PSYCHOLOGY 380A
STRUCTURAL EQUATION MODELING

Dewey Hall Room 342 and Room 128
Thursday 1:00pm-3:45pm
3 credits

Instructor:

Keith Burt, Ph.D.
Dewey Hall Room 340
Keith.Burt@uvm.edu
Office phone: 656-4285
Office Hours: Wednesdays 10:30am-11:30am and by appointment

GENERAL INFORMATION
Course Website / Contacting: http://bb.uvm.edu/. Handouts, course announcements, Web links, and other important information will be posted on the website. You should familiarize yourself with the Psyc380A Blackboard page and check it frequently for important updates. Email is the best way to reach me, and I generally respond to emails within 24-48 hours. Please use regular email rather than the Blackboard email feature.

Course Overview and Objectives

This course is designed to introduce you to the theory and method of structural equation modeling (SEM) and confirmatory factor analysis (CFA), from the perspective of an applied researcher. Class will be a mix of lecture/discussion and hands-on computer work, with each week's meeting time divided roughly equally between lecture and computer lab.

The course will be taught primarily using the Mplus software program (available in Room 128 and grad computer lab) although efforts will be made to connect topics to other widely-used SEM programs.

Prerequisites for this course include completion of a one-year graduate-level course in multivariate statistics (e.g., PSYC340 + PSYC341 or the equivalent). The lecture notes and course discussions are aimed at applied researchers with an intermediate statistical background, and for the most part lectures will emphasize conceptual and practical aspects of model-testing.

Primary Textbook (required)


Optional Textbook (recommended)

COURSE EVALUATION AND ASSIGNMENTS

Your course grade will be expressed as a percentage of 100 total possible points, divided into three categories: (1) four labs, (2) a brief presentation of a published SEM analysis in your area of interest, and (3) a final project. Thus:

Four lab exercises * 10 points each = 40 points
Presentation = 15 points
Final project = 45 points
Total = 100 points

<table>
<thead>
<tr>
<th>Grade</th>
<th>% of Points</th>
<th>Grade</th>
<th>% of Points</th>
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<tbody>
<tr>
<td>A</td>
<td>93-100</td>
<td>C</td>
<td>73-76</td>
</tr>
<tr>
<td>A-</td>
<td>90-92</td>
<td>C-</td>
<td>70-72</td>
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<tr>
<td>B+</td>
<td>87-89</td>
<td>D+</td>
<td>67-69</td>
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<tr>
<td>B</td>
<td>83-86</td>
<td>D</td>
<td>63-66</td>
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<tr>
<td>B-</td>
<td>80-82</td>
<td>D-</td>
<td>60-62</td>
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<td>C+</td>
<td>77-79</td>
<td>F</td>
<td>Below 60</td>
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Lab exercises: These will be opportunities for you to get further "hands-on" experience with various aspects of conducting CFA/SEM analyses. Each will be posted to Blackboard and/or distributed in class approximately 10-14 days prior to the due date.

Presentation: This will be a brief (~15 minute) oral presentation of an article chosen by you that uses CFA and/or SEM techniques. Articles must be approved by the course instructor. You should describe the research context and primary questions, the data (sample size, distribution info, missing data, measures), and note how CFA/SEM was used to analyze the data. You should also critique the use of CFA/SEM in terms of the material learned in class, and note whether there are any additional analyses possible that would help to answer the research questions.

Final project: The final project is your opportunity to conduct and write up a complete, start-to-finish CFA or SEM analysis. The write-up will be similar to how one might write up an SEM for publication in APA format, although a higher level of detail will be expected than is allowed in most applied journals. The length for Psy380A final projects will vary, but it is expected that most projects will be 8-12 double-spaced pages.

More detailed information and guidance on the final project will be available throughout the semester. Students are encouraged to analyze their own data if available. If students do not have access to SEM-friendly data, the instructor will provide sample data to analyze. Projects will be graded on clarity and comprehensiveness of writing and correct application and sequence of analyses, not on statistical significance and/or "good model fit". Further project details will be provided throughout the semester.

