

# **PSYC\*7070, Course Outline: Fall 2022**

## **General Information**

**Course Title: PSYCHOLOGICAL MEASUREMENT**

### **Course Description:**

Psychology 7070 covers measurement theory (classical test theory and item response theory), exploratory, and confirmatory factor analysis, and structural equation modeling. The course is designed for future practitioners and researchers. For future practitioners the course is intended to provide a background in psychometric methods that is necessary for the appropriate use of psychological tests and measures. For researchers, the course will illustrate the importance of taking measurement issues into account when conducting research as well as provide students with skills and knowledge to conduct a variety of useful psychometric analyses.

**Credit Weight: .50**

**Academic Department (or campus): Psychology**

**Semester Offering: Winter**

**Class Schedule and Location: Tuesday, 8:30-11:20 am, ROZH 109.**

## **Instructor Information**

Instructor Name: Jeffrey Spence

Instructor Email: [spencejr@uoguelph.ca](mailto:spencejr@uoguelph.ca)

Office location and office hours: By appointment MCKN extension 4006

## **Learning Outcomes**

1. Develop an in-depth understanding of classical test theory.
2. Compute and appropriately interpret evidence for reliability and validity.
3. Understand and interpret item response theory analyses.
4. Understand how to properly interpret individual test scores and understand factors that influence their accuracy and validity.
5. Conduct and interpret exploratory factor analysis.

6. Conduct and interpret confirmatory factor analysis.
7. Acquire an introductory knowledge of structural equation modeling, including understanding model fit, model comparisons, model identification, and proper interpretation latent and structural models.
8. Understand how to fit and interpret more advanced confirmatory models.

### Lecture Content:

You are responsible for all material presented in lectures, including any announcements. Order of topics covered may change.

- Week 1 (September 13): Introduction and course overview; What is psychometrics?
- Week 2 (September 20): Variance, covariance, correlation; Introduction to classical test theory and reliability
- Week 3 (September 27): Introduction to and foundations for confirmatory models
- Week 4 (October 4): Basic confirmatory models: How to run, fit, interpret, troubleshoot
- Week 5 (October 11): No class due to holiday.
- Week 6: (October 18) Advanced confirmatory models and Sample size planning; Alternatives to maximum likelihood for confirmatory models
- Week 7 (October 25): Open book Midterm (covering weeks 1-6)
- Week 8 (November 1): Introduction to exploratory models; Exploratory factor analysis; Decisions
- Week 9 (November 8): Numerical Example of an Exploratory Factor Analysis; Practical reliability
- Week 10 (November 15): Interpreting test scores and validity I
- Week 11 (November 22): Validity II
- Week 12 (November 29): Item response theory
- Week 13 (December 1): Make up class from holiday; Open book Midterm II (covering Weeks 8-12)

### Course Assignments and Tests:

#### Assignments:

Assignments (20%): There will be 4 assignments throughout the term (each worth 5%). The assignments are intended to give you hands on experience applying the statistical techniques learned in the course. At the class session when the assignment is due, the assignments will be taken up in class. Please make two copies of your assignments: one copy to be turned in at the **beginning of class**, and the other copy to be retained by you to serve as a basis for class discussion. When turning in assignments it is important that the final product is **your own work**. These are not group assignments and must be completed individually. If you have any questions regarding this issue please ask the instructor or consult the University of Guelph's policy on cheating and academic misconduct.

#### Exams:

Take home Midterm Exam I (35%):

The midterm will be handed out during class time and will be based on all the material covered in lecture and in the assigned readings up to October 25, inclusive.

Take home Midterm Exam II (35%):

The midterm will be handed out during class time and will be based on all material covered in lecture and in the assigned readings from November 1 to November 29, inclusive.

Participation/attendance (10%): At the end of the term, students will provide a self-evaluation (out of 100) for how much they believe they contributed, attended, and participated. The instructor may increase the self-evaluation if it is perceived to be too low.

