**POS 6933 – Section 016D – Spring 2015**
**Hierarchical Linear Models**
**Department of Political Science, University of Florida**

Thursday: Periods 2-3; Room: MAT 251 then POLS Computer Lab 4th period

Instructor: Prof. Badredine Arfi
Office: 221 Anderson Hall
Phone: (352) 273 2357. Email: barfi@ufl.edu
Office Hours: Tuesday 8:30 am – 11:00a m or by appointment

## Course Description and Objectives

This course is designed to cover advanced statistical topics for graduate students in political/social sciences. The course specifically deals with various topics in what is called as multilevel or hierarchical linear models (HLM). The course assumes that any student taking this course has already been adequately exposed to a one-semester course on linear regression models and a one-semester course on regression models for categorical and limited dependent variables.

The main goal of the course is to encourage the students to acquire a good and working knowledge of how the statistical analysis of data is conducted using multilevel linear models. The course specifically offers an understanding of how such models work under various conditions. The course also concentrates on studying some of the potential drawbacks and limitations and how we can overcome them. However, due to time constraints, the course selectively dwells on a limited number of specific models and modifications thereof.

It is my hope that by the end of the semester, three goals will have been achieved:

(1) you should have improved your already acquired skills in understanding and critically evaluating the quantitative professional literature using HLM.
(2) you should be able to design and carry out statistical projects that employ HLM techniques for testing substantive theories
(3) you will become better equipped to explore and study more advanced statistical models and techniques in future projects.

To insure that the class is a hand-on type of learning experience the course is organized every week in two sessions. One session will consist of a lecture and Q&A of the major theoretical notions and aspects of the course. A second session will consist of a **collective** learning through direct group discussion and practice of the ways on how to use stata to analyse multilevel data. The second session will be held in the lab room of the political science department. Students are required to attend both sessions and come prepared to effectively participate in both sessions.

**Requirements and Evaluation**

The requirement for this course is simple: work diligently and persistently. This includes attending classes, doing the readings carefully before the class meets, and working regularly on the problem sets and the research paper. Each student should expect to be spending many hours learning how to excel in using the Stata software commonly used to estimate the models discussed in class.

There will be a number of homework assignments from the stata book that the students must complete and turn in. The homework assignments are due on dates to be specified; no late submission is acceptable. In addition, the students are strongly encouraged to solve many of the exercises at the end of each chapter of the stata book. This is a good way to put into practice the concepts learned in each chapter as well as provide yourself with much needed practice to effectively understand and master the purported statistical skills.

A major component of the course evaluation will be a term research replication paper. Each student is expected to produce a manuscript of high quality using an appropriate modelling strategy. I will work closely with the students on their projects.

**Distribution of Grades**

1. **40%:** Weekly graded sets of exercises from the stata book. All assignments are to be emailed to me before the beginning of class on their respective due dates. No late submission is accepted for any reason (except when justified with officially sanctioned documentation).

2. **50%**: A Replication Paper chosen by the student in consultation with the instructor (see down below). The goal is to produce a high quality manuscript, using a model (or models) discussed in the course. See down below for details.

3. **10%:** Each student will present his/her paper at the exam date and time set by the university for the course. The presentation will consist of a ppt presentation for about 10 minutes followed by 5 minutes of Q & A.

**Required Reading Materials**

1. Stephen W. Raudenbush and Anthony S. Bryk. 2002. Hierarchical Linear Models: Applications and Data Analysis Methods. 2nd edition. Sage Press. **On reserve at Library West.**

2. Sophia Rabe-Hesketh and Anders Skrondal. 2012. Multilevel and Longitudinal Modeling Using Stata. 3rd edition. Volume I: Continuous Responses & Volume II: Categorical Responses, Counts, and Survival. Stata Press. **On reserve at Library West.**

3. Extra readings to be available on e-learning site for the course in the folder called resource.

**Computer Requirements**

All models covered in this class will be estimated using the Stata software package. It is a must that you have a UF account and password so that you can use the computers in the Anderson datalab. Stata is available on all of the Anderson Hall datalab computers. Alternatively you can use your own computer should you own a copy of stata.

**Specifics on the Research Paper**

In order for the instructors to provide adequate and timely guidance in the preparation of this paper, you will be required to turn in various brief intermediate papers throughout the semester.

