Introduction

Description

The course is designed to introduce and expand on the theoretical foundations and applications of various issues and methodologies in the area of measurement. The course provides emphasis on issues rooted in Classical Test Theory (Part I of course) as well as those which underlie the more modern approach to measurement characterized by Item Response Theory (IRT) (Part II of course). Psychophysiological approaches to measurement are also discussed (Part III of course). For some lectures, a speaker of renown in the area of psychometrics will be invited to give a presentation on issues in his/her area of expertise.

A "hands-on" or practical approach characterizes this course. Specifically, the second half of each lecture will typically involve students going to the IT lab on the 3rd floor in order to familiarize themselves with various software programs developed within the confines of CTT and IRT.

Officially, this course will be given in the English language. However, it can be conducted in a bilingual fashion in order to accommodate the wide array of students currently enrolled in the Joint Ph. D. program.

Except for weeks 7 and 12 which will serve as workshops toward the advancement and completion of final projects, each meeting will generally be of the following form:

1) Lecture delivered by professor Tomiuk and/or guest lecturer (approx. 1.5 hrs)
2) Student presentations and/or demonstrations at IT Lab (approx. 1.5 hrs)

The active preparation and participation of students is essential. Hence, each student is expected to prepare for each lecture by doing the assigned readings which, in turn, mainly consist of book chapters and articles. Multiple examples of measures and analyses will also be presented throughout the course. They will be based on measures and methods developed in various fields including marketing, management, and psychology.

During lab sessions, students will be driven to familiarize themselves in the practical use of various software programs which are commonly utilized within the confines of CTT (SPSS for Exploratory Factor Analysis and LISREL for Confirmatory Factor Analysis) and IRT (Testgraf and Multilog ou Parscale).

Objectives
The objectives of the course are the following:

(i) Introduce students to the theoretical foundations and applications underlying current measure development issues in the social sciences via the general perspectives of Classical Test Theory (CTT) and Item Response Theory (IRT).

(ii) Provide students with ample opportunity to familiarize themselves with various software programs which can be very useful in the development, purification, and validation of measures within the contexts of CTT and IRT. To this end, a hands-on approach is therefore adopted throughout the second half of most lectures.

(iii) Augment and refine the ability of students to generate measures of latent constructs which are reliable and valid and which display discriminatory power as well.

(iv) Introduce students to psychophysiological methodologies which are used in the assessment of unconscious/automatic processes in human functioning.

Contact information

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Learning material

Bibliography

- Codex of notes and readings for the course Measurement # 80109B

Assignments and examinations

- Assignment 1 (individual basis) (15%)
  Course evaluation involves multiple components and all are conducted on an individual basis. The first assignment will revolve around issues in CTT whereas the second will focus on IRT. In each case, students will be asked to engage in data analysis (30% of final mark). Each student will also present one article chosen amongst the readings for a particular week (10% of final mark) and will be evaluated for course participation (10% of final mark). This activity is defined here as "intelligent participation". Restating the obvious and engaging in time consuming diatribes for the sake of simply speaking will not be rewarded.

- Assignment 2 (individual basis) (15%)
• Presentation of an article (individual basis) (10%)
• Final Project (individual basis) (50%)
  Written report 40%
  Presentation 10%

For the final project, each student is expected to:

(1) propose and develop a multidimensional concept/construct; and to subsequently create items designed to measure this concept;
(2) gather data with a sample of manageable size and run analyses based on an chosen ensemble of methodologies covered in the course (not all); and
(3) produce a final report in the form of a scientific article (50% of final mark) and present their findings in class (10% of final mark).

Ultimately, the idea behind the final project is to have students go through the necessary and customary steps that are involved in the development of measures which are valid, reliable, and whose items display discriminatory power.

• Course participation (10%)

Plagiarism

Please consult article 12 of the Règlement régissant l’activité étudiante à HEC Montréal (regulation governing student activities at HEC Montréal), to find out the acts and gestures that are considered plagiarism or another academic violation (12.1), along with the applicable procedure (12.2) and sanctions, which range up to suspension and even expulsion from HEC (12.3). Violations are analyzed based on the facts and circumstances, and sanctions are applied accordingly.

List of sessions

Session 1 : 23 août

Description

Part 1 of course : Classical Test Theory and the Traditional Measure Development Paradigm

Topics:
  Overview of course outline
  Measurement in science
  Latent Variables
  Constructs and Measures
  Levels of Measurement
  Overview of basic statistical concepts and matrix algebra

Reading list

Session 2 : 30 août

Description
Topics:
- Classical Test Theory
- Historical overview
- True score and measurement error
- Basic assumptions
- Reliability (Definitions, forms, and theory)
- Multiple-item measures

Reading list


  Chapters 6 and 7

Session 3 : 13 septembre

Description
Topics:
- Classical Test Theory (cont'd)
- Cronbach's Alpha as a lower bound to reliability
- Item-total correlation
- Bi-serial correlation
- Exploratory Factor Analysis in measure development

Reading list

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  Chapters 11 and 12

**Session 4 : 20 septembre**

**Description**

**Topic:**
The traditional measure development and purification paradigm

**Reading list**

  Chapter 8


**En réserve à la bibliothèque**


**Session 5 : 27 septembre**

**Description**

**Topics:**
Confirmatory Factor Analysis in measure development
The Lisrel CFA Model
Item reliability and measurement error
The updated measure development and purification paradigm

Reading list

  Chapter 13


Session 6 : 4 octobre

Description

Topics:
- Forms of validity
- MTMM and Construct validation
- CFA Models for testing construct validity
- Multiple informant data

Reading list

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Chapter 3

Session 7 : 11 octobre

Description

Measure development workshop
Session 8 : 25 octobre

Description

Part II of course : Item Response Theory (IRT)

Topics:
Introduction to IRT
Basic assumptions
Item characteristic curves
Item discrimination
Parametric IRT Models: The Rasch, 2-PL, and 3-PL Models

Reading list


Van der Linden, Wim J. & Hambleton, Ronald K. (1997). Item Response Theory: Brief history, common models and extensions. In Van der Linden,

Wim J. and Hambleton, R. K. (Eds.), Handbook of Item Response Theory (pp. 1-28). Springer-Verlag.

Chapters 1, 2, 3 and 4
Session 9 : 1 novembre

Description

Topics:
IRT Model fit
IRT Models for Polytomous Items
Overview of Parscale or Multilog

Reading list

  Chapters 5, 6 and 9


Session 10 : 8 novembre

Description

Topics:
Reliability in IRT
Item and test information
Differential Item Functioning and impact
Invariance or measurement equivalence
Applications of IRT to scale analysis and attitude assessment.

Reading list

  Chapters 10, 12 and 13


Session 11 : 15 novembre

Description

Topics:
Nonparametric approaches to IRT
The Testgraf program

Reading list


### Session 12 : 22 novembre

**Description**
Measure development workshop

### Session 13 : 29 novembre

**Description**
**Part III of course : Introduction to Psychophysiological Methods and Course Conclusion**

Topics:
- Facial EMG (frequency and intensity assessments)
- Physiological methods of measurement
- Reliability issues
- Raw data transformation for processing

**Reading list**


**Session 14 : 6 décembre**

**Description**

Course wrap up: Towards an integrated measure development paradigm

Presentations of research projects

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