



Aachen International
Summer School
in Research Methods

RWTHAACHEN
UNIVERSITY

3RD AACHEN INTERNATIONAL SUMMER SCHOOL IN RESEARCH METHODS AND DATA SCIENCE (ACISS)

INTRODUCTION TO MEASUREMENT THEORY AND STRUCTURAL EQUATION MODELING

APPLYING STRUCTURE EQUATION MODELS (SEM) AS A TOOL FOR
SUBSTANTIVE RESEARCH AND SCALE DEVELOPMENT/VALIDATION

PRIV.DOZ. DR. PETRA RIEFLER

School of Business and Economics
RWTH Aachen University

Contact: aciss@time.rwth-aachen.de

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1 COURSE OVERVIEW

Course Name:	INTRODUCTION TO MEASUREMENT THEORY AND STRUCTURAL EQUATION MODELING
Degree Programmes:	<ol style="list-style-type: none"> 1. Post-Docs and PhD students 2. Master BWL (all specializations): MSBWL10, MSBWL13 Master Wirtschaftswissenschaften (all specializations): MSWiWi10, MSWiWi14 Master Wirt.-Ing. (MSWiBau, MSWiEET, MSWiWPT, MSWiMB, all specializations): MSWi10, MSWi15
Lecturer:	Priv.Do. Dr. Petra Riefler
Contact:	petra.riefler@fhwn.ac.at
Location and Time:	C.Le.Ver 25 September – 29 September, 9am to 5pm
Content Description:	This course provides (1) a broad introduction to measurement theory for developing and assessing multi-item scales, and (2) a user-friendly introduction to structural equations modelling (SEM) using LISREL as software.
Qualification Objectives:	After participating in this course, students should be in a position to: <ol style="list-style-type: none"> 1. Understand fundamental premises of measurement theory 2. Develop new (and evaluate existing) scales for empirical research 3. Conceptualize and evaluate basic SEM models 4. Use LISREL for validating scales 5. Use LISREL for conducting substantive empirical research
Literature:	See readings below
Course Examination:	<ol style="list-style-type: none"> 1. Written assignment (75%) 2. Exercises (25%)
Participation Requirements:	<ol style="list-style-type: none"> 1. Solid command of English 2. Basic understanding of Regression Analysis and Factor Analysis 3. Willingness to engage in preparatory readings of conceptual and empirical papers
Group Size:	30 participants (max)
Workload:	30 hours of lecturing and exercises Additional individual preparation and written assignment
Type of Teaching Event:	Combination of lecture, discussions, and exercises
Language:	English
Credits:	5

2 SCOPE OF THE COURSE

This course provides (1) a broad introduction to measurement theory for developing and assessing multi-item scales, and (2) a user-friendly introduction to structural equations modelling (SEM) using LISREL as software.

The course is aimed at non-experts and designed to familiarize participants with (a) the various steps associated with the development and validation of sound reflective/formative measures; and (b) the fundamentals of conceptualizing, estimating, and interpreting structure equation models.

The course will be work intensive and involves a substantial part of independent empirical work. Previous successful completion of data analysis courses is highly recommended. Please note that a detailed reading list will be made available ahead of the first session.

After participating in this course, students should be in a position to:

- Understand fundamental premises of measurement theory
- Understand the differences between reflective and formative measures
- Develop new (and evaluate existing) scales for empirical research
- Conceptualize and evaluate basic SEM models
- Use LISREL for validating scales
- Use LISREL for conducting substantive empirical research

3 PARTICIPANTS AND REQUIREMENTS

Participants

1. Post-Docs and PhD students
2. Master BWL (all specializations): MSBWL10, MSBWL13
Master Wirtschaftswissenschaften (all specializations): MSWiWi10, MSWiWi14
Master Wirt.-Ing. (MSWiBau, MSWiEET, MSWiWPT, MSWiMB, all specializations): MSWi10, MSWi15

Due to the interactive teaching format, the number of participants is limited to 30. Advanced master students are invited to participate, but preference will be given to PhD students.

Requirements

- Solid command of English.
- Basic understanding of Regression Analysis and Factor Analysis
- Willingness to engage in preparatory readings of conceptual and empirical papers

Grading

The final grade will be calculated as the weighted average of the grades for the written assignment (in the form of a report) (75 %), and exercises (estimating and interpreting LISREL models) (25%).

