sure that most of it is understandable to a trained statistician unfamiliar with your particular topic. Never run over the allotted time.
 - Be enthusiastic and optimistic about meeting the job requirements and responsibilities.
 - Always be polite even if you don't get the job. There may be an opportunity later for you or another University of Alabama student.
6. If you do find a job, but later decide to change jobs, keep in mind the fact that it is much easier to find a job if you already have one, *i.e.*, don't quit your job first and then start looking. The gap in your employment history will raise questions.

Specific Advice for M. S. Students

1. Learn as much as possible about the various statistical computer packages such as SAS, Minitab, Excel, etc. Many jobs in industry require this knowledge.
2. Your job search should begin in earnest late in the Fall semester or early in the Spring semester of your second year. Do not wait until after you graduate to begin looking for a job.

Specific Advice for Ph. D. Students

1. It is best to submit papers from your dissertation research well before you graduate. The paper(s) can be re-formatted to meet dissertation requirements.
2. Academic jobs usually begin in Fall semesters. Applications for these jobs often need to be submitted by January 31. The interviewing process takes place during the Spring semester. One must enter the academic job market on time to expect to find a position. Apply to a number of universities, but do not apply for every available job. Obtain the opinion of your faculty advisor first to save time and focus your search.
3. It is helpful to give presentations of your research results at local and national meetings. Travel support (from the Graduate School and the Graduate Student Association) is often available. Try to attend the Joint Statistical Meetings in August of the summer before your final year in the Ph. D. program.

Appendix

Will You Get a Job in Industry?

New Researcher's Survival Guide

The Neophyte Researcher's Miscellany

Publication is as Easy as C-C-C