<b>Assignment or Test</b>	<b>Due Date</b>	<b>Contribution to Final Mark (%)</b>	<b>Learning Outcomes Assessed</b>
<b>Take home Midterm I</b>	<b>October 25</b>	<b>35</b>	<b>1,2,6,7,8</b>
<b>Take home Midterm II</b>	<b>December 1</b>	<b>35</b>	<b>1,2,3,4,5</b>
<b>Assignments</b>	<b>See schedule of dates</b>	<b>20</b>	<b>1-8</b>

## **Course Resources**

### **Recommended Texts:**

Brown, T. A. (2015). *Confirmatory Factor Analysis for Applied Research*. New York, NY: The Guilford Press.

Kline, R. B. (2005). *Principles and practice of structural equation modeling*. New York, NY: The Guilford Press.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory (3<sup>rd</sup> edition)*. New York, NY: McGraw-Hill Inc.

## Other Resources:

**Course Website:** On CourseLink. This website will contain announcements, lecture notes, discussion, and other information pertinent to the course.

## Course Policies

### Grading Policies

All assignments will be graded in accordance with standards established by the University of Guelph. [Graduate Grade interpretation](#)

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time. Failure to turn in assignments at the scheduled time will result in a grade of 0 for that assignment.

***Please note that these policies are binding unless academic consideration is given to an individual student.***

### Course Policy regarding use of electronic devices and recording of lectures:

***Electronic recording of classes is expressly forbidden without consent of the instructor. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the instructor.***

## Student Rights and Responsibilities when Learning Online

### *Privacy Rights*

Lectures held via Virtual Classroom on Courselink may be recorded for the purpose of posting them for students. As a student, you have the right to protect your privacy online and may choose to turn off your video and/or audio when in session. In the event that your video and/or audio remain on, please note that you are consenting to your presence in lecture recordings. Under no circumstances are you permitted to transmit copies of the recordings to others, without the express written consent of the instructor.

### *Online behaviour*

According to the University Secretariat, students have a responsibility to help support community members' access to the tools they need to engage in their learning and development, both in and outside of the classroom. An example of this type of responsibility is the requirement to abide by the following:

Section 4.3.3. Disruption - to not interfere with the normal functioning of the University, nor to intimidate, interfere with, threaten or otherwise obstruct any activity organized by the University, including classes, or to hinder other members of the University community from being able to carry on their legitimate activities, including their ability to speak or associate with others.

As such, appropriate online behaviour will not be tolerated. Examples of inappropriate online behaviour include

- Posting inflammatory messages about your instructor or fellow students
- Using obscene or offensive language online
- Copying or presenting someone else's work as your own
- Adapting information from the Internet without using proper citations or references
- Buying or selling term papers or assignments
- Posting or selling course materials to course notes websites
- Having someone else complete your quiz or completing a quiz for/with another student
- Stating false claims about lost quiz answers or other assignment submissions
- Threatening or harassing a student or instructor online
- Discriminating against fellow students, instructors and/or TAs
- Using the course website to promote profit-driven products or services
- Attempting to compromise the security or functionality of the learning management system
- Sharing your username and password

## **University Policies**

### **Academic Consideration**

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the academic calendar for information on regulations and procedures for

Academic Consideration:

[Grounds for Academic Consideration](#)

### **Academic Misconduct**

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community, faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring.

University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the

responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the [Graduate Calendar](#):

### **Accessibility**

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact [Student Accessibility Services](#) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 54335 or email [accessibility@uoguelph.ca](mailto:accessibility@uoguelph.ca) or the [Student Accessibility Services Website](#)

### **Course Evaluation Information**

Please refer to the [Course and Instructor Evaluation Website](#) .

### **Drop date**

The last date to drop one-semester courses, is December 2. For regulations and procedures for Dropping Courses, see [Current Graduate Calendar](#)

## SCHEDULE OF DATES

Please note. The content of this schedule and order of topics may be subject to change.