**Each student must:**

- Find a published paper that interests you and that applies a statistical method comparable to the material covered in this course. **Date: January 22nd – one page summary of the chosen paper.**
- Obtain the data from the authors (or elsewhere). **Date: February 5th – one page report.**
- Replicate the published results as nearly as possible. **Date: March 12th – submit a multiple-page report.**
- You **must extend** the analysis in some way. You could, for example:
    - Suggest a more appropriate functional form for the estimation and re-estimate.
    - Argue that one or a set of important variables were omitted and conduct the analysis anew.
    - Argue that the results are likely to be sensitive to sample selection or variable measurement etc. and then conduct appropriate analyses to address that possibility.
    - Extend the data or use a different data set to test the theory.
    - Any other good idea that you might have.
- The final product should be **15-20 pages long**, including the bibliography. **Date: April 16th.**
- Prepare a ppt presentation at the exam date and time set by the university for the course.

**Important Note:**

- The instructor reserves the right to change any part or aspect of this document should a need for doing so emerge at any point in time during the semester.

**Critical Dates:**

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|---|---|
| Classes Begin | January 5 |
| Official University Holidays - no classes | January 18: Martin Luther King Jr. Day<br>February 27 - March 5: Spring Break |
| ISA 56th Annual Convention – New Orleans | February 18 – 21 |
| Reading Days - no classes | April 21-22 |
| Final Exams | April 23, April 25-29 |

**Rules of the University of Florida**

- 6C1-4.041 Student Honor Code and Student Conduct Code: Scope and Violations.
- **There is a zero-percent tolerance on plagiarism.**
- **No homework cooperation with anybody (including your classmates) is allowed.**

| OUTLINE OF THE LECTURES | | | |
|---|---|---|---|
| **Week** | **Date** | **TOPIC** | **Reading: Chap.** |
| **1** | **1 –8** | The Logic of Hierarchical Linear Models | **1, 2** |
| **2** | **1 – 15** | Principles of Estimation and Hypothesis Testing for Hierarchical Linear Models | **3** |
| **3** | **1 – 22** | An Illustration | **4** |
| **4** | **1 – 29** | Formulating Models: Applications I | **5** |
| **5** | **2 – 5** | Formulating Models: Applications II | **6** |
| **6** | **2 – 12** | Meta-Analysis: Applications | **7** |
| **ISA Convention February 18 – 21** | | | |
| **8** | **2 – 26** | Three-Level Models | **8** |
| **Spring Break: February 27 – March 5** | | | |
| **10** | **3 – 12** | Assessing the Adequacy of Hierarchical Models | **9** |
| **11** | **3 – 19** | Hierarchical Models for Latent Variables | **11** |
| **12** | **3 – 26** | Models for Cross-Classified Random Effects | **12** |
| **13** | **4 – 2** | Hierarchical Generalized Linear Models | **10** |
| **14** | **4 – 9** | Stata Session | |
| **15** | **4 – 16** | Stata Session | |

| OUTLINE OF THE STATA SESSIONS | | |
|---|---|---|
| **Week** | **TOPIC** | **Reading: Chap.** |
| **1** | Variance-Components Models | **2** |
| **2** | Random-Intercept Models with Covariates | **3** |
| **3** | Random-Coefficients Models | **4** |
| **4** | Longitudinal and Panel Data:<br>Subject-Specific Effects and Dynamic Models | **5** |
| **5** | Longitudinal and Panel Data:<br>Marginal Models | **6** |
| **6** | Longitudinal and Panel Data:<br>Growth-Curve Models | **7** |
| **ISA Convention February 18 – 21** | | |
| **8** | Models with Nested and Crossed Random Effects:<br>Higher Level Models with Nested Random Effects | **8** |
| **Spring Break: February 27 – March 5** | | |
| **10** | Models with Nested and Crossed Random Effects:<br>Crossed Random Effects | **9** |
| **11** | Models for Categorical Responses:<br>Binary Responses | **10** |
| **12** | Models for Categorical Responses:<br>Ordinal Responses | **11** |
| **13** | Models for Categorical Responses:<br>Nominal Responses and Discreet Choices | **12** |
| **14** | Models for Count Responses | **13** |
| **14** | Models for Survival Data:<br>Discreet Time Survival | **14** |
| **15** | Models for Survival Data:<br>Continuous-Time Survival | **15** |
| **15** | Models with Nested and Crossed Random Effects | **16** |