Course outline

Instructor: Prof. Vishal Gupta (Wing 14-E), Prof. Kathan Shukla (Wing 11-J)

Course Description:

The course builds on the insights and knowledge obtained in first year research methodology courses (Survey of Statistical Methods, Introduction to Research Methods and Qualitative Techniques) and provides a hands-on training of Structural Equation Modeling (SEM). The course shall introduce the participants to survey-based research designs and the SEM analytic technique used to analyze the data collected. The course shall provide inputs relating to measurement theory and ways to incorporate them in our analysis. The course will be based on a combination of theoretical and practice-oriented sessions that will provide working knowledge of statistical software like SPSS, AMOS and M*plus*.

Learning Objectives:

Upon the completion of this course, the participants would:
1. Understand concepts like correlations, reliability, measurement error, validity, regression, causality, cross-sectional design, common method variance, mediation, moderation and other such terms used in the design and conduct of management research.
2. Understand analysis techniques like factor analysis (exploratory and confirmatory) and structural equation modeling (SEM).
3. Get hands-on training on statistical analysis packages like SPSS, AMOS and M***plus***.

Course Duration and Pedagogy:

This is a 1 credit course and will be conducted during the September to November, 2017. A combination of lectures, presentation and class-room exercises will be used. Participants are expected to familiarize themselves with the assigned readings and come to class prepared to participate in class discussions.

Textbooks and reading material:
Course Mat: Course material will be given at the beginning of the course.

Reference Texts:
RT1: Viswanathan, M. (2005). *Measurement Error and Research Design.* Thousand Oaks: Sage.
RT2: DeVellis, R. F. (1991). *Scale Development.* Newbury Park, California: Sage.
RT3: Kline, R. B. (2011). *Principles and Practice of Structural Equation Modeling* (Third Edition). New York: Guilford Press.
RT4: Byrne, B. M. (2010). *Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming* (Second Edition). New Delhi: Routledge.
RT5: Muthen, L. K. and Muthen, B. O. (1998 – 2017). M*plus* User's Guide. Seventh Edition. Los

Angeles, CA: Muthen & Muthen. Freely available at
https://www.statmodel.com/ugexcerpts.shtml

Evaluation:
Class Assignments: 30%
(The course will involve several assignments throughout the term including analyses and interpretation of data sets, designing research methods, and critically assessing specific research designs.)

Paper Presentation and Write-up: 40%
(The course requirements include the completion of a project where participants will choose a set of hypotheses of interest and develop a research method to test the hypotheses. A paper based on this project as well as a class presentation will be required. Various sections of the paper will be due during the course of the semester. The project will involve application of course material in designing the method for a study and providing rationale for it. For example, a survey or an experimental method could be used. Data collection is encouraged but not necessary.)

End Term Examination: 30%

SESSION PLAN

Session*	Topics & Learning Objectives
1-3	*Introduction to Measurement Errors, Reliability, Validity and Factor Analysis* **Learning objective:** Understand the idea of psychometric testing, measurement errors and how the errors can be corrected using empirical procedures. Understand the concept of latent variables and exploratory factor analysis. Discuss the different procedures for conducting factor analysis, and interpretation of factors. Application of concepts to analyzing social science problems Hands-on exercises using SPSS/R.
4	*Introduction to Measurement Models and Confirmatory Factor Analysis* **Learning objective:** Understand the philosophy of measurement models in Social Science Research. Understand the advantages of measurement models over traditional data analysis techniques like summation of construct items. Learn the differences (philosophical and methodological) between CFA and EFA. Application of concepts to analyzing social science problems. Hands-on exercises using AMOS, M*plus*.
5-6	*Introduction to SEM and Path Analysis* **Learning objective:** Understand the philosophy of testing of theories over testing of hypotheses. Learn the advantages of SEM over traditional techniques like Regressions for Social Science Research. Understand the various steps involved in conducting Structural Model Testing (model specification, model identification, model estimation, model evaluation and model modifications). Application of concepts to analysing social science problems. Hands-on exercises using AMOS, M*plus*.
7	*Mediation and Moderation Testing using SEM* **Learning objective:** Understand the idea of mediation and moderation in social science research. Learn about direct effects, indirect effects and interaction effects. Learn how to preform tests of mediation using Sobel-t test and the bootstrapping method. Learn how to visualize moderation results and test for their significance. Application of concepts to analysing social science problems. Hands-on exercises using AMOS, M*plus*.
8	*Multi-group and Measurement Invariance* **Learning objective:** Learn to analyse a structural equation model across multiple samples. Discuss the idea of measurement invariance across different groups and tests for the significance of differences. Application of concepts to analysing social science problems. Hands-on exercises using AMOS, M*plus*.
9-10	*Advanced Issues in SEM* **Learning objective:** Learn about handling Missing Data, Latent Class Models, Complex Survey data with sampling weights, multi-trait multi-method (MTMM) analysis and common-method issues in social science research. Application of concepts to analysing social science problems. Hands-on exercises using AMOS, M*plus*.

