New Degree Program Request

I. Proposal to Establish a New Degree Program: A Graduate Certificate in Statistics.

DATE: June 2008

PROPOSAL PREPARED BY:
Ron Barry, Professor of Statistics
Margaret Short, Assistant Professor of Statistics

The Department of Mathematics and Statistics presently offers an M.S. degree in Statistics. However, many of the students in 600-level statistics courses are graduate students from other departments, e.g. Biology and Wildlife, Natural Resources Management, Fisheries and Ocean Sciences and Petroleum Engineering. Some of these students take a substantial course load of statistics courses and we support the creation of a Graduate Certificate in Statistics to give such students a credential recognizing their quantitative expertise. This formal recognition of statistical expertise should help these students in their careers.

We propose that the Certificate in Statistics be a post-bachelors program, equivalent to a full year of graduate statistics courses. The Certificate will be based completely on coursework: there will be no exams outside of course exams, and there will be no project or thesis. While most of the courses in the program are applied statistics courses, we expect that a student who earns a certificate should have some grasp of theoretical statistics. Thus we propose requiring that all students take at least one theory-based core courses (STAT651) from the M.S. in Statistics. While it is possible that a student could enroll in the Graduate Certificate program while not being concurrently enrolled in another graduate program, we expect that most students will also be enrolled in other UAF M.S. or Ph.D. programs.
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<th>Position</th>
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<td>Department Chair, Dept. of Mathematics and Statistics</td>
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<td>Curriculum Council Chair</td>
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<td>Dean, College of Natural Science and Mathematics</td>
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<td>Dean of Graduate School</td>
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<td>President, UAF Faculty Senate</td>
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<td>Chancellor</td>
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**BOARD OF REGENTS:**

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Identification of Program

A. Description of the Program:

1. Program title:

Graduate Certificate – Statistics

2. Credential level of the program: Graduate Certificate. A Graduate Certificate is defined by the UA Board of Regents to be:

Graduate Certificate, 12-29 credits
Awarded for completion of a series of graduate courses that constitute a focused area of graduate study. Students must meet the requirements for admission to the Graduate School. The credits may be applied to a subsequent or concurrent master's degree.

3. Admission requirements and prerequisites

Applicants must follow the admission requirements of UAF Graduate School.

The prerequisites are: (1) a bachelor’s degree from an accredited institution. (2) C or better grades in Calculus I, II, III (or the equivalent), with at least a B average over Calc. I, II, III. Must also have STAT401 (Regression and Analysis of Variance) or equivalent.

4. Course descriptions of required and recommended elective courses:

All recommended and required courses are already approved UAF courses, listed in the catalog and regularly offered.

5. Requirements for the certificate:

Graduate Certificate Program

1. Complete the general university requirements
2. Have a Bachelor’s Degree from an accredited institution
3. Complete the following:

   STAT 651-- Statistical Theory I.................................3

4. Complete one or more of the following:

   A. One of the following theory courses:
      STAT652-- Statistical Theory II.................................4
      STAT653-- Statistical Theory III.................................3
B. Two graduate statistics courses (STAT602, STAT605, 
STAT611, STAT621, STAT631)

5. Complete additional graduate courses to total at least 12 credits by 
completing graduate STAT courses and/or courses from the 
following:
   STAT461—Applied Multivariate Statistics.............3
   PHYS 628—Digital Time Series Analysis..............3
   WLF/FISH 625—Analysis of Vertebrate Population Survival 
   and Movement....................................................3
   FISH 601—Quantitative Fishery Science.............3
   ECON 626—Econometrics..................................3
   ECON 627—Adv. Econometrics..........................3
   ESM 621—Operations Research........................3
   MATH 641—Real Analysis...............................4
   MIN/GE 653—Geostatistical Ore Reserve Est........3

6. Minimum credits required.................................................12

B. Program Goals

The Graduate Certificate in Statistics is meant to recognize strong abilities in 
Statistical Analysis, including:

1. Understanding the foundations of several broad classes of statistical techniques 
(such as Time Series Analysis, Design of Experiments, Spatial Statistics etc.).
2. Knowing how to apply these techniques to data and draw reasonable 
conclusions.
3. Understanding statistical literature.
4. Developing novel analyses when the assumptions of standard analyses are 
violated.

The likely candidates for the Certificate will be Ph.D. and possibly Masters students 
already enrolled at UAF in a scientific discipline or who have a good quantitative 
background.

