

**College of Charleston
Charleston, South Carolina 29424**



REQUEST TO MODIFY AN EXISTING PROGRAM

**Bachelor of Science in Mathematics
Adding a Concentration in Statistics**

P. George Benson

P. George Benson, President

September 2008

Classification

Program Title:	Bachelor of Science degree in Mathematics with concentration in Statistics
Academic Unit:	Mathematics/School of Sciences and Mathematics
Designation, type, and level of degree	Bachelor of Science degree in Mathematics with concentration in Statistics
Proposed date of implementation	October 2008
CIP code:	270101
Identification of Program (New or Modification)	Modification
Program qualifies for supplemental awards	Yes-Palmetto Fellows and Life Scholarship awards
Method of delivery:	Traditional

Justification

Purpose and Objectives of the Program: Statistics is rapidly becoming an important area for success in many endeavors. Mining, analyzing, and making sense of enormous data sets are challenges faced in today's highly technological world: from pharmaceutical research, to search engines; from academic research to environmental science. Practicing statisticians are highly sought after and well paid for careers in business, industry, biomedicine, environmental science, as well as in academics and private research facilities.

Currently, the only concentration with an emphasis in statistics is the Actuarial Studies concentration. However, this concentration requires courses in business and economics that many mathematics students do not want to pursue. This proposal creates a concentration for students desirous of pursuing careers in statistics by including all of the necessary statistics background and eliminating the economics and business requirements. In addition, Math 311, Advanced Calculus, is added to provide the necessary preparation for students who wish to pursue graduate degrees in statistics. Moreover, the Mathematics Department has hired two new PhD Statisticians and is currently recruiting another.

Need for the Program in the State: The purpose of this modification is to provide mathematics students at our university, the opportunity to prepare themselves for careers and graduate studies in statistics. The focus is on providing a needed component to our own offerings rather than to fill a void in offerings in the State of South Carolina.

Currently, only the University of South Carolina Columbia offers a B.S. Degree in Statistics. Clemson offers a Mathematical Science program that contains some statistics courses. Coastal Carolina University offers a minor in Statistics, but no major.

Centrality of the Program to the Mission of the College of Charleston: The central mission of the College of Charleston is to provide students with a high-quality undergraduate liberal arts education. This includes providing programs that offer majors and topics relevant to today's academic, business and industrial climate. Statistics has become such an important facet of study for so many different disciplines, that the time has come to provide our students with quality training in statistics so that they will be adequately prepared for careers requiring these skills.

Relationship with Other Programs at the College of Charleston: The Concentration in Statistics will be beneficial in many ways with existing programs at the College of Charleston. The new Discovery Informatics major requires their majors to take several statistics courses as required courses and offers others as electives. Some of these courses have not had very high enrollment numbers due to the small number of DI majors. However, with the addition of the

Concentration in Statistics, these courses will now be populated both by DI majors and by Mathematics majors pursuing the Concentration in Statistics.

Another benefit to other programs will be the new course, Math 475 Statistical Consulting, the recommended Capstone Experience for the Concentration in Statistics. With this course, students from Marine Biology, Biology, Environmental Science and other areas will be able to obtain statistical direction for their thesis and research projects from students in the Concentration in Statistics.

Comparison with Related Programs: The most closely related program to the proposed Concentration in Statistics is the Concentration in Actuarial Studies, which is also offered by the Mathematics Department. The difference in these two concentrations is that Actuarial Studies requires a number of economics and finance courses as part of the program. These courses are not required in the Concentration in Statistics and are replaced by additional statistics offerings and electives. The rationale for this change is that a student wishing to pursue a career or graduate study in statistics does not necessarily need a background in finance and economics. Such a student would be better prepared with a more rigorous statistics background.

Enrollment

Students interested in pursuing the B. S. Degree in Mathematics with a Concentration in Statistics must be students in good standing at the College of Charleston at the time that they declare their intentions.

Currently, there are 82 Mathematics Majors and, of those, 29 are in the Concentration in Pure Mathematics, 24 are in the Concentration in Secondary Education, 16 are in the Concentration in Applied Mathematics, and 13 are in the Concentration in Actuarial Studies. With the addition of a Concentration in Statistics, we anticipate that there will be some changes in the proportions of Mathematics Majors in each of the concentrations. Certainly, some students in the Actuarial Studies or Applied Mathematics Concentrations may choose to enter the Concentration in Statistics. However, we anticipate that the Concentration in Statistics will attract many new majors since the job market in statistics is very good.