*Each session will be of 2hour 30 minutes duration

<div align="center">**TOPICS AND ASSIGNED READINGS**</div>

Session 1-3: Introduction to Measurement Error, Reliability, Validity and Factor Analysis
Readings:
Course Mat:
- Chapter 1 of RT1: What is Measurement? (pages 1-95)
- Chapter 6 of RT2: Factor Analytic Strategies (pages 91-109)
- Conway, J. M., & Huffcutt, A. I. (2003). A review and evaluation of exploratory factor analysis practices in organizational research. *Organizational Research Methods,* 6, 147-168.

Demo: Factor analysis using R and SPSS

Additional Readings:
Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods,* 4, 272-299.
Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment Research & Evaluation,* 10(7). URL http://pareonline.net/getvn.asp?v=10&n=7

Van Dynes, L., Graham, G. W., & Dienesch, R. M. (1994). Organizational citizenship behavior: Construct redefinition, measurement and validation. *Academy of Management Journal, 37,* 765-802.

Session 4: Introduction to Measurement Models and Confirmatory Factor Analysis
Readings:
Course Mat:
- Chapters 5, 6, 7 and 9 of RT3: Measurement Models and Confirmatory Factor Analysis (pp. 230-264)
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research,* XVIII, 39-50.
- Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural equation modeling: Guidelines for determining model fit. *Electronic Journal of Buisness Research Methods, 6,* 53-60.
- Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of educational research*, *99*(6), 323-338.

Additional Readings:
Williams, L. J., Vandernberg, R. J., & Edwards, J. R. (2009). Structural equation modeling in management research: A guide for improved analysis. *The Academy of Management Annals, 3,* 543-604.

Sessions 5-6: Introduction to SEM and Path Analysis
Readings:

Course Mat:
- Chapters 5, 6, 7 and 9 of RT3: Measurement Models and Confirmatory Factor Analysis (pp. 230-264)
- Chapters 8 and 10 of RT4: Identification and Structural Regression Models (pp. 124-153, 265-295)

Demo: Demonstration of topics covered using AMOS

Session 7: Mediation and Moderation Testing in Structural Models
Readings:
Course Mat:
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51,* 1173-1182.
- Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: A general analytical framework using moderated path analysis. *Psychological Methods, 12*(1), 1-22.
- Chapter 12 of RT4

References:
- David Kenny's mediation website: http://davidakenny.net/cm/mediate.htm
- David MacKinnon's mediation website:
  http://www.public.asu.edu/~davidpm/ripl/mediate.htm
- Christopher Preacher's online Sobel test calculator:
  http://www.psych.ku.edu/preacher/sobel/sobel.htm
- Bootstrap macro for testing multiple mediators:
  http://www.comm.ohio-state.edu/ahayes/SPSS%20programs/indirect.htm
- Steinmetz, H., Davidov, E., & Schmidt, P. (2011). Three approaches to estimate latent interaction effects: Intention and perceived behavioral control in the theory of planned behavior. Methodological Innovations Online, 6(1), 95-110.