Complete attendance of each session of the course is obligatory. No exceptions apply. Leaves will only be granted in cases of illnesses or if the person demanding a leave is required to participate in an official activity of the University, Faculty, or Institute. In the first case, the doctor's medical certificate must be presented to the Chair immediately (i. e. latest by the first working day following the absence day). Failure to comply with this rule leads to a no-pass grade. Passing grades can generally not be earned by students who miss more than 20% of the total class-time.

4 TENTATIVE COURSE SCHEDULE

The lecturing days will comprise morning sessions (9:00-12:00) and afternoon sessions (13:30-17:00). The course will take the form of workshop sessions, placing particular emphasis on student participation. Theoretical discussion of key issues will be accompanied by practical demonstration of scale development and SEM software (i.e., LISREL). There will also be time to discuss specific questions students might have about their own research projects related to the course topics.

Days 1 and 2 introduce SEM as an analytical approach and discuss key issues associated with the theoretical specification, graphical representation, identification, and fit assessment of SEM models. Further, strategies for model modification and cross-validation are outlined. To enable participants experience SEM “in action”, the above issues are illustrated by specifying and estimating models in LISREL. Detailed guidance for setting up and interpreting the relevant input/output files of the program is provided.

Days 3 and 4 provide a broad introduction to measurement theory focusing on the steps associated with the development and validation of sound measures for use in substantive research. Using an example of a published scale, the course demonstrates theoretical aspects in an applied context. Further, differences in reflective and formative measures are highlighted. One afternoon is reserved for individual feedback to PhD students regarding methodological questions for their current research projects.

On Day 5, students will independently apply their gained knowledge to solve a set of exercises using LISREL, which account for 25% of grading.

Days 1+2: Introduction to SEM

Preparatory Reading:

- Diamantopoulos, A., Siguaw, J. A., & Siguaw, J. A. (2000). *Introducing LISREL: A guide for the uninitiated*. Sage.
- Anderson & Gerbing (1988). Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach, *Psychological Bulletin*, 103(3): 411-423.
- Iacobucci (2009). Everything you always wanted to know about SEM (Structural Equation Modelling) but were afraid to ask. *Journal of Consumer Psychology*, 19(4): 673-680.

Days 3+4: Introduction into Measurement Theory and Scale Development & One-to-One PhD Project Coaching

Preparatory Readings:

- Netemeyer, R.G.; Bearden, W. O. and Sharma, S. (2003). *Scaling Procedures*, Sage Publications (ISBN: 0 -7619-2027-7)

- Churchill, G. A. (1979), A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 16, 64 -73
- Riefler, P., Diamantopoulos, A. and Sigauw, J. (2012), Cosmopolitan Consumers as a Target Group for Segmentation, *Journal of International Business Studies*, 43(3), 285-305.
- Noar, S. M. (2009), The role of structural equation modeling in scale development. *Structural Equation Modeling*, 10(4), 622 -647

Note: Additional readings for specific topics will be recommended to interested students in class.

Day 5: Group Assignment and Discussion

- **Exercises:** Group assignment to solve a list of tasks in LISREL using knowledge acquired during the course
- **Discussion** of academic papers introducing/using scales and/or questions on current PhD projects if desired (related to scales, SEMs, or questionnaire design)
- **Summary and Wrap-up**, including details on the written assignment

5 Written Assignment (Research Paper)

Based on individual interest, students can *choose* between two topics for their written assignment:

Topic 1: Critical analysis of an existing scale

Students identify a recent paper (preferably in their own field of interest/expertise) involving the development of a new scale for a particular construct. The critical analysis includes all stages of measurement development highlighting problematic shortcomings and theoretical/practical consequences. Importantly, students provide justified suggestions on how these shortcomings could have been addressed accordingly.

Topic 2: Replication of a published structural equation model

Students identify a recent paper (preferably in their own field of interest/expertise) estimating a SEM and providing the covariance matrix (e.g. in the Appendix). Using the covariance matrix, the students replicate the model in LISREL. Based on the available data, they run rival (alternative) models that they justify as theoretically relevant. They compare and discuss results. Finally, they propose additions/changes to the model for future research.

Note: Guidelines on length, structure, and deadlines for the research paper will be provided in the course.

Contact Details

Priv.Do. Dr. Petra Riefler
UAS Wiener Neustadt
Johannes-Gutenberg-Str. 3
A-2700 Wiener Neustadt

+43 (0) 26 22 | 89 0 84 – 307
petra.rieffler@fhwn.ac.at