From:	Schroeder, Margaret <m.mohr@uky.edu>
Sent:	Monday, April 27, 2015 3:04 PM
To:	Brothers, Sheila C; Hippisley, Andrew R
Subject:	GC: Biostatistics
Attachments:	Certificate in Biostatistcs Proposal Apr 27.pdf

Proposed New Graduate Certificate: Biostatistics

This is a recommendation that the University Senate approve the establishment of a new Graduate Certificate: Biostatistics, in the Department of Biostatistics within the College of Public Health.

The revised proposal is attached.

Best-

Margaret

Margaret J. Mohr-Schroeder, PhD | Associate Professor of Mathematics Education | STEM PLUS Program Co-Chair | Department of STEM Education | University of Kentucky | www.margaretmohrschroeder.com

UNIVERSITY OF KENTUCKY COLLEGE OF PUBLIC HEALTH

Proposal for a Graduate Certificate in Biostatistics

Purpose and Background

There is an increasing need for research-oriented health professionals who will be qualified to conduct population-based research and clinical trials in the next several decades. There has been an intense demand for scientifically trained (subject matter) data analysts who can address the issues in conducting studies which include large amounts of complex data. The neurosciences, surveillance, and computational biology are expected to be growth areas which will demand the complex, integrated skill set of a new group of professionals. The Graduate Certificate in Biostatistics (GCB) provides a mechanism for students admitted to the Graduate School to enhance their competencies and skills in biostatistics without undertaking a graduate degree. The GCB is uniquely different than other graduate certificates in statistics, i.e. the Graduate Certificate in Applied Statistics, in that the courses and audience will be focused on specific methodological issues in medical and health applications, e.g. statistical genetics, clinical trials, pharmacoepidemiology. The certificate will be accessible to students enrolled in the Graduate School and will be valuable to future researchers in a variety of fields of study.

The Graduate Certificate in Biostatistics (GCB) is a 15-credit hour graduate certificate that allows students studying in programs outside the Department of Biostatistics to learn a basic background in the design and analysis of biomedical studies. The courses included in this certificate will provide students with an introduction to methodological applications in public health and medical research; skills that will be necessary for completing quantitative components of research projects and attractive to future employers.

The most recent funding opportunity announcement for our Center for Clinical and Translational Science, explicitly asks for training in Biostatistics (with courses focused on the use of Biostatistics in translational science) through certificate programs.
Biostatistics Certificate programs housed in Colleges or Schools of Public Health include the following:

University of Minnesota
http://sph.umn.edu/programs/certificate/biostat/
University of West Virginia
http://publichealth.hsc.wvu.edu/academics/online-programs/applied-biostatistics-certificate/
Oregon Health Sciences University
http://www.ohsu.edu/xd/education/schools/school-of-medicine/departments/clinical-departments/public-health/education-programs/biostatistics-graduate-program/index.cfm
University of Iowa
http://www.public-health.uiowa.edu/certificate-in-biostatistics/

Certificate Director and Faculty
Heather M Bush, PhD is an Associate Professor in the Department of Biostatistics, College of Public Health and serves as the Co-Director of the Applied Statistics Lab and CCTS Biostatistics, Epidemiology and Research Design Core. In an effort to provide resources beyond study design and data analysis, Dr. Bush also launched DATAQUeST (DATA QUality and STatistical programming) to provide investigators within and outside the University access to SAS

programmers, analysts, and data managers. The faculty of record for this certificate are the graduate faculty in the Department of Biostatistics, College of Public Health. These faculty include:

Dr. Heather Bush, Associate Professor, Department of Biostatistics
Dr. Richard Charnigo, Professor, Departments of Biostatistics and Statistics
Dr. David Fardo, Associate Professor, Department of Biostatistics
Dr. Richard Kryscio, Professor, Departments of Biostatistics (Chair) and Statistics
Dr. Philip Westgate, Assistant Professor, Department of Biostatistics
Dr. Brent Shelton, Professor, Department of Biostatistics, Division Chair of Cancer Biostatistics
Dr. Li Chen, Assistant Professor, Department of Biostatistics, Division of Cancer Biostatistics
Dr. Chi Wang, Assistant Professor, Department of Biostatistics, Division of Cancer Biostatistics
Dr. Emily Van Meter, Assistant Professor, Department of Biostatistics, Division of Cancer Biostatistics

Certificate Objectives

To prepare students to design and analyze biomedical studies.
To identify appropriate statistical tests for comparisons in one or multiple samples
To provide correct interpretations in testing and estimation paradigms
To understand the use of different regression methods for investigating the association of risk factors and outcomes while controlling for confounding.

