

## Course code: Quantitative Methods – Advanced statistics, 7.5 credits

When it was approved

The syllabus is valid from spring semester 2022

### A. General information

The course is offered by the Department of Psychology at Lund University

The language of instruction is English.

### B. Learning outcomes

On completion of the course, the student shall:

#### *Knowledge and understanding*

- demonstrate knowledge of measurement and structural models estimated within the structural equation model (SEM) paradigm
- demonstrate knowledge about multilevel models as they are defined both in mixed model regression and SEM
- demonstrate an understanding of how SEM and multilevel models has developed from regression analysis and analysis of variance (ANOVA)
- demonstrate an understanding of the kind of research questions SEM and multilevel models address and knowledge about both limitations and alternative methods that can answer the same research questions
- demonstrate knowledge about the distributional requirements for the methods and options when those methods are not justifiable (robust alternatives, generalized methodology)

#### *Competence and skills*

- show skills in performing analyses in R (or other statistics programs) of SEM models and multilevel models.
- show skills in reporting results from SEM and multilevel models

#### *Judgement and approach*

- be able to independently choose among statistical models covered in the course in relation to research questions and data.
- be able to reflect on both strengths and limitations independently and critically in relation to SEM and multilevel analysis.

### C. Course content

The course will present both measurement models, e.g., confirmatory factor analysis, structural models, and multilevel models. The focus is on model definitions, estimations, how to extract useful information from the results of the statistical techniques, and how to find deviations from the methods assumptions. Another focus will be on how to report SEM and multilevel models.

## **D. Course design**

The course includes lectures, seminars and "lab reports". There will be four separate sub-subjects taking about 2 weeks (half-time). Each sub-subject will be introduced by a lecture, then the students will get time to read the relevant literature (2 days), the literature will be discussed during a seminar. The last week the student work with a data-material and write a short report. The two last weeks will be devoted to a larger report where the student chose their own material and statistical method.

Four sub-subjects

1. Introduction to regression analysis, factor analysis and ANOVA models; why is there need for extensions
2. Measurement models together with psychometrics, both cross sectional and longitudinal
3. Structural models using cross sectional data
4. Multilevel models using experimental and longitudinal data

## **E. Assessment**

Each statistical technique is examined separately in "lab reports". The methods on which the lab reports are based are introduced in a lecture, discussed during the seminar and the lab reports are designed as to be possible to finish within 3 half-days.

Each sub-subjects give 1 credit. The students need to attend to the seminar and hand in the report to get the credit.

The final report gives 3,5 credits. The students should choose method and data together with the examiner.

If the student misses a seminar the lab-report is extended with a section where the student discusses the relevant method more in general (see course description).

There is no examination of the course outside the lab-reports and the final report. There is opportunity to hand in the reports afterwards up to two years after the course has ended.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

## **F. Grades**

The grading scale consists of Pass and Fail. A grade of Pass requires that the doctoral student fulfils the stated learning outcomes for the course.

At the start of the course, students are informed about the learning outcomes stated in the syllabus and about the grading scale and how it is applied on the course.

## **G. Entry requirements**

PSYP13 Psychology: Advanced Scientific Methods in Psychology, 15 credits at the International Master Program in Psychology at Lund. Equivalent studies at other departments or universities can also qualify the student for admission. To be eligible for the course, the student must be currently enrolled as a doctoral student and have prior knowledge of quantitative methods

A good command of the English language, both spoken and written, equivalent to English 6/B (advanced) proficiency in the Swedish secondary system, is required. Equivalence assessments will be made according to national guidelines.

Doctoral students from the Department of Psychology at Lund University have precedence if a selection process for applicants is required.

## **Course literature**

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). New York: Guilford Press.

+ articles, around 150 pages