

APPLICATION FOR NEW COURSE

1. Submitted by the College of Public Health Date: January 15, 2008

Department/Division proposing course: Biostatistics

2. Proposed designation and Bulletin description of this course:

a. Prefix and Number BST 765

b. Title* Missing Data Methodology for Public Health

*If title is longer than 24 characters, write a sensible title (24 characters or less) for use on transcripts:

Missing Data

c. Courses must be described by at least one of the categories below. Include the number of actual contact hours per week for each category, as applicable.

() CLINICAL () COLLOQUITUM () DISCUSSION () LABORATORY (3) LECTURE
() INDEPEND. STUDY () PRACTICUM () RECITATION () RESEARCH () RESIDENCY
() SEMINAR () STUDIO () OTHER – Please explain: _____

d. Please choose a grading system: Letter (A, B, C, etc.) Pass/Fail

e. Number of credit hours: 3

f. Is this course repeatable? YES NO If YES, maximum number of credit hours: _____

g. Course description:

This course surveys methods for analyzing data with missing observations. This includes methods for data missing completely at random including hot deck cold deck, mean substitution, and single imputation; methods for data

missing at random including multiple imputation and weighted estimating equations and methods for data missing not at random including pattern mixture models, selection models, and shared random effects models

h. Prerequisite(s), if any:

BST 676 (Biometrics II) and BST 762 (Longitudinal Data Analysis)

i. Will this course be offered through Distance Learning? YES NO

If YES, please circle one of the methods below that reflects how the majority of the course content will be delivered:

Internet/Web-based Interactive video Extended campus Kentucky Educational Television (KET/teleweb) Other

Please describe "Other": _____

3. Teaching method: N/A or Community-Based Experience Service Learning Component Both

4. To be cross-listed as: _____
Prefix and Number Signature of chair of cross-listing department

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5. Requested effective date (term/year): Fall / 2010
6. Course to be offered (please check all that apply): Fall Spring Summer
7. Will the course be offered every year? YES NO
If NO, please explain: This course will be an elective in the proposed Ph.D. Epidemiology/Biostatistics program. We anticipate offering it perhaps every third semester (i.e., twice every three years).
8. Why is this course needed?
This course will be an elective in the proposed Ph.D. Epidemiology/Biostatistics program. This course will also be available as a selective for M.P.H. and Dr.P.H. students concentrating in Biostatistics who have the prerequisite noted above.
9. a. By whom will the course be taught? Richard Kryscio
- b. Are facilities for teaching the course now available? YES NO
If NO, what plans have been made for providing them?
10. What yearly enrollment may be reasonably anticipated?
5-10 students per offering
11. a. Will this course serve students primarily within the department? Yes No
- b. Will it be of interest to a significant number of students outside the department? YES NO
If YES, please explain.
The course will be an elective for the proposed Ph.D. in Epidemiology/Biostatistics. Some of the students in that program may consider Epidemiology their home department.
12. Will the course serve as a University Studies Program course[†]? YES NO
If YES, under what Area?
[†]AS OF SPRING 2007, THERE IS A MORATORIUM ON APPROVAL OF NEW COURSES FOR USP.
13. Check the category most applicable to this course:
- traditional – offered in corresponding departments at universities elsewhere
- relatively new – now being widely established
- not yet to be found in many (or any) other universities
14. Is this course applicable to the requirements for at least one degree or certificate at UK? Yes No
15. Is this course part of a proposed new program? YES NO
If YES, please name: Ph.D. Epidemiology/Biostatistics
16. Will adding this course change the degree requirements for ANY program on campus? YES NO
If YES[†], list below the programs that will require this course:

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†In order to change the program(s), a program change form(s) must also be submitted.

17. The major teaching objectives of the proposed course, syllabus and/or reference list to be used are attached.
18. Check box if course is 400G or 500. If the course is 400G- or 500-level, you must include a syllabus showing differentiation for undergraduate and graduate students by (i) requiring additional assignments by the graduate students; and/or (ii) the establishment of different grading criteria in the course for graduate students. (See SR 3.1.4)

19. Within the department, who should be contacted for further information about the proposed new course?

Name: Richard Kryscio Phone: 257-4064 Email: kryscio@email.uky.edu

20. Signatures to report approvals:

4-1-08
DATE of Approval by Department Faculty

6-26-08
DATE of Approval by College Faculty

* DATE of Approval by Undergraduate Council

* DATE of Approval by Graduate Council

8/19/08
* DATE of Approval by Health Care Colleges Council (HCCC)

