New Course Request

Indiana University

Indianapolis Campus

Check Appropriate Boxes: Undergraduate credit [ ] Graduate credit [ ] Professional credit [ ]

1. School/Division: Medicine | Public Health
   2. Academic Subject Code: PBHL

3. Course Number: B641 (must be cleared with University Enrollment Services)
4. Instructor: Yiannoutsos

5. Course Title: Linear Models in Public Health

  Recommended Abbreviation (Optional): Linear Models in Public Health

(Limited to 32 Characters including spaces)

6. First time this course is to be offered (Semester/Year): Fall 2011

7. Credit Hours: Fixed at 3 / or Variable from 0 to 0

8. Is this course to be graded S-F (only)? Yes [ ] No [✓]

9. Is variable title approval being requested? Yes [ ] No [✓]

10. Course description (not to exceed 50 words) for Bulletin publication:
    This is a first course into two multivariate statistical procedures, the Analysis of Variance and Regression with
    special focus in problems related to Public Health sciences. This is an introductory course that will expose students to these methods, and consolidate their understanding of statistical inference (estimation and testing of statistical hypotheses) in the context of the two procedures.
    Prerequisite: P551 or Equivalent

11. Lecture Contact Hours: Fixed at 3 / or Variable from 0 to 0

12. Non-Lecture Contact Hours: Fixed at 0 / or Variable from 0 to 0

13. Estimated enrollment: 30 / of which 100 / percent are expected to be graduate students.

14. Frequency of scheduling: one time per year. Will this course be required for majors? Yes [ ]

15. Justification for new course: Necessary component for the development of the Biostatistics concentration curriculum.

16. Are the necessary reading materials currently available in the appropriate library? Yes [ ]

17. Please append a complete outline of the proposed course, and indicate instructor (if known), textbooks, and other materials.

18. If this course overlaps with existing courses, please explain with which courses it overlaps and whether this overlap is necessary, desirable, or unimportant.

19. A copy of every new course proposal must be submitted to departments, schools, or divisions in which there may be overlap of the new course with existing courses or areas of strong concern, with instructions that they send comments directly to the originating Curriculum Committee. Please append a list of departments, schools, or divisions thus consulted.

Submitted by: Carole Kacius
Department Chairman/Division Director
Date 5.5.10

Approved by: [Signature]
Dean
Date

Chancellor/Vice-President
Date

University Enrollment Services
Date

After School/Division approval, forward the last copy (without attachments) to University Enrollment Services for initial processing, and the remaining four copies and attachments to the Campus Chancellor or Vice-President.
INDIANA UNIVERSITY SCHOOL OF MEDICINE
DEPARTMENT OF PUBLIC HEALTH
SEMESTER, YEAR

COURSE TITLE: Linear models in Public Health
COURSE NUMBER: B641
LOCATION:
DATE: TBD

FACULTY: Constantin Yiannoutsos, Ph.D.
Division of Biostatistics
401 W. 10th Street
Suite HITS 3000
Indianapolis, IN 46202
Tel.: 278-3045
Fax: 274-2678
e-mail: cyiannou@iupui.edu
Office hours: TBD

PREREQUISITE: P551 or Equivalent

COURSE DESCRIPTION

This is a first course into two multivariate statistical procedures, the Analysis of Variance (ANOVA) and Regression with special focus in problems related to the Public Health sciences. This is an introductory course that will expose students to these methods, and consolidate their understanding of statistical inference (estimation and testing of statistical hypotheses) in the context of the two procedures.

The course will be taught in two sessions, a lecture, where the relevant theory and methods will be presented, and a practicum or laboratory session, involving hands-on analysis of real-life problems using the SAS statistical software package. The content of the lectures is presented below. Data sets will be obtained from the textbook and/or the instructor’s experience. Students are strongly encouraged to contact the instructor via e-mail for any course-related matters.

MPH PROGRAM COMPETENCIES ADDRESSED IN THIS COURSE

This course addresses the following Public Health competencies:
• Describe theories and methods used in population health models
• Distinguish amount and characterize inputs, throughputs and outputs of the public health system.
• Demonstrate analytic and assessment proficiency when formulating hypotheses, evaluating the integrity and comparability of data, and identifying gaps in data resources.

Also, the course addresses the following skill development:
• Describe environmental, social and biological determinants of health and disease and their political, economic and legal contexts.
• Write proposal, reports, policies, or program guidelines and evaluations.
• Make presentations in support of a particular public health proposal using demographic, statistical, programmatic and scientific information.
• Create learning environments for program management, policy proposals or intervention strategies.

LEARNING OBJECTIVES

Upon successful completion of the course, students will be able to
• Generate descriptive statistics in a variety of applications
• Understand in depth the concept of correlation and linear association
• Be able to carry out analyses where mathematical models reflecting the association between factors under consideration are evaluated
• Generate predictions for future observations based on relationships identified in the current data
• Appropriately select the proper linear model and design studies involving comparisons between groups and assessment of associations between multiple factors.

REQUIRED OR SUGGESTED TEXT AND/OR READINGS

The class textbook is “Applied Regression Analysis and Other Multivariate Methods” by Kleinbaum, Kupper, Muller and Nizam (2007, Duxbury Press). Detailed notes will also be also provided.