2. Relation to the “Purposes of the University”

From UAF Vision Statement, the interests of the university includes spearheading 
integrated research “emphasizing our complex high latitude physical, biological and 
social systems”; students success (in general); and “...vitality and creativity of new 
discoveries and research...”. The proposed Graduate Certificate in Statistics will 
courage and reward more in-depth study of statistics by graduate students, primarily in
the sciences. This will improve the students’ employability and improve the quality of research design and analysis.

II. Enrollment information

A. We sent out an informal e-mail survey of interest in the program to graduate students in the College of Natural Sciences and Mathematics and to graduate students in the School of Fisheries and Ocean Science. We received fourteen replies—ten said they were interested but wanted more information while four said that they were likely to enroll. A faculty member from the SFOS in Juneau sent the following comment: “Many of our graduate students in Fisheries would be interested in certifying an expertise in statistics. The statistical theory course series in particular would be very useful to us.”

B. Minimum enrollment to maintain the program for years 1, 2, 3, 4 and 5:

The main purpose of the program is to give graduate students (especially Ph.D. students) in fields outside statistics a credential that signifies strong quantitative training. The cost of the program is negligible because the collection of courses used are already offered. Thus we would be willing to sustain the program even if it had as few as one graduate per year.

C. Maximum enrollment which the program can accommodate.

The only variable cost of the program is possibly larger class sizes. Realistically, we could accommodate twenty or more students per year, which is likely to be far more than will enter the program.

III. Need for program

The Graduate Certificate formally recognizes a graduate student’s strong quantitative skills. For students, this recognition should increase their employability. For employers, the Certificate program is designed to ensure that Certificate holders have moved beyond a broad knowledge of statistical techniques to have a good grasp of the fundamentals of statistics.

IV. Resources Impact

Implementing the Certificate Program will have virtually no impact on resources. The Department Chair in the Dept. of Mathematics and Statistics or a designated Faculty member will have to answer questions about the program and review applications. There will be program assessment required.
There may be a slight increase in enrollment in applied statistics courses. The statistics core courses are likely to have an increase in enrollment, but not one that would require any reallocation of workloads; current enrollment in these courses is 5 to 10. No new courses, new library materials or facilities will be required.

V. Relation of Program to other Programs with in the System

A. Effects on enrollments elsewhere in the system:

There are several elective courses in the Program Description that are not taught by the Statistics Program. Probably the students who enter the Graduate Certificate program will take these courses whether or not the Graduate Certificate exists, but there is the possibility of a slight enrollment increase. If earning a Graduate Certificate in Statistics increases employability of Ph.D. or Masters students, the existence of the Graduate Certificate could be used to help recruit graduate students in other programs.

B. Does it duplicate/approximate programs anywhere in the system?

The nearest program to the Graduate Certificate in Statistics is UAF’s M.S. in Statistics. Roughly speaking, the Graduate Certificate covers roughly half of the coursework in the Master’s program, sans the comprehensive exams and project. We expect no negative impact of the Graduate Certificate on the M.S. in Statistics. Historically, some students who took one or two of the required courses for this certificate eventually completed an M.S. so this certificate may lead to increased graduates in the statistics program.

C. How does the program relate to research or service activities?

Many research activities involve research design and statistical analysis. To the extent that the Graduate Certificate encourages, recognizes and rewards strong quantitative skills, especially in the fundamentals of statistics, it will support the goals of other graduate programs at UAF.

VI. Implementation/Termination

A. Date of implementation: Spring 2009.

B. Plans for recruiting students: Students will be recruited internally (mainly by word of mouth) and through e-mailing to graduate students at UAF. Posters advertising the Statistics M.S. will be modified to mention the certificate program; these will be sent to other universities.

C. Termination date and plans for phasing out program if it proves unsuccessful
If there are no students in the program for three years in a row, we may terminate the program.

D. Assessment of the program

There will be three means of assessment. First, the Statistics Faculty will meet once a year to discuss the progress of students, in our courses, who are enrolled in the Certificate Program. Second, we will survey a sample of recent graduates each year to assess whether the program curriculum was useful and whether the certificate was helpful in obtaining employment or in the student’s research. See the attached assessment plan.

Appendix A. Statistics Faculty.

**Barry, Ronald**
University of California, Irvine 1991, Ph.D.
Experimental design, spatial statistics.
ffrpb@uaf.edu

**McIntyre, Julie**
2006. Assistant Professor of Statistics.
North Carolina State University 2003, Ph.D.
Measurement error models and nonparametric statistics.
ffjpm@uaf.edu

**Short, Margaret**
2006. Assistant Professor of Statistics.
University of Minnesota 2003, Ph.D.
Bayesian spatial and spatio-temporal statistical modeling
ffmbs1@uaf.edu

**Thomas, Dana L.**
1981. Professor of Statistics.
Oregon State University 1982, Ph.D.
Experimental design; simultaneous inference; design and analysis of resource selection studies.
ffdl@uaf.edu
Title: Graduate Certificate in Statistics

Target admission date: Spring 2009

How does the program relate to the Education mission of the University of Alaska and the MAU? What State Needs are met by this program?