PROJECTED TOTAL ENROLLMENT

YEAR	FALL		SPRING		SUMMER	
	Headcount	Credit Hrs.	Headcount	Credit Hrs.	Headcount	Credit Hrs.
2008-09	4	60	5	75	2	6
2009-10	9	135	10	150	2	6
2010-11	15	225	17	255	2	6
2011-12	18	270	20	300	2	6
2012-13	20	300	20	300	2	6

PROJECTED NEW ENROLLMENT

YEAR	FALL		SPRING		SUMMER	
	Headcount	Credit Hrs.	Headcount	Credit Hrs.	Headcount	Credit Hrs.
2008-09	0	0	0	0	0	0
2009-10	1	15	1	15	0	0
2010-11	1	15	1	15	0	0
2011-12	1	15	1	15	0	0
2012-13	1	15	1	15	0	0

First year \$31,920 gross revenue
 Fifth year \$168,000 gross revenue

*per credit revenue based on a standard course load per semester of 15 hours; based on total (not new) student enrollments in program; assumes 5th year tuition is same as first year; considers only the 21 hours specific to the Statistics track & not which are from the required math classes.

Curriculum

Sample Curriculum: The curriculum plan for the Concentration Core Courses required for all Math Majors in Statistics is given below.

MATH 120 Introductory Calculus	4 hours
MATH 203 Linear Algebra	3 hours
MATH 220 Calculus II	4 hours
MATH 221 Calculus III	4 hours
MATH 295 Intro to Abstract Math	3 hours
Capstone:	
MATH 475 Statistical Consulting	3 hours

One of the following course/lab pairs:

CSCI 220/222	4 hours
<u>MATH 245/246</u>	<u>4 hours</u>
Subtotal (core courses)	25 hours

Statistics Concentration

All of the following courses:

MATH 311 Advanced Calculus	3 hours
MATH 250 Statistical Methods I	3 hours
MATH 350 Statistical Methods II	3 hours
MATH 530 Mathematical Statistics I	3 hours
MATH 531 Mathematical Statistics II	3 hours

Plus 6 hours of courses from:

MATH 335	Bayesian Statistics	3 hours
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MATH 440	Statistical Learning I	3 hours
MATH 441	Statistical Learning II	3 hours
MATH 451	Linear Programming	3 hours
MATH 452	Operations Research	3 hours
CSCI 334	Data Mining	3 hours (requires MATH 207 and CSCI 230)
Subtotal (stat concentration courses)		21 hours (27 if CSCI 334 is taken)
TOTAL FOR PROGRAM		46 hours (52 hours if CSCI 334 is taken)

Below is a year-by-year plan for a typical student showing the mathematics courses that they would take during each of their semesters. In addition to the major requirements, each student must complete the general liberal arts education requirements. This includes six credit hours in English, six in History, eight in Natural Science, twelve in Foreign Language, six in Social Science, and twelve in Humanities. The general education requirements add 50 hours of course work. The total for the general education and the major requirements with the Statistics Concentration total between 96 and 102 credit hours. This leaves a minimum of 20 hours of elective coursework that must be completed to obtain the required 122 credit hours for graduation.

PROPOSED B.S. IN MATHEMATICS WITH A CONCENTRATION IN STATISTICS

Freshman Year

Fall	Math 120	Spring	Math 220 Math 250
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Sophomore Year

Fall	Math 221 Math 203	Spring	Math 220 Math 350
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Junior Year

Fall	Math 245/246 Math 295	Spring	Math 311 Stat. Elective
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Senior Year

Fall	Math 530 Stat. Elective	Spring	Math 531 Math 475
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Assessment of Student Learning: There will be several different methods used to assess student learning, in addition to the traditional grading methods. Since the majority of students in the Statistics Concentration will be taking the Math 475 Statistical Consulting course, this will be used to evaluate the quality of understanding obtained by these students. Every client using the services of Math 475 will fill out a survey indicating their level of satisfaction with the services provided. As students graduate from the program, a database will be used to track their progress in jobs and graduate school. Information from these sources will be used to evaluate and improve the program.

New Courses to be added to the Undergraduate Catalog in the Next 5 Years: The modification proposed requires one new course initially, Math 475 Statistical Consulting. Every major in mathematics must complete a Capstone Experience, and this course will be the recommended Capstone Experience for the Statistics Concentration. At present, there are no plans to add additional courses, but there are plans to offer Special Topics courses that may be applied to the Plan of Study for students in this concentration. If these courses become popular, they may be added to the regular course offerings in the future. A catalog description of Math 475 is given below:

MATH 475 Statistical Consulting

This course is a recommended capstone course for Mathematics Students with a concentration in Statistics. The purpose of this course is to expose statistics students to real-world statistical analyses using actual data provided by students and researchers who are interested in the results of the analyses. Professors and students from biology, geology, and environmental science, as well as clients from business and industry in the community will be seeking statistical advice from students in this class. Students will learn to use the statistics program SAS during the course.

