UNIVERSITY OF DENVER

COLLEGE OF EDUCATION

**RMS 4916 – LATENT GROWTH CURVE MODELING**

Fall 2017

**Instructor: Duan Zhang, Ph.D.** Office: KRH 232 Tel: 303-871-3373

Email: [duan.zhang@du.edu](mailto:duan.zhang@du.edu) Fax: 303-871-4456

**Class Meetings: Monday 4-6pm in KRH 306**

**Office Hours:** M&W 2 – 4pm. Online office hours are available during these times via Adobe Connect at <https://connect.du.edu/zhangofficehours>.

GTA: Lilian Chimuma ([llchimuma@gmail.com](mailto:llchimuma@gmail.com)) in KRH 2nd floor RMS cubicle

GTA Office Hours: T 3-5pm & F 9-11am

**Prerequisite:** RMS 4914 (Structural Equation Modeling)

**Text:**

Terry E. Duncan, Susan C. Duncan and Lisa A. Strycker (2006). An

Introduction to Latent Variable Growth Curve Modeling: Concepts, Issues, and Applications, 2nd Ed. Lawrence Erlbaum Association.

Supplemental Readings and Other Course Materials Will Be Provided.

**Course Objectives**

This course is for advanced doctoral students in social science who have strong interest and background in quantitative research methods. Its primary goal is to introduce students to individual-level trajectory analysis (latent growth curve analysis) in a structural equation modeling framework. They will learn theory and applications of the models to appropriate research questions in the behavioral and social sciences. The course will be focused on practical techniques to analyze longitudinal research data.

At the end of this course the student is expected to

* Understand traditional longitudinal data analysis methods
* Be effective consumers of research articles using latent growth curve modeling
* Be able to run latent growth curve models in the framework of structural equation modeling and interpret the results

**Software**

We will be using the computer programs MPlus and AMOS for this course. They are available in the KRH lab during this quarter. More information about MPlus can be found at <http://www.statmodel.com/>. The company also offers a free demo-version with a limited modeling capacity (<http://www.statmodel.com/demo.shtml> ).

**Course Format**

This is a hybrid course in which the class meeting time will be evenly distributed online and face-to-face (roughly 90 minutes each way). You are required to engage with course content and complete in-class and after-class assignments through the canvas course. You must participate fully in the face-to-face AND online portion of this course in order to fulfill the learning objectives and receive a passing grade.

**COURSE REQUIREMENTS**

**Attendance.** Everyone is expected to attend all classes. However, it is recognized that extenuatingcircumstances may prevent you from coming to class on a given day. Please communicate to the instructor the reason of your absence beforehand. There is no *a priori* relationship between attendance and final grade for this course. It is expected that you will complete all of the readings for that class period prior to class. You also should come prepared with questions if you do not understand something you have read or we have discussed.

**Incompletes.** Incompletes are discouraged. Prolonged illness may warrant assigning an incomplete where noother grade will do justice to the student’s academic performance and commitment to the course. Incompletes must be arranged with me prior to the end of the quarter. It will revert to a grade of F if not cleared within appropriate time frame (see <http://www.du.edu/registrar/calendar/incompletedeadline.html> for dates).

**Tentative Class Schedule**

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| **Class Date** |  | **Topic** | **Reading—D,D&S** | **Assignments Due** |
| Week 1 | Review of SEM theory and practice | | SEM book&notes |  |
| Week 2 | Introduction to Concepts in Trajectory Analysis and “Growth” | | 1&cvs | Homework #1 |
| Week 3 | Foundations of Growth Models | | 2&cvs | Article critique |
| Week 4 |  | LGM, Repeated Measures ANOVA, & HLM | 3&cvs | Statement of interest |
| Week 5 |  | Multivariate LGM | 4&cvs | Homework #2 |
| Week 6 | Multi-Group LGM | | 5&cvs | Research Proposal |
| Week 7 | Accelerated Design and Multilevel Longitudinal Approaches | | 6-7&cvs | Homework #3 |
| Week 8 | Growth Mixture Modeling | | 8&cvs | Homework #4 |
| Week 9 | Piecewise and Pooled Interrupted Time Series Design | | 9&cvs | Homework #5 |
| Week 10 | Miscellaneous Topics in LGCM | | 10-13&cvs | Final Project Report |

**COURSE ASSIGNMENTS**

All class assignments are to be submitted through canvas electronically. The due dates are listed in the tentative course schedule. Late assignments will be accepted but will receive a one point deduction for each calendar day the assignment is late. Brief introductions are below. More specific guidelines can be found on canvas.

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| **Grades** are based on the weighted total points, with breakdowns as follows: |

Homework 10% X 5

Statement of interest 5%

Research proposal 15%

Article critique 10%

Final Project Report 20%

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| |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | A | 93-100 | A- | 90-92 | B+ | 87-89 | B | 83-86 | B+ | 80-82 | | C+ | 77-79 | C | 73-76 | C- | 70-72 | D+ | 67-69 | D | 63-66 | | D- | 60-62 | F | <60 |  |  |  |  |  |  | |

**Homework (10 pts X 5)**

A total of five homework assignments will be posted in the corresponding week folders. You will use the given dataset and research questions to run some analysis and write up your results. Note: you are no longer expected to interpret the whole output. Talk about those of most importance as if you are writing them for a manuscript. Suggested length 1-3 pages double-spaced excluding tables and figures.

