

**Latent Variable Modeling and Statistical Computing**  
**16:300:696**  
**Fall 2013**

**Course Syllabus**

- Instructor:** Jimmy de la Torre, Ph.D.
- Office:** Room 343, Graduate School of Education
- Email:** [j.delatorre@rutgers.edu](mailto:j.delatorre@rutgers.edu)
- Phone:** (732) 932-7496 Ext. 8308
- Fax:** (732) 932-6829
- Office hours:** Monday, 3:50-4:50, or by appointment
- Time:** Monday, 1:10 – 3:50 PM
- Place:** Room 314, Graduate School of Education
- Suggested Texts:** Bartholomew, D. J., Knott, M., & Moustaki, I. (2011). *Latent variable models and factor analysis: A unified approach* (3rd ed.). West Sussex: Wiley & Sons.
- Gelman, A., Carlin, J. B., Stern, H. S., & Rubin, D. B. (2003). *Bayesian data analysis* (2nd ed.). Boca Raton: Chapman & Hall.

**Course Description**

The course provides an overview of some of the most commonly encountered latent variable models in the educational and psychological measurement literature. It will also introduce simulation as a research method to investigate newly developed latent variable models and procedures. In addition to programming skills, students will also learn a few estimation algorithms that are appropriate for latent variable models.

**Course Objectives**

At the end of the course, students are expected to:

- 1) be acquainted with some of the most commonly used latent variable models in educational and psychological measurement;
- 2) be familiar with expectation-maximization and Markov chain Monte Carlo algorithms, two of the most implemented algorithms in education testing and measurement; and
- 3) acquire basic programming skills to be able to implement simulation-based research studies.

**Course Requirements**

**1) Class Participation (30% of the Final Grade)**

Students are expected to actively contribute to the class discussion, and will be graded based on their participation. In addition to assigned reading, in-class and homework exercises will also be discussed. Finally, students are also expected to participate in the class discussion by reporting on assigned topics.

## 2) Project (40% of the Final Grade)

An individual programming project that involves a latent variable model or procedure will be required. In this project, students are expected to develop their own computer codes to estimate new or existing latent variable models, or implement new or existing procedures for latent variable models. A research question is not necessary, but may be appropriate for some projects. The final written project is due on the last day of the class.

## 3) Project Presentation (30% of the Final Grade)

The last two meetings will be devoted to project presentation. Students will be given approximately 30-40 minutes to give a presentation based on their project. The presentation will be graded based on its clarity, and the student's ability to respond to project-related questions.

The final letter grade will be assigned as follows:

Final Score	Letter Grade
90% and Above	A
80%-89%	B+
75%-79%	B
65%-74%	C+
60%-64%	C
Below 60%	F

## Class Schedule

The class schedule below is subject to change if necessary.

Week	Date	Topic
1	9/9	Basics of Ox Programming
2	9/16	Functions (I)
3	9/23	Functions (II)
4	9/30	Data Generation and Analysis
5	10/7	EM (I)
6	10/14	EM (II)
7	10/21	MCMC (I)
8	10/28	MCMC (II)
9	11/4	Advanced IRT Models
10	11/11	Other Models for Cognitive Diagnosis
11	11/18	Linear Factor Analytic Models
12	11/25	Latent Class Models
13	12/2	Some IRT and CDM Procedures
14	12/9	Project Presentation I
15	12/16	Project Presentation II and Paper Submission

## **ACADEMIC INTEGRITY POLICY**

Please comply with standards of academic integrity in this course. For the homework assignments, you are allowed to work with your classmates; however, submitted works should be of your own. For the exams, you are not allowed to work with or request help from anyone. The consequence for violating policies of academic integrity and other elements of the student code of conduct are serious and can have a tremendous negative impact on your academic progress and future career. Please familiarize yourself with the university policy on academic integrity: <http://studentconduct.rutgers.edu/academic-integrity>.

### **Policy on Academic Integrity**

Please refer to the Policy on Academic Integrity for Undergraduate and Graduate Students at <http://academicintegrity.rutgers.edu>.

The University Code of Student Conduct can be accessed at:  
<http://studentconduct.rutgers.edu/university-code-of-student-conduct>

Related regulations may also be found in the Rutgers Graduate School of Education Catalog.

Clear evidence of violation of academic integrity policy may result in a grade of *F* for the assignment AND the course.