Curriculum

The Graduate Certificate in Biostatistics consists of 15 credit hours. Six credit hours are required (CPH 580 and CPH 630), and students must select an additional 9 credit hours from a variety of electives. Students will be required to complete 15 hours of coursework with no course grade lower than B to complete the curriculum. The current curriculum is:

Required Courses*

CPH 580	Biostatistics I	Descriptive statistics, hypothesis testing, paired and unpaired tests, ANOVA, contingency tables, log rank test, and regression with biostatistics applications. Prereq: MA 109 or equivalent. [STA 570 may be substituted for this course with permission of the certificate director]
CPH 630	Biostatistics II	Students will learn statistical methods used in public health studies. This includes receiver operator curves, multiple regression logistic regression, confounding and stratification, the Mantel-Haenzel procedure, and the Cox proportional hazardous model. Lecture, two hours; laboratory, two hours per week. Prereq: STA 580 or equivalent. (Same as STA 681.)

Elective Courses

CPH 631	Design and Analysis of Health Surveys	Students will learn design and analysis issues associated with well-known national health surveys, including reliability and validity of measurements, instrument validation, sampling designs, weighing of responses, and multiple imputations. Students will learn how to use statistical software to analyze data from complex survey designs. Lecture, two hours; laboratory, two hours per week. Prereq: STA 580 or equivalent.

CPH 636	Data Mining in Public Health	This course concerns statistical techniques for and practical issues associated with the exploration of large public health data sets, the development of models from such data sets, and the effective communication of one's findings. Prereq: STA 570 or 580 and CPH 535, or consent of instructor.
CPH 664	Design and Analysis of Clinical Trials	This course will introduce the fundamental concepts used in the design of Phase IIV clinical trials and statistical methodology associated with trial data analysis. Prereq: STA 570 or permission of instructor

Elective Courses (cont'd)

BST 655	Introduction to Statistical Genetics	BST 655 presents an introduction to the statistical methodologies used today to investigate genetic susceptibility to complex diseases. The course focuses on linkage and association analysis with applications to real-world data. Commonly used (and freely available) software will be presented and used throughout. Because the field is constantly evolving, a focus of the material for this course will be recent statistical human genetics literature. Prereq: STA 580 or equivalent. (Same as STA 655.)
BST 761	Time to Event Analysis	Analysis of time to event data encountered in Public Health and Medicine. Survival distributions and hazard functions. Time to event analysis using Kaplan-Meier method and life-table method. Accelerated failure time model, logit model for discrete data, complimentary log-log model, and proportional hazards model. Tests for goodness-of-fit, graphical methods, and residual and influence statistics. Time- dependent covariates, non-proportional hazards, left truncation, and late entry into the risk set. Sample size and power, competing risks, and time to event analysis with missing data. Prereq: STA 580 or equivalent.
CPH 713	Pharmaco-epidemiology	This course will provide an overview of the field of pharmacoepidemiology and its relationship to health care research. Various topics including methodology and analytical issues relevant to the conduct of pharmacoepidemiologic research will be covered. Time will also be spent reviewing existing papers in the field of pharmacoepidemiology.

*Please note that these courses are shared with the Department of Statistics. These courses are also required in the Certificate of Applied Statistics. Both of these courses are currently taught by faculty with primary appointments in Biostatistics. The Department of Statistics is considered primary for STA 580 (Biostatistics I) but it is also cross-listed as CPH 580; the Department of Biostatistics is considered primary for CPH 630 (Biostatistics II) but it is also cross-listed as STA 681.

Students enrolled in the MPH program as Biostatistics concentrators must get prior approval of coursework by the Certificate Director, as no more than 3 credit hours of certificate electives can be used towards the completion of the MPH degree.

Resources Available
No additional resources are needed.

Admission Requirements and Application Procedures

To be considered for this certificate program candidates must be associated with the University of Kentucky in one of the following categories:
- Enrolled post baccalaureate or in a degree program and admitted to the graduate school.
- Enrolled in a professional degree program.
- A resident in the medical center.
- Admission to the curriculum will be subject to approval of the GCB committee and acceptance to the Graduate School.

Students enrolled in the Epidemiology and Biostatistics PhD program are not eligible for admission to the Graduate Certificate in Biostatistics.

Admission to the Graduate Certificate or award of the graduate certificate does not guarantee admission to any degree program at the University of Kentucky.

