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OFFICE OF THE SENATE COUNCIL

NEW COURSE FORM

1. General Information

a. Submitted by the College of: Public Health Today's Date: 16 April 2012

b. Department/Division: Biostatistics

c. Contact person name: Richard Kryscio Email: kryscio@email.uky.edu Phone: 257-4064

d. Requested Effective Date: ☐ Semester following approval OR X☐ Specific Term/Year[1] Fall 2013

2. Designation and Description of Proposed Course

a. Prefix and Number: BST 681

b. Full Title: Linear Regression

c. Transcript Title (if full title is more than 40 characters): _____

d. To be Cross-Listed[2] with (Prefix and Number): _____

e. Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours[3] for each meeting pattern type.

45 (3 per week) Lecture _____ Laboratory[1] _____ Recitation _____ Discussion _____ Indep. Study

_____ Clinical _____ Colloquium _____ Practicum _____ Research _____ Residency

_____ Seminar _____ Studio _____ Other – Please explain:

f. Identify a grading System: X☐ Letter (A, B, C, etc.) ☐ Pass/Fail

g. Number of credits: 3

h. Is this course repeatable for additional credit? YES ☐ NO X☐

If YES: Maximum number of credit hours: _____

If YES: Will this course allow multiple registrations during the same semester? YES ☐ NO ☐

i. Course Description for Bulletin:

This course, the first in a two-semester sequence in regression modeling, covers linear regression models for normally distributed outcomes. The course will cover simple and multiple linear regression, estimation, interpretation, hypothesis testing, model building and diagnostics, matrix algebra for regression, and an introduction to design of experiments. The course will include the use of computing tools to apply these models to real data.

j. Prerequisites, if any: STA 580 or consent of instructor.

k. Will this course be offered through Distance Learning? YES[4] ☐ NO X☐

l. Supplementary teaching component, if any: ☐ Community-Based Experience ☐ Service Learning ☐ Both

3. Will this course be taught off campus? YES ☐ NO X☐

4. Frequency of Course Offering

NEW COURSE FORM

a. Course will be offered (check all that apply): X☐ Fall ☐ Spring ☐ Summer

b. Will the course be offered every year? YES X☐ NO ☐

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[1]Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received

[2]The chair of the cross-listing department must sign off on the Signature Routing Log.

[3]In general, undergraduate courses are developed on the principle that one semester hour of credit represents one hour of classroom meeting per week for a semester, exclusive of any laboratory meeting. Laboratory meeting, generally, represents at least two hours per week for a semester for one credit hour. (from *SR 5.2.1*)

[4]You must *also* submit the Distance Learning Form in order for the proposed course to be considered DL delivery.

If NO, explain: _____

5. Are facilities and personnel necessary for the proposed new course available? YES X☐ NO ☐

If NO, explain: _____

6. What enrollment (per section per semester) may reasonably be expected? 5

7. Anticipated Student Demand

a. Will this course serve students primarily within the degree program? YES X☐ NO ☐

b. Will it be of interest to a significant number of students outside the degree program? YES ☐ NOX ☐

If YES, explain: _____

8. Check the category most applicable to this course:

X☐ Traditional – Offered in Corresponding Departments at Universities Elsewhere

☐ Relatively New – Now Being Widely Established

☐ Not Yet Found in Many (or Any) Other Universities

9. Course Relationship to Program(s)

a. Is this course part of a proposed new program? YES ☐ NO X☐

If YES, name the proposed new program: _____

b. Will this course be a new requirement[5] for ANY program? YESX ☐ NO ☐

If YES[5], list affected programs: Ph.D. program in Epidemiology and Biostatistics

10. Information to be Placed on Syllabus

a. Is the course 400G or 500? *YES* ☐ *NO X*☐

If YES, the *differentiation for undergraduate students must be included* in the information required in ***10.b.*** You must include: (i) identification of additional assignments by the graduate students; and /or (ii) Establishment of different grading criteria in the course for graduate students. (See *SR 3.1.4.*)

b. X ☐ The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500 level grading differentiation if applicable, from ***10.a*** above) are attached. *NO* ☐

[5]In order to change a program, a program change form must also be submitted.

Signature Routing Log

To Be Added by Academic Affairs prior to submission to HCCC

UNIVERSITY OF KENTUCKY
COLLEGE OF PUBLIC HEALTH

Course Syllabus

BST 681: Linear Regression
Fall 2013

Course meeting schedule

Lectures will take place on **Mondays** from **12:00 to 2:30 p.m.** in **Building Number**.

