

New Course Request

Indiana University
NOV 11 2008

Indianapolis Campus

Check Appropriate Boxes: Undergraduate credit Graduate credit Professional credit 90

1. School/Division Science, Biostatistics 2. Academic Subject Code BIOS

3. Course Number 546 (must be cleared with University Enrollment Services) 4. Instructor J. Harezlak

5. Course Title Applied Longitudinal Data Analysis

Recommended Abbreviation (Optional) Appl Longitudinal Data Analysis
(Limited to 32 Characters including spaces)

6. First time this course is to be offered (Semester/Year): Spring/2009

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

8. Is this course to be graded S-F (only)? Yes _____ No X

9. Is variable title approval being requested? Yes _____ No X

10. Course description (not to exceed 50 words) for Bulletin publication: _____

P: STAT 512, 525; or permission of instructor. Covers modern methods for the analysis of repeated measures, correlated outcomes and longitudinal data. Topics: repeated measures ANOVA, random effects and growth curve models, generalized estimating equations (GEE) and generalized linear mixed models (GLMMs). Extensive use of statistical software, e.g. SAS, R.

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

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

13. Estimated enrollment: 5-10 of which 100 percent are expected to be graduate students.

14. Frequency of scheduling: spring Will this course be required for majors? yes

15. Justification for new course: Required course for new biostatistics Ph.D. program

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: Berlin Barlow Date 6/6/08
Department Chairman/Division Director

Date _____
Dean of Graduate School (when required)

Approved by: James M. Murphy Date 6/25/2008
Dean

Merry L. Quener Date 11/4/08
Chancellor/Vice-President

Jackie O'Palko **APPROVED** OCT 10 12 2008
Curriculum Committee Date _____

Date _____
University Enrollment Services

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.

BIOS 546
Applied Longitudinal Data Analysis

Syllabus

BIOS 546 – Applied Longitudinal Data Analysis (3 cr.)

Instructor: Jaroslaw Harezlak

A. Course Description:

This course covers modern methods for the analysis of repeated measures, correlated outcomes and longitudinal data, including the unbalanced and incomplete data frequently encountered in biomedical research. Topics include an introduction to the analysis of correlated data, repeated measures analysis of variance (ANOVA), random-effects and growth-curve models, generalized linear models for correlated data, including generalized estimating equations (GEE), and generalized linear mixed models (GLMMs).

Class presentations and homework assignments will focus on data analysis in SAS using PROC GLM, PROC MIXED, PROC GENMOD, and PROC NL MIXED.

B. Prerequisites:

STAT 525 and STAT 512, or permission of the instructor.

C. Required and Recommended Texts:

The course will use the following textbook:

Fitzmaurice, G. M., Laird, N. M., and Ware, J. H. *Applied Longitudinal Analysis*. Wiley & Sons (FLW).

We will supplement the textbook with instructors' own lecture notes.

D. Description for Bulletin:

P: STAT 512, 525; or permission of instructor. Covers modern methods for the analysis of repeated measures, correlated outcomes and longitudinal data. Topics: repeated measures ANOVA, random effects and growth curve models, generalized estimating equations (GEE) and generalized linear mixed models (GLMMs). Extensive use of statistical software, e.g. SAS, R.

E. Instructor:

Jaroslaw Harezlak, PhD, Assistant Professor

Contact information:

Jaroslaw Harezlak, PhD
Division of Biostatistics
Indiana University School of Medicine
410 West 10th Street, Suite 3000
Indianapolis, IN 46202

Office: (317) 274-2682

Email: harezlak@iupui.edu

F. Educational objectives:

At the end of the course students will be able to:

- use modern statistical methods for the analysis of repeated measures, correlated outcomes and longitudinal data
- utilize SAS software for the analysis of such data

Meeting Times: Lectures and lab sessions twice per week with approximately 1 lab session for every 3 lectures

Format: Lectures with periodic labs to demonstrate and explore statistical method and SAS programming.

G. Evaluation and Grading:

Students will be evaluated based on their performance on the homework assignments (40%), the mid-term exam (30%), and the final exam (30%). Letter grades for the course are assigned using the following scale: A: 90-100; B: 80-89; C: 70-79; D: 60-69; F: less than 60. Within each letter grade, "+" and "-" will be assigned if the numeric score is in the top and bottom quintiles, respectively.

H. Course Outline

Part I: ANALYSIS OF VARIANCE AND INTRODUCTION TO CORRELATED DATA

1. Lecture: Introduction
Reading: FLW, Chapter 1
2. Lecture: Introduction to Correlated Data
Reading: FLW, Chapter 2
3. Lab: Using PROC MIXED in SAS

Part II: LINEAR MODELS FOR LONGITUDINAL DATA

- 4-6. Lectures: Statistical Basis of Repeated Measures Analysis
Reading: FLW, Chapter 3-4
7. Lecture: Crossover Designs
8. Lecture: Parallel Groups Repeated Measures Analysis
Reading: FLW, Chapter 5
9. Lab: Longitudinal Data Analysis using PROC MIXED
10. Lecture: Statistical Modeling of Repeated Measures
Reading: FLW, Chapter 6
11. Lab: Synthesis of Ideas for Repeated Measures Analysis
12. Lecture: General Linear Model for Longitudinal Data
Reading: FLW, Chapter 7

13. Lecture: Mixed Effects Model for Longitudinal Data
Reading: FLW, Chapter 8
14. Lecture: Prediction of Subject-Specific Regression Coefficients
Growth Curve Models and Two-Stage Analysis
15. Lab: General Linear Mixed Models
- 16-18. Lecture: Selection of Model for Covariance, Empirical Variance Estimation,
Sample size estimation,
Drop-outs, missing values and mis-timed values
19. Lecture: Review of Logistic and Poisson Regression
20. Lab: Mid-Term Exam Review
21. **Mid-Term Exam**

Part III: GENERALIZED LINEAR MODELS FOR LONGITUDINAL DATA

20. Lecture: Introduction to Generalized Linear Models
Reading: FLW, Chapter 9
21. Lecture: Generalized Linear Models for Longitudinal Data
- 22-23. Lectures: Marginal Models and Generalized Estimating Equations
Reading: FLW, Chapter 10
24. Lab: GEE using PROC GENMOD
25. Lecture: Generalized Linear Mixed Models
Reading: FLW, Chapter 11
26. Lecture: Response Conditional Models for Longitudinal Data
Reading: FLW, Chapter 12
27. Lab: GLMMs using PROC NLMIXED
28. Lecture: Multilevel Models
Reading: FLW, Chapter 17
29. Lab: Multilevel Models
30. Review

I. Cheating and Plagiarism:

Academic misconduct will *not* be tolerated and all cases will be reported. Examine the IU Code of Student Rights, Responsibilities, and Conduct at <http://life.iupui.edu/help/code.asp> and in particular examine the rules regarding academic misconduct at http://life.iupui.edu/help/docs/Part_3all.html. Violations of these rules will result in a grade of "F" (or 0%) for the assignment in question, and may result in an "F" for the course or even expulsion from the university (see http://life.iupui.edu/help/docs/Part_4all.html#sanction).

J. Americans with Disabilities Act:

If you need any special accommodations due to a disability, please contact Adaptive Educational Services at (317)-274-3241. The office is located in CA 001E.