Faculty

Rank and Academic Qualifications: The Mathematics Department at the College of Charleston has, in the past three years, hired two new Ph.D. Statisticians and has plans to hire at least one more. In addition to the Ph.D. Statisticians, the Mathematics Department has three Ph.D. Mathematicians with expertise in Statistics. This gives a total of five Ph.D. professors to teach the offerings in the Concentration in Statistics with an additional professor to be hired shortly.

Faculty by Rank	Highest Degree	Field of Study	Teaching in Field
Professor #1	PhD	Probability	Yes
Professor #2	PhD	Probability	Yes
Asst. Prof. #1	PhD	Statistics	Yes
Asst. Prof. #2	PhD	Statistics	Yes
Senior Instructor	PhD	Probability	Yes

Enumeration and Discussion of New Faculty and Staff Qualifications

Explanation of Proposed Changes in Faculty Assignment: The Department of Mathematics will assign courses in the Concentration of Statistics as part of normal teaching loads. Since all of the courses except for one new course are already currently part of the department course offerings, there will not be a major shift in course assignments.

Institutional Plan for Faculty Development Related to the Program: Faculty teaching in this concentration will already be involved in research in their field of expertise. The Mathematics Department and the College of Charleston support travel for faculty to conferences and workshops. Several faculty members teaching in this concentration have attended the Joint Statistical Meetings and have participated in short courses to keep abreast of advances in the field of statistics.

YEAR	NEW	EXISTING	TOTAL
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ADMINISTRATION

	Headcount	FTE	Headcount	FTE	Headcount	FTE
2008-09	0	0	0	0	0	0
2009-10	0	0	0	0	0	0
2010-11	0	0	0	0	0	0
2011-12	0	0	0	0	0	0
2012-13	0	0	0	0	0	0
Totals	0	0	0	0	0	0

FACULTY

	Headcount	FTE	Headcount	FTE	Headcount	FTE
2008-09	0	0	5	2.5	5	2.5
2009-10	1	0.25	5	2.5	6	2.75
2010-11	0	0	6	2.75	6	2.75
2011-12	0	0	6	2.75	6	2.75
2012-13	0	0	6	2.75	6	2.75
Totals	1	0.25	5	2.5	6	2.75

STAFF

	Headcount	FTE	Headcount	FTE	Headcount	FTE
2008-09	0	0	0	0	0	0
2009-10	0	0	0	0	0	0
2010-11	0	0	0	0	0	0
2011-12	0	0	0	0	0	0
2012-13	0	0	0	0	0	0
Totals	0	0	0	0	0	0

Physical Plant

The Statistics Concentration will not place any additional requirements on the Physical Plant.

Equipment

The Statistics Concentration will not require any additional equipment.

Library Resources

The additional library resources required by the Statistics Concentration will not exceed those acquisitions already provided to the Department of Mathematics on a yearly basis.

Accreditation

The Statistics Concentration will be offered under the broader Mathematics discipline which is not subject to any special accrediting agency.

Articulation

Currently, the Department of Mathematics offers mathematics majors an opportunity to obtain a Master's Degree in Biostatistics through a five-year plan with the Medical University of South Carolina. Upon approval of this proposal, the Math Department hopes to see an increase in the number of students pursuing this plan. Up until now, very few students have opted for this five-year plan.

Estimated Cost

Since there will be one new course offered each spring semester (Math 475 Statistical Consulting), there will be a need to hire an adjunct to cover one lower-level course. This will enable of the statistics faculty members to teach the Math 475 course.

Estimated New Costs by Year

CATEGORY	FIRST	SECOND	THIRD	FOURTH	FIFTH	TOTALS
Program Administration	0	0	0	0	0	0
Faculty Salaries	2,500	2,500	2,500	2,500	2,500	12,500
Graduate Assistants	0	0	0	0	0	0
Clerical/Support Personnel	0	0	0	0	0	0
Supplies and Materials	0	0	0	0	0	0
Library Resources	0	0	0	0	0	0
Equipment	0	0	0	0	0	0
Facilities	0	0	0	0	0	0
Other (Identify)	0	0	0	0	0	0
TOTALS	2,500	2,500	2,500	2,500	2,500	12,500

Sources of Financing by Year

	FIRST	SECOND	THIRD	FOURTH	FIFTH	TOTALS
Estimated FTE	0	0	0	0	0	0
Tuition Funding						
Other Legislative Funding	0	0	0	0	0	0
Reallocation of Existing Funds	2,500	2,500	2,500	2,500	2,500	2,500
Federal Funding	0	0	0	0	0	0
Other Funding	0	0	0	0	0	0
TOTALS	2,500	2,500	2,500	2,500	2,500	2,500

Institutional Approval

Department of Mathematics
College Curriculum Committee
Faculty Senate
Dean, School of Sciences and Mathematics
Provost of the College
President of the College
Board of Trustees

November 2007
March 2008
April 2008
May 2008
May 2008
May 2008
August 2008