Contact information

Instructor: Dr. Philip Westgate
Multi-Disciplinary Science Building (MDS), Room 205B.

Telephone: (859) 218-2082

E-mail: philip.westgate@uky.edu (Preferred Contact)

Office Hours: By Appointment

Course description

This course, the first in a two-semester sequence in regression modeling, covers linear regression models for normally distributed outcomes. The course will cover simple and multiple linear regression, estimation, interpretation, hypothesis testing, model building and diagnostics, matrix algebra for regression, and an introduction to design of experiments. The course will include the use of computing tools to apply these models to real data.

Course rationale:

This course is essential for all biostatistics students, as understanding the theory and application of linear regression is a vital prerequisite toward comprehending and being able to apply other statistical regression procedures in future coursework. Linear regression is commonly utilized in public health studies, and this course will teach students the theory behind this method, and how to utilize it for real world data analyses. Students will also learn how to interpret statistical results in a manner that is meaningful to investigators with whom they will work in their future careers.

Course prerequisites

Prerequisite: STA 580 or consent of instructor.

Course objectives

To provide a strong background in linear regression
To provide realistic applications of linear regression and biostatistics to public health
To provide a background in common computing tools for the management and analysis of real world data
To enhance statistical literacy and thinking

Competency Attainment

Below we list the competencies for the PhD program in Epidemiology and Biostatistics, with notation indicating the minimal level of attainment for someone who has successfully completed BST 681. The parenthetical numbers 0, 1, 2, and 3 represent Unaware (No information or skill in this area), Aware (Basic mastery; able to identify the concept or skill but with limited ability to perform or apply it independently), Knowledgeable (Intermediate level of mastery; able to apply and describe the concept or skill), and Proficient (Advanced mastery; able to synthesize, critique, or teach the concept or skill) respectively.

1. Understand the interface between biostatistics and epidemiology. (1)
2. Demonstrate advanced proficiency to apply concepts and methods from these disciplines jointly. (1)
3. Demonstrate the ability to review and critically evaluate the literature in a substantive area of research, be able to identify gaps in knowledge and be able to formulate original research hypotheses or statements. (0)
4. Evaluate the strengths and limitations of epidemiologic reports. (1)
5. Draw appropriate inferences from data. (2)
6. Communicate research results orally and in writing to lay and professional audiences. (2)
7. Demonstrate an understanding of concepts of probability and statistical inference as they apply to problems in public health. (2)
8. Demonstrate proficiency in using computing tools commonly encountered in epidemiology and biostatistics. (2)
9. Understand the principles of epidemiologic study design and be able to calculate the appropriate epidemiologic measures for most typical designs. (0)
10. Become proficient at and be able to evaluate the strengths and limitations of advanced designs including multivariate linear models, generalized linear models, longitudinal models, mixed effects models, and survival models both parametric and nonparametric. (1)
11. Understand the principles of chronic and infectious disease epidemiology. (0)
12. Demonstrate an understanding of research methods used in epidemiology and biostatistics. (1)
13. Demonstrate knowledge of the public health system in the commonwealth and the country. (0)

Student learning outcomes:

Students completing BST 681 will be able to:

1. Understand the theoretical details behind linear regression
2. Understand the role of matrix algebra for linear regression
3. Carry out model building procedures and statistical inference
4. Interpret model results
5. Understand basic experimental designs
5. Use SAS for data manipulation and storage
6. Use SAS for obtaining descriptive statistics and carrying out linear regression

Textbooks

DC Montgomery, EA Peck, GG Vining. Introduction to Linear Regression Analysis. 4th edition. Wiley, 2007.

Course requirements and learner evaluation

Course grades will be based upon evaluation of the following activities:

Homeworks (20%):
Students will be given eight homework assignments (2.5% / assignment) that are due at the start of the class period the week after it has been assigned.

Linear Regression Application Project (30%)
Students will be expected to provide written reports toward the end of the semester which will include the analysis and interpretation of data. Reports are designed to test students' understanding of the material covered in this course, with an emphasis on how to analyze real-world data and how to meaningfully interpret and report results from their analysis.