EVALUATION AND GRADING SCALE

Percent of final grade:
Homework 30%
Mid-term examination 30%
Final examination 40%
Total 100%

Grades from homework, mid-term and final examination will be averaged. The final grade will be assigned as follows:

| 94%-100%:  | A  | 74%-76%:  | C  |
| 91%-93%:   | A- | 71%-73%:  | C- |
| 87%-90%:   | B+ | 67%-70%:  | D+ |
| 84%-86%:   | B  | 64%-66%:  | D  |
| 81%-83%:   | B- | 61%-63%:  | D- |
| 77%-80%:   | C+ | Anything less than 60%: -F |

GUIDELINES
OnCourse, an IUPUI web-based environment for learning and collaboration, will be used. OnCourse provides a way for instructors and students to communicate and share course lessons, resources, and tools and importantly to reduce paper wastage. You will receive instruction during the MPH orientation regarding access to and use of OnCourse.

For additional information visit: General Information:
http://registrar.iupui.edu/registration-guide/oncourse.htm
http://www.indiana.edu/~ittrain/oncourse/workshops_materials/ONSTU.pdf

and more specific information:

https://oncourse.iu.edu/portal/site!/gateway/page!/gateway-500

All analyses will be performed with the SAS system (SAS Institute, Cary, NC) version 9.2 or later.

ATTENDANCE
Attendance to lectures or laboratory sessions is not mandatory. Each student assumes responsibility for mastery of the material. Attendance to in-class examinations is mandatory. Make-up examinations will be granted rarely on a case-by-case basis. There will be no make-up for missed homework. Students are responsible to hand in homework on time. Appropriate mode for transmission of homework will be discussed at the beginning of each class.

STUDENTS WITH DISABILITIES
Students needing accommodations because of disability will need to register with Adaptive Educational Services (AES) and complete the appropriate forms issued by AES before accommodations will be given. The AES office is located in CA 001E and you can reach the office staff by calling 274-3241.

STUDENT COURSE EVALUATION
The Department of Public Health evaluates all courses. Student course evaluations will be conducted in a manner that maintains the integrity of the process and the anonymity of respondents.

ACADEMIC INTEGRITY
Academic and personal misconduct by students in this class are defined and dealt with according to the procedures in the Student Misconduct section of the IUPUI Code of Student Rights, http://live.iupui.edu/dos/code/htm.

CLASS SCHEDULE
The class will be taught once weekly (date TBD). There will also be a separate one-hour computer laboratory session.
The following didactic units generally represent one week of instruction.

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<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading Assignment</th>
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| 1    | Review of basic concepts  
- Descriptive statistics  
- Sampling distributions  
- Statistical inference: Estimation; Hypothesis testing | Chapter 1, 3 |
| 2    | Simple linear (straight line) regression  
- Mathematical properties of the straight line  
- Least squares estimation of the “best-fitting” straight line  
- Inference about the slope b, the regression line, prediction | Chapter 4, 5 and 7 |
| 3    | The correlation coefficient  
- $r$ as a measure of linear association  
- What $r$ does not measure  
- Inference on the correlation coefficient | Chapter 6 |
| 4    | Multiple regression  
- Assumptions in multiple regression  
- Determination of the best estimate of the multiple regression equation  
- Testing of hypotheses in multiple regression  
- Overall test, partial $F$ test | Chapter 8, 9 |
| 5    | Multiple and partial correlation coefficient  
- The correlation matrix  
- Multiple correlation coefficient  
- Partial correlation coefficient  
- Multiple partial regression | Chapter 10 |
| 6    | Confounding and interaction  
- Interaction  
- Confounding | Chapter 11 |
| 7    | Regression diagnostics  
- Checking the assumptions of the regression model graphically and statistically  
- Quantile-quantile (Q-Q) plots  
- Probability (P-P) plots, normal plots  
- Analysis of residuals, outliers, collinearity | Chapter 12 |
<p>| 8    | Midterm examination |</p>
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| 9    | **Selecting the best regression equation**  
- Strategies for selecting the best model  
- All possible regressions  
- Forward selection and backward-elimination techniques  
- Stepwise selection technique and “chunk-wise” selection | Chapter 16 |
| 10   | **One-way analysis of variance**  
- Problem, assumptions and data configuration  
- Methodology for the one-way (fixed effects) ANOVA  
- Multiple comparison and *post-hoc* procedures for the one-way ANOVA | Chapter 17 |
| 11   | **Two-way analysis of variance I**  
- The principle of blocking  
- Randomized blocks: a special case of the two-way classification  
- The ANOVA table for the randomized-blocks experiment  
- Fixed-effects ANOVA model for the randomized-blocks experiment  
- Two-way ANOVA with equal cell numbers  
- Tests of hypotheses  
- Orthogonal contrasts, and “custom” hypothesis tests | Chapter 18, 19 |
| 12   | **Two-way analysis of variance II**  
- Problems with unequal cell numbers  
- Regression approach for unequal cell numbers  
- Higher-level ANOVA | Chapter 20 |
| 13   | **Analysis of covariance**  
- The problem of adjusting for continuous covariates  
- The assumption of parallelism  
- The link between lack of parallelism and interaction | Chapter 15 |
| 14   | **Dummy variables-regression**  
- Applications to analysis of variance problems  
- Applications to analysis of covariance | Chapter 14 |
| 15   | **Polynomial regression**  
- Polynomial models  
- Least-squares regression for fitting a parabola  
- Fitting and testing higher-order models | Chapter 13 |
| 16   | **Final examination** | |