Graduate Certificate Completion Requirements
The Graduate Certificate curriculum involves a total of 15 graduate credit hours including 6 credit hours of required courses. All course work for the Graduate Certificate must be completed within five years of admission. Graduate Certificate students must maintain a GPA of 3.0 or better to progress in the curriculum.

Award of the Graduate Certificate
When a student enrolled in the UK Graduate School has successfully completed the last required course and has satisfied the GPA and grade requirements, the Director shall send a completed, signed Graduate Certificate Completion Form to the Dean of the Graduate School verifying that the student has fulfilled all requirements for the Certificate and requesting award thereof. The Graduate School shall then issue the student's certificate and officially notify the University Registrar of the awarding of the Certificate for posting to the student's permanent transcript.

Program assessment
The Graduate Certificate in Biostatistics (GCB) will be assessed both quantitatively and qualitatively. First, with respect to quantitatively, we will yearly assess the number of new applications to the GCB. We conservatively hope to have at least **10** new enrollees each year, with the exception of the first year or two when the certificate is new. Furthermore, we will yearly assess the number of certificates awarded. Measures of success include a completion rate (within 3 years of initiating the certificate) of at least 85%. We will additionally measure time to completion of the certificate, courses most frequently enrolled in by certificate students, and courses requested to meet certificate requirements. These assessments will serve to improve course offerings and may facilitate the development of additional courses. Finally, the College of Public Health performs a self-study and assesses programs and courses for accreditation (CEPH). Assessment of curriculum for this certificate will coincide with those initiatives.

If the GCB is consistently not meeting our enrollment goals, we will convene an external panel consisting of faculty in Health Sciences, Pharmacy, Medicine, Public Health, Center for Health Services Research, and Center for Clinical and Translational Science to help identify potential students and improvements to the offerings (e.g. course times, delivery modes) of the GCB. Furthermore, this will allow us to determine if there are any research programs at the University of Kentucky that under-utilize the GCB, thus requiring more targeted advertising of the GCB.

Student Learning Outcomes and Assessment
The certificate objectives will serve as the learning outcomes as provided in the curricular map below, and assessment will be at the class-level using course-embedded assessments (e.g. exams, data analysis projects, written and oral reports, clinical protocols) with a requirement of having no course grade lower than B.

Courses	Student Learning Outcomes
Required Courses	
CPH 580 Biostatistics I	To prepare students to design and analyze biomedical studies. To identify appropriate statistical tests for comparisons in one or multiple samples. To provide correct interpretations in testing and estimation paradigms.
CPH 630 Biostatistics II	To prepare students to design and analyze biomedical studies. To identify appropriate statistical tests for comparisons in one or multiple samples. To provide correct interpretations in testing and estimation paradigms. To understand the use of different regression methods for investigating the association of risk factors and outcomes while controlling for confounding.
Elective Courses	
CPH 631 Design and Analysis of Health Surveys	To prepare students to design and analyze biomedical studies. To identify appropriate statistical tests for comparisons in one or multiple samples. To provide correct interpretations in testing and estimation paradigms. To understand the use of different regression methods for investigating the association of risk factors and outcomes while controlling for confounding.
CPH 636 Data Mining in Public Health	To prepare students to design and analyze biomedical studies. To identify appropriate statistical tests for comparisons in one or multiple samples. To provide correct interpretations in testing and estimation paradigms. To understand the use of different regression methods for investigating the association of risk factors and outcomes while

	controlling for confounding.
[CPH 664](#) Design and Analysis of Clinical Trials	To prepare students to design and analyze biomedical studies. To identify appropriate statistical tests for comparisons in one or multiple samples. To provide correct interpretations in testing and estimation paradigms.
[BST 655](#) Introduction to Statistical Genetics	To prepare students to design and analyze biomedical studies. To identify appropriate statistical tests for comparisons in one or multiple samples. To provide correct interpretations in testing and estimation paradigms. To understand the use of different regression methods for investigating the association of risk factors and outcomes while controlling for confounding.
[BST 761](#) Time to Event Analysis	To prepare students to design and analyze biomedical studies. To identify appropriate statistical tests for comparisons in one or multiple samples. To provide correct interpretations in testing and estimation paradigms. To understand the use of different regression methods for investigating the association of risk factors and outcomes while controlling for confounding.
CPH 713 Pharmaco-epidemiology	To prepare students to design and analyze biomedical studies. To identify appropriate statistical tests for comparisons in one or multiple samples. To provide correct interpretations in testing and estimation paradigms. To understand the use of different regression methods for investigating the association of risk factors and outcomes while controlling for confounding.