**Statement of Interest (5 pts)**

Select an area of interest to you that is appropriate for LGCM application. Give a justification of your study as for why it is important, how it will contribute to the literature, and why LGCM is the proper statistical method to use. Use brief references as necessary. Suggested length 1-2 pages double-spaced.

**Article Critique (10 pts)**

You are required to review an empirical LGCM article EITHER provided by the instructor OR in the content area of your own choice. In the latter case the article needs to be approved by the instructor before working on the assignment. Write a summary about how LGCM was applied in the research study. You are NOT expected to understand and write about every aspect in the article. The goal of this assignment is to introduce you to empirical application of LGCM so as to prepare you for the course project. Suggested length is 2-3 pages double spaced.

**Course Project**

This course requires a class project in which students are expected to

1. identify a research problem that can be addressed through LGCM analysis
2. get a longitudinal dataset that will be used to study the research problem
3. construct research hypotheses to be tested and variables that will be used
4. develop LGCM models to test the research hypotheses
5. run the models in the appropriate program
6. report and interpret the results
7. make some conclusions

**Research Proposal (15 pts)**

Before working on the project, a project research proposal needs to be submitted covering the first **four** bullet points to get the instructor’s approval. If the students don’t have their own data/ideas to explore, they are strongly encouraged to schedule individual meetings with the instructor as early as possible to work out some plans. It should conform to the latest APA style and be about 10-12 pages double spaced.

**Final Project Report (20 pts)**

The final project report should be consisted of all the major components of a typical research paper (title page, abstract, introduction, methods, results, discussion, and references) and follow APA style and be about 10-20 double-spaced pages. More specific guidelines can be found in the assignments section on canvas.

**Selected LGCM References**

Boker, S.M. (2001). Differential structural equation modeling of intraindividual variability. In L. Collins & A. Sayer (Eds.), New methods for the analysis of change (pp. 5-27).Washington, D.C.: APA Press.

Boker, S. M., Neale, M. C. & Rausch, J. R. (2004). Latent differential equation modeling

with multivariate multi-occasion indicators. In K. van Montfort, H. Oud, & A. Satorra (Eds.), Recent developments on structural equation models: Theory and applications (pp. 151-174). Amsterdam: Kluwer.

Ferrer, E., Hamagami, F., & McArdle, J.J. (2004). Modeling latent growth curves with

incomplete data using different types of structural equation modeling and multilevel

software. Structural Equation Modeling, 11, 452-483.

Little, T.D., Schnabel, K.U, & Baumeter, J. (2000). Modeling longitudinal and multilevel data. Mahwah, NJ: Lawrence Erlbaum Associates.

McArdle, J. J. & Hamagami, F. (1992). Modeling incomplete longitudinal and

cross-sectional data using latent growth structural models. Experimental Aging Research, 18 (1), 145-166.

McArdle, J.J. & Nesselroade, J.R. (2003). Growth curve analysis in contemporary

psychological research. In J. Schinka & W. Velicer (Eds.) Comprehensive Handbook of

Psychology, Volume Two: Research Methods in Psychology. New York: Wiley.

McArdle, J. J. & Ferrer, E., Hamagami, F., & Woodcock, J. R. (2002). Longitudinal multilevel analyses of test-retest data on the growth and decline of cognitive abilities. Developmental Psychology, 38, 115-142.

Collins, L. & Horn, J. (2001.), Best Methods For The Analysis Of Change: Recent Advances, Unanswered Questions, Future Directions. Washington, DC: American Psychological Association.

Moscowitz, D & Hershberger, S. (2002). Modeling intraindividual variability with repeated measures data: Advances and techniques. Mahwah, NJ: Lawrence Erlbaum Associates.

Skrondal, A. and Rabe-Hesketh, S. (2008). [Multilevel and Longitudinal Modeling using Stata](http://www.stata-press.com/books/mlmus.html), second edition. College Station, TX: Stata Press.

Singer, J.D. & Willett, J.B. (2003). Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence. NY: Oxford University Press.

Verbeke, G, & Moldenberghs, G. (2000). Linear mixed models for longitudinal data. NY: Springer-Verlag.

**Important Notices**

**Students with Special Needs**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides protection for persons with disabilities. This legislation requires that allstudents with disabilities be comprehensive civil rights guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact University Disability Services Program on the 4th floor of Ruffatto Hall ( Tel: 303- 871-2455).

**Statement on Plagiarism**

As commonly defined, plagiarism consists of passing off as one’s own ideas, words, writings, etc. which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have his/her permission. Plagiarism is one of the worst academic sins, for it destroys the trust among colleagues, without which research cannot be safely communicated. If you have any questions regarding plagiarism, please contact Citizenship and Community Standards Office at Rm 201 Driscoll Center North (Tel: 303-871-4851).

**Academic Honesty:** All work submitted in this course must be your own and produced exclusively for thiscourse. The use of sources (ideas, quotations, paraphrases) must be properly acknowledged and documented. For the consequences of violating the Academic Misconduct policy, refer to the University of Denver website on the Honor Code ( www.du.edu/honorcode ). See also http://www.du.edu/studentconduct for general information about conduct expectations from the Office of Student Conduct.

Violations of the Honor Code and Academic Misconduct will be taken seriously and are grounds for automatic failure of the course. When the Instructor has concerns about potential academic misconduct, a memo detailing the instance(s) of potential misconduct will be forwarded to the Office of Student Conduct for their review and records. If you are in doubt regarding any aspect of these issues as they pertain to this course, please speak with the instructor.