* DATE of Approval by Senate Council

* DATE of Approval by University Senate

Richard Kryscio / Richard Kryscio
printed name Reported by Department Chair signature

Linda Alexander / Linda Alexander
printed name Reported by College Dean signature

printed name Reported by Undergraduate Council Chair signature

printed name Reported by Graduate Council Chair signature

Heidi Anderson / Heidi Anderson
printed name Reported by Health Care Colleges Council Chair signature

Reported by Office of the Senate Council

Reported by Office of the Senate Council

*If applicable, as provided by the *University Senate Rules*. (<http://www.uky.edu/USC/New/RulesandRegulationsMain.htm>)

BST 765: Missing Data Methodology for Public Health

Course Description: This course surveys methods for analyzing data with missing observations. This includes methods for data missing completely at random including hot deck cold deck, mean substitution, and single imputation; methods for data missing at random including multiple imputation and weighted estimating equations and methods for data missing not at random including pattern mixture models, selection models, and shared random effects models

Course Structure: 3 credit hours (3 hours of lecture, 0 hours of laboratory)

Prerequisites: BST 676 (Biometrics II) and BST 762 (Longitudinal Data Analysis)

Initial Offering: Fall 2010

Instructors: Any faculty member in the Department of Biostatistics

Philosophical Statement: Missing data occurs frequently in survey sampling, in longitudinal studies, and in clinical trials. Missing observations are either missing completely at random (MCAR), missing at random (MAR), or missing not at random (MNAR) and different statistical methodology applies to each setting. In both the longitudinal setting and the clinical trial setting participant drop out often generates missing observations. Specialized methodology focuses on this important special case. In all cases examples of health surveys, clinical trials, or longitudinal studies with missing responses will be used to motivate the methodology covered. Statistical software for implementing the methodology will be covered as well. Doctoral students may also find that the course provides ideas for dissertation topics.

Objectives: Students completing CPH 765 will be able to:

1. Apply simple imputation methods to missing data problems in public health.
2. Apply multiple imputation methods to missing data problems in public health.
3. Apply pattern mixture models to missing data problems in public health
4. Apply selection models to missing data problems in public health.

References:

1. Madow, Olkin, Rubin (eds) (1983) *Incomplete Data in Sample Surveys. Volume II: Theory and Annotated Bibliography*. New York: Academic Press.
2. Dmitrienko, Molenberghs, Chuang-Stein, and Offen (2005) *Analysis of Clinical Trial Data Using the SAS System*. Chapter 5: Analysis of Incomplete Data. Cary, NC: SAS Publishing
3. Little and Rubin (2002) *Statistical Analysis with Missing Data*. New York: Wiley
4. Rubin (1987) *Multiple Imputation for Nonresponse in Surveys*. New York: Wiley.
5. Schafer (1997) *Analysis of Incomplete Multivariate Data*. London: Chapman & Hall.
6. Molenberghs and Kenward (2007) *Missing Data in Clinical Studies*. New York: Wiley.
7. Allison (2001) *Missing Data* Thousand Oaks, CA: Sage

Detailed Outline:

- I. Introduction to Incomplete Data
 - a. Missing Data Mechanisms: MCAR, MAR, and MNAR
 - b. Informative and non-Informative missing data
 - c. Review of statistical estimations techniques:

- (i) likelihood estimation
- (ii) least squares
- (iii) estimation equations
- d. motivating examples from sample surveys, clinical trials, and longitudinal studies

II. Imputation methods for Data MCAR

- a. Complete cases method
- b. Available Case method
- c. Single Imputation Methods
 - (i) Hot Deck and Cold Deck
 - (ii) Unconditional means
 - (iii) Conditional Means
 - (iv) Last Observation Carried Forward

III. Multiple Imputation Methods for Data MAR

- a. Conditional Means
- b. Propensity Scores
- c. Monte Carlo Markov Chain
- d. Inference based on multiple imputations

IV. Methods for Data MNAR

- a. Pattern Mixture Models
- b. Selection Models
- c. Shared Parameter Models
- d. Sensitivity Analysis

V. Missing Categorical Responses

- a. Weighted Least Squares
- b. Estimation-Maximization algorithm

VI. Nonparametric Methods

- a. Inverse Probability Weighting
- b. Quasi-Likelihood functions
- c. Weighted Estimating Equations

Note: Motivating case studies may vary from year to year.

Assessment: There will be regular homework assignments (60%) and a final project (40%).

Grading Scale:

Grade	%
A	90-100
B	80-89
C	70-79
E	60-69