Benefits of the Graduate Certificate in Biostatistics

For Students
- Enhanced employment and research opportunities
- Provides the opportunity to obtain formal training in biostatistics without pursuing a terminal degree.

For The College
- Provides recognition for ongoing efforts of both faculty and students in the area of Biostatistics
- Provides greater interdisciplinary interactions from areas outside of Public Health

For the University of Kentucky and the Commonwealth of Kentucky
- Provides appropriate relevant educational experiences in Biostatistics to enhance the health and welfare of Kentuckians.

- Provides enhanced career opportunities for graduates in Kentucky.
- Strengthens UK's reputation as an institution that values and actively fosters high quality, relevant education and training that serves the multi-factorial needs of the Commonwealth, the nation, and the world.
- Provides a pool of appropriately trained quantitative researchers some of whom may pursue terminal degrees in public health.
- Enhances the reputation of UK throughout the state, nation, and world as graduates improve their ability to evaluate and analyze within a quantitative framework.

April 24, 2015

Heather Bush
Associate Professor
Dept. of Biostatistics
CAMPUS

Dear Dr. Bush,

I am pleased to write this letter of support for your graduate certificate in Biostatistics. My only suggestion is that you formally allow STA 570 or STA 580 to count for CPH 580. This will allow student to choose between the graduate certificate in Applied Statistics and the Biostatistics certificate after taking the first course.

Sincerely,

Dr. Arnold J. Stromberg
Professor and Chair
Department of Statistics
University of Kentucky

SIGNTURE ROUTING LOG

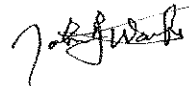## General Information:

Proposal Name: Graduate Certificate in Biostatistics

Proposal Contact Person Name: Andrea Perkins   Phone: 218-2021   Email: andrea.perkins@uky.edu

INSTRUCTIONS:
Identify the groups or individuals reviewing the proposal; note the date of approval; offer a contact person for each entry; and obtain signature of person authorized to report approval.

Internal College Approvals and Course Cross-listing Approvals:

Reviewing Group	Date Approved	Contact Person (name/phone/email)	Signature
Academic Affairs Committee	10/9/2014	John Watkins/218-0240/john.watkins@uky.edu	*(signature)*
Faculty Council	10/27/2014	Steve Fleming/218-2229/steven.fleming@uky.edu	*(signature)*
Academic Dean-Public Health	11/3/2014	Kathryn Cardarelli/218-0241/Kathryn.cardarelli@uky.edu	*(signature)*

External-to-College Approvals:

Council	Date Approved	Signature	Approval of Revision[6]
Undergraduate Council			
Graduate Council		Roshan Nikou	
Health Care Colleges Council			
Senate Council Approval		University Senate Approval	

Comments:

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[6] Councils use this space to indicate approval of revisions made subsequent to that council's approval, if deemed necessary by the revising council.

Rev 8/09

From:	Nikou, Roshan
Sent:	Friday, January 23, 2015 3:31 PM
To:	Brothers, Sheila C; Carvalho, Susan E; Ellis, Janie; Ett, Joanie M; Hippisley, Andrew R; Jackson, Brian A; Lindsay, Jim D.; Nikou, Roshan; Price, Cleo; Timoney, David M
Cc:	Watkins, John; Fleming, Steve; Cardarelli, Kathryn; Diaz, Monica; Brzyski, Anna; Wang, Cecilia
Subject:	Transmittals
Attachments:	Program change PhD in Music Education-signed.pdf; Graduate Certificate in Eurhythmics rev-signed.pdf; Latino-signed.pdf; GC in BIOSTATISTICS Proposal-signed.pdf

TO: Andrew Hippisley, Chair and Sheila Brothers, Coordinator
        Senate Council

FROM: Brian Jackson, Chair and Roshan Nikou, Coordinator
        Graduate Council

Graduate Council approved the following proposals and is now forwarding them to the Senate Council to approve.

Programs and Certificates

PhD in Music Education

Graduate Certificate in Eurhythmics

Graduate Certificate in Latin American, Caribbean, and Latino Studies

Graduate Certificate in Biostatistics

Roshan Nikou
The Graduate School
The University of Kentucky
101 Gillis Building - 0033
Phone: (859) 257-1457
Fax: (859) 323-1928
Roshan.Nikou@uky.edu