OTHER NOTES

Religious Holidays: Students have the right to practice the religion of their choice. Students should submit in writing to the instructor by the end of the second full week of classes their documented religious holiday schedule for the semester. Faculty must permit students who miss work for the purpose of religious observance to make up this work.
### CLASS SCHEDULE (subject to change throughout the semester, depending on topics and time)

<table>
<thead>
<tr>
<th>Date</th>
<th>Class</th>
<th>Topic</th>
<th>Reading*</th>
<th>Due</th>
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<tbody>
<tr>
<td>8/29</td>
<td>1</td>
<td>Course introduction; matrix algebra</td>
<td>Cronbach &amp; Meehl 1955</td>
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<tr>
<td>9/5</td>
<td>2</td>
<td>EFA and CFA: Background, core concepts</td>
<td>Brown ch. 1-3 (pp. 1-62)</td>
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<tr>
<td>9/12</td>
<td>3</td>
<td>CFA: Identification and fit</td>
<td>Brown ch. 3 &amp; 4 (skim)</td>
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<tr>
<td>9/19</td>
<td>4</td>
<td>Model revision, multiple-group CFA, tests of invariance</td>
<td>Brown ch. 5 &amp; 7</td>
<td>Lab 1</td>
</tr>
<tr>
<td>9/26</td>
<td>5</td>
<td>Multi-trait multi-method (MTMM) approaches</td>
<td>Brown ch. 6; Campbell &amp; Fiske 1959</td>
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<tr>
<td>10/3</td>
<td>6</td>
<td>Path analysis</td>
<td>Stage et al. 2004</td>
<td>Lab 2</td>
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<tr>
<td>10/10</td>
<td>7</td>
<td>SEM (introduction)</td>
<td>Breckler 1990; Tomarken &amp; Waller 2005</td>
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<tr>
<td>10/17</td>
<td>8</td>
<td>SEM (continued)</td>
<td>MacCallum et al. 1992, 1993</td>
<td>Lab 3</td>
</tr>
<tr>
<td>10/24</td>
<td>9</td>
<td>Mediators, moderators, latent interactions</td>
<td>Cole &amp; Maxwell 2003; Jaccard &amp; Wan 1995</td>
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<tr>
<td>10/31</td>
<td>10</td>
<td>Latent growth models</td>
<td>Curran &amp; Hussong 2003</td>
<td>Lab 4</td>
</tr>
<tr>
<td>11/7</td>
<td>11</td>
<td>Missing data; <em>presentations</em></td>
<td>Brown ch. 9; Schafer &amp; Graham 2002</td>
<td></td>
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<tr>
<td>11/14</td>
<td>12</td>
<td>Statistical power; <em>presentations continued</em></td>
<td>Brown ch. 10; MacCallum et al. 1996; Muthén &amp; Muthén, 2002</td>
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<tr>
<td>11/21</td>
<td>13</td>
<td>Wrap-up/conclusion</td>
<td>McDonald &amp; Ho 2002; Tomarken &amp; Waller 2003</td>
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*Other readings may be added to the syllabus throughout the semester; these will be made available on Blackboard, by sign-out, or will be easily obtainable through the UVM library system.

*Final projects due on 12/4*


**Course Bibliography** (may be added to or changed during the semester)

**Class 1: Course Introduction**

*Other readings of interest:*


**Class 2: Background to EFA and CFA**
[Textbook reading: Brown pages 1-62]

*Other readings of interest:*


**Class 3: Identification, Fit, and Model Comparison in CFA**
[Textbook reading: Brown chapters 3 & 4]

*Other readings of interest:*


**Class 4: Model Revision, Multiple-Group CFA, Invariance and Equality Constraints**
[Textbook reading: Brown chapters 5 and 7]
Other readings of interest:


Class 5: Multi-Trait/Multi-Method Approaches
[Textbook reading: Brown chapter 6], also:


Other readings of interest:


Class 6: Path Analysis

Other readings of interest:


Class 7: SEM (Introduction)


Other readings of interest:

Class 8: SEM (Continuation)


**Class 9:** Mediators/Moderators/Latent Variable Interactions


**Other readings of interest:**


**Class 10:** Latent Growth Models


**Other readings of interest:**


**Class 11:** Missing Data

[Textbook reading: Brown chapter 9], also:


**Class 12:** Statistical Power

[Textbook reading: Brown chapter 10], also:


**Other readings of interest:**


**Class 13: Wrap/up and Conclusion**


**Other readings of interest:**