From UAF Vision Statement, the interests of the university includes spearheading integrated research “emphasizing our complex high latitude physical, biological and social systems”; students success (in general); and “…vitality and creativity of new discoveries and research…”. The proposed Graduate Certificate in Statistics will encourage and reward more in-depth study of statistics by graduate students, primarily in the sciences. This will improve the students’ employability and improve the quality of research design and analysis.

What are the Student opportunities and outcomes? Enrollment projections? We sent out an informal e-mail survey of interest in the program to graduate students in the College of Natural Sciences and Mathematics and to graduate students in the School of Fisheries and Ocean Science. We received fourteen replies- ten said they were interested but wanted more information while four said that they were likely to enroll. Faculty from the SFOS in Juneau sent the following comment: “Many of our graduate students in Fisheries would be interested in certifying an expertise in statistics. The statistical theory course series in particular would be very useful to us.”

Describe Research opportunities: Many research activities involve research design and statistical analysis. To the extent that the Graduate Certificate encourages, recognizes and rewards strong quantitative skills, especially in the fundamentals of statistics, it will support the goals of other graduate programs at UAF.

Describe Fiscal Plan for development and implementation: There are only negligible costs associated with the proposed program. These include a need for annual program assessment, some advising and possibly an increase in the sizes of some statistics courses. This should not result in an appreciable increase in workload.
Graduate Certificate in Statistics
Minimum Requirements for the Certificate: 12 credits

The Graduate Certificate in Statistics is designed for students who are pursuing a graduate degree in a quantitative field of study. The curriculum of the Graduate Certificate is designed to expose the students to a variety of areas in applied statistics along with a core of theoretical statistics that will enable the students to understand advanced statistical techniques. The Certificate program is entirely based on coursework – there are no comprehensive exams, projects or theses. This Graduate Certificate will also demonstrate students’ quantitative expertise to future employers.

Graduate Certificate Program

1. Complete the general university requirements
2. Have a Bachelor’s Degree from an accredited institution. Prerequisites are Calc. I, II and III (MATH200-201-202) or equivalent with at least a C in each course and a B average overall, and STAT401 (Regression and Analysis of Variance) or equivalent.
3. Complete the following:

   STAT 651-- Statistical Theory I.......................................3

4. Complete one of the following options:

   A. One of the following theory courses:
      STAT652-- Statistical Theory II........................................4
      STAT653-- Statistical Theory III.......................................3
      OR

   B. Two graduate statistics courses (STAT602, STAT605, STAT611, STAT621, STAT631)

5. Complete additional graduate courses to total at least 12 credits by completing graduate STAT courses and/or courses from the following:

   STAT461—Applied Multivariate Statistics.................3
   PHYS 628—Digital Time Series Analysis....................3
   WLF/FISH 625—Analysis of Vertebrate Population Survival and Movement.................................................3
   FISH 601—Quantitative Fishery Science....................3
   ECON 626—Econometrics........................................3
   ECON 627—Adv. Econometrics..................................3
   ESM 621-- Operations Research.............................3
   MATH 641—Real Analysis.......................................4
   MIN/GE 635—Geostatistical Ore Reserve Est.............3

6. Minimum credits required............................................12
Mission: We shall provide quality education responsive to the needs of individual students and the diverse population of Alaska.
Goal: To assure that our graduates are adequately prepared to succeed in the job market through the application of advanced statistics to their primary field of study.

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<th>Intended Outcome Objectives</th>
<th>Assessment Criteria</th>
<th>Implementation Procedures (what, when, who)</th>
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<td>The Graduate Certificate in Statistics will further students' career and improve the quality of their research in their primary area of expertise.</td>
<td>Alumni survey</td>
<td>Each May, the statistics faculty will send an alumni survey to all students who graduated the previous year. The statistics faculty will evaluate the survey responses. We will ask the alumni for suggestions for improvements in the program, applicability to their academic research and career.</td>
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<td>Students' will leave the program with adequate skills in advanced statistical theory and methods.</td>
<td>Evaluation of student learning.</td>
<td>Once each year, the statistics faculty will meet to discuss the performance of Graduate Certificate Students in their courses.</td>
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<td>Evaluating the prerequisites of students entering the program.</td>
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<td>Once each year, the statistics faculty will examine the background of all entering students, and determine whether the students are starting the program with adequate skills.</td>
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