Midterms (50%)
Two Midterms will be given, each worth 25% of the final grade

Grading Scale: 100 – 85 = A
84 – 70 = B
69 – 60 = C
59 – 0 = E

Instructor expectations

1. I expect you to attend every class session. The components are highly interrelated; missing a class will detract from the learning potential of subsequent sessions.
2. I expect you to be in the classroom and prepared to begin work at the scheduled starting time for each session.
3. I expect you to actively participate in discussions.
4. I expect you to act professionally.
5. I expect you to ask questions when you are confused or need more explanation

Academic honesty

Academic honesty is highly valued at the University. You must always submit work that represents your original words or ideas. If any words or ideas used in a class assignment submission do not represent your original words or ideas, you must cite all relevant sources and make clear the extent to which such sources were used. Words or ideas that require citation include, but are not limited to, all hard copy or electronic publications, whether copyrighted or not, and all verbal or visual communication when the content of such communication clearly originates from an identifiable sources. Please see the University's policies concerning the consequences for plagiarism. Source: www.uky.edu/ombud/plagerism.pdf Policy: www.uky.edu/usc/new/rulesandregulationsmark.htm

Accommodations

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, submit to me a Letter of Accommodation from the Disability Resource Center (www.uky.edu/TLC/grants/uk_ed/services/drc.html). If you have not already done so, please register with the Disability Resource Center for coordination of campus disability services available to students with disabilities.

Religious Observances

Students will be given the opportunity to make up work (typically, exams or assignments) when students notify their instructor that religious observances prevent the student from doing their work at its scheduled time. Students must notify the course instructor at least two weeks prior to such an absence and propose how to make up the missed academic work.

Inclement weather
The University of Kentucky has a detailed policy for decisions to close in inclement weather. The snow policy is described in detail at http://www.uky.edu/MicroLabs/documents/p-weather.pdf or you can call (859) 257-5684.

Late work policy
Only students with university or instructor excused absences will be allowed to submit late work without penalty. Late work is defined as any work handed in after the scheduled due date and time. It is the student's responsibility to make arrangements for determining and handing in missed work, preferably in advance, but no later than one week after the absence. In all other cases, late work will be penalized 15% for each day late, and assignments will not be accepted more than one week late.

Excused absences policy
Attendance, excused absences and make-up opportunities for this course will conform to the course policies established by the Office of Academic Ombud Services as found at www.uky.edu/Ombud/policies.php

Course schedule and topics

Tentative Schedule of Topics and Assignments:

Date	Topic	Readings	Due Dates
Aug 27	Introduction to Simple Linear Regression: The data, the model, sums of squares, estimation, variance, assumptions	Chapters 1, 2	
Sept 3	Labor Day No Class		
Sept 10	Introduction to SAS: Managing data, descriptive statistics, simple linear regression		Homework 1 Due
Sept 17	Simple Linear Regression: Interpretation, inference, model fit, application	Chapter 2	Homework 2 Due
Sept 24	Introduction to Multiple Linear Regression: The model, assumptions, interpretation, estimation, matrix algebra and notation, application	Chapter 3: 3.1 - 3.3 (to pg 92), 3.4 – 3.6	Homework 3 Due
Oct 1	The model, assumptions, interpretation, estimation, matrix algebra and notation, application (continued)	Chapter 3: 3.1 - 3.3 (to pg 92), 3.4 – 3.6	Homework 4 Due
Oct 8	Midterm 1		
Oct 15	Inference: Sums of Squares, General Linear Hypotheses, application	Chapter 3: 3.3 (pg 92-99)	
Oct 22	Interactions, Categorical Covariates, application	Chapter 8	Homework 5 Due
Oct 29	Model Diagnostics: Residuals, Residual Plots, leverage, normality, outliers, application	Chapter 4: 4.1 - 4.2, 4.4 Chapter 6: 6.1 - 6.2	Homework 6 Due
Nov 5	Diagnostics: Measures of Influence, Lack of Fit test, Multicollinearity, application	Chapter 6 Chapter 4: 4.5 Chapter 3: 3.8 Chapter 10	Homework 7 Due
Nov 12	Model Selection Methods with application	Chapter 9	Homework 8 Due
Nov 19	Midterm 2		
Nov 26	Introduction to Design of Experiments		
Dec 3	Design of Experiments continued with application		
Dec 10	Exam Week (No Class)		Project Due

PLS 640 Advanced Topics in Plant Propagation

PLS 641 Plant Water Relations

PLS 643 Advanced Greenhouse Crop Production

PhD in Epidemiology/Biostatistics and the following related courses:

BST 639, Drop, Computing Tools for the Biomedical Sciences

BST 760, Drop, Advanced Regression

BST 701, Change, Bayesian Modeling in Biostatistics

BST 740, Change, Spatial Statistics

BST 762, Change, Longitudinal Data Analysis

BST 764, Change, Applied Statistical Modeling for Medicine and Public Health

BST 766, Change, Analysis of Temporal Data in Public Health

BST 681, New, Linear Regression

BST 682, New, Generalized Linear Models

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