Session 8: Multi-group Analysis and Measurement Invariance
Readings:
Course Mat:
- Chapter 10 of RT3
- Chapters 7, 8 and 9 of RT4
- Sass, D. A. (2011). Testing measurement invariance and comparing latent factor means within a confirmatory factor analysis framework. *Journal of Psychoeducational Assessment*, *29*(4), 347-363.

Additional Readings:
Ping Jr., R. A. (1995). A Parsimonious Estimating Technique for Interaction and Quadratic Latent Variables. Journal of Marketing Research, 32(3), 336-347.
Little, T. D., Bovaird, J. A., & Widaman, K. F. (2006). On the Merits of Orthogonalizing Powered

and Product Terms: Implications for Modeling Interactions Among Latent Variables. Structural Equation Modeling, 13(4), 497-519.

Marsh, H. W., Wen, Z., & Hau, K. T. (2004). Structural equation models of latent interactions: evaluation of alternative estimation strategies and indicator construction. Psychological Methods, 9(3), 275-300.

Session 9-10: Advanced Issues in SEM

- Chapters 10, 12 and 13 of RT4

Additional Reading:

- Schoorman, F. D., & Mayer, R. C. (2008). The Value of Common Perspectives in Self-Reported Appraisals: You Get What You Ask For. *Organizational Research Methods, 11,* 148-159.
- Williams, L. J., and O'Boyle Jr., E. H. (2008). Measurement models for linking latent variables and indicators: A review of human resource management research using parcels. *Human Resource Management Review, 18,* 233-242.
- Hall, R. J., Snell, A. F., & Foust, M. S. (1999). Item Parceling Strategies in SEM: Investigating the Subtle Effects of Unmodeled Secondary Constructs. *Organizational Research Methods, 2*(3), 233-256.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88,* 879-903.
- Spector, P. E. (2006). Method variance in organizational research: Truth or urban legend? *Organizational Research Method, 9,* 221-232.
- Chang, S.-J., Van Witteloostuijn, A., Eden, L. (2010). From the editors: Common method variance in international business research. *Journal of International Business Research, 41,* 178-184.
- Antonakis, J., Bendahan, S., Jacquart, P., Lalive, R. (2010). On making causal claims: A review and recommendations. *The Leadership Quarterly, 21,* 1086-1120.
- Podsakoff, P. M. & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management, 12,* 531-544.

Demo: Demonstration of topics covered using AMOS.

Note on Student Projects

The project will consist of several phases that are listed below:

Part I (Weightage 10%):
(i) Identify theory/past research that will form the basis for your paper. While in-depth discussion and theorizing is not central to the purpose of this paper, it is important that you are clear about the rationale/theory for the hypotheses for purposes of designing the method. Further, you need to know past research in terms of methodological issues in order to provide support for your own method.
(ii) Develop and state the hypotheses that you are going to test.
(iii) Develop the overall design and provide the rationale for choosing it to test your hypotheses.

Part II (Weightage 15%):
(iv) Clearly describe the independent and dependent variables and their operationalizations. As a part of the paper you are required to develop a multiple-item measure for at least one variable which should have at least five items.
(v) Provide complete details of all materials to be used. If you are using a questionnaire, the complete questionnaire must be presented. If you are conducting an experiment, all materials should be presented. The paper should provide support for choice of materials. The final paper should contain an appendix where all materials are presented. The reader should be able to go out and collect data immediately using the information provided. Describe all details such as the participants in the study, the exact procedure to be employed, etc., along with rationale for your choice. As you consider your paper, make sure you have addressed the issues we cover in class such as reliability, validity, etc. These principles should be used to develop your method and also to provide support for your choices.

Part III (Weightage 15%):
(vi) Collect data (primary/secondary) and describe the data analyses that you performed on the data including assessment of reliability, validity, usage of AMOS/M*plus*, etc.

Total weightage of the project will be 40% in the evaluation of the course. The final presentation and paper should be of good quality that is reflective of work done throughout the course. The paper should be organized into headings and sub-headings similar to published work.