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### **Week 1 (September 13): Introduction and Course Overview, What is Psychometrics?**

Borsboom, D., Mellenbergh, G. J., & van Heerden, J. (2003). The theoretical status of latent variables.

*Psychological Review*, 110, 203-219.

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### **Week 2 (September 20): Variance, covariance, correlation; Introduction to classical test theory and reliability**

Allen, M. J., & Yen, W. M. (1979). Classical true-score theory. In *Introduction to measurement theory* (pp. 56-65). Monterey, CA: Brooks/Cole.

Nunnally, J. C., & Bernstein, I. H. (1994). The theory of measurement error. In *Psychometric theory* (3<sup>rd</sup> edition). New York, NY: McGraw-Hill Inc.

Osterlind, S. J. (2006). Classical test theory. In *Modern measurement: Theory, principles, and applications of mental appraisal* (pp. 53-85). Columbus, OH: Pearson Merrill Prentice Hall.

#### Assignments:

**Hand out:** *Assignment 1 (due on September 27)*

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### **Week 3 (September 27): Introduction to and foundations for confirmatory models**

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, 323-338.

#### Assignments:

**Due:** *Assignment 1*

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**Week 4 (October 4):** Basic confirmatory models: How to run, fit, interpret, troubleshoot

Graham, J. M. (2006). Congeneric and (essentially) tau-equivalent estimates of score reliability:

What they are and how to use them. *Educational and Psychological Measurement, 66*, 930-944.

Jackson, D. L., Gillaspay Jr., J. A., & Purc-Stephenson, R. (2009). Reporting practices in confirmatory factor

analysis: An overview and some recommendations. *Psychological Methods, 14*, 6-23.

**Hand out: Assignment 2 (due on October 18)**

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**Week 5 (October 11):** No class due to holiday

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**Week 6 (October 18):** Advanced confirmatory models and Sample size planning; Alternatives to maximum likelihood for confirmatory models

Multidimensional:

Edwards, J. R. (2001). Multidimensional constructs in organizational behavior research: An integrative analytic framework. *Organizational Research Methods, 4*, 144-192.

Crede, M., & Harms, P. (2015). 25 years of higher-order confirmatory factor analysis in the organizational sciences: A critical review and developing of reporting recommendations. *Journal of Organizational Behavior, 36*, 845-872.

Causal-formative distinction:

Bollen, K. A., & Lennox, R. (1991). Conventional wisdom on measurement: A structural equation perspective. *Psychological Bulletin, 110*, 305-314.

Bollen, K., A., & Diamantopoulos, A. (2017). In defense of causal-formative indicators: A minority report. *Psychological Bulletin, 22*, 581-596.

Assignments:

**Due: Assignment 2**

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**Week 7 (October 25): MIDTERM** (Covering Week 1 to Week 6)

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**Week 8 (November 1):** Introduction to exploratory models; Exploratory factor analysis; Decisions

Comrey, A. L., & Lee, H. B. (1992). Chapter 1: Introduction. In *A first course in factor analysis* (pp. 1-13). Hillsdale, NJ: Lawrence Earlbaum.

Comrey, A. L., & Lee, H. B. (1992). Chapter 8: Planning the standard design factor analysis. In *A first course in factor analysis* (pp. 205-228). Hillsdale, NJ: Lawrence Earlbaum.

Assignments:

**Hand out: Assignment 3 (due November 15)**

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**Week 9 (November 8):** Numerical Example of an Exploratory Factor Analysis; Practical reliability

Comrey, A. L., & Lee, H. B. (1992). Chapter 10: Interpretation and Application of Factor Analytic results. In *A first course in factor analysis* (pp. 240-262). Hillsdale, NJ: Lawrence Earlbaum.

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**Week 10 (November 15):** Interpreting test scores and validity I

Borsboom, D., Mellenbergh, G. J., & van Heerden, J. (2004). The concept of validity.

*Psychological Review*, 111, 1061-1071.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, 56, 81-105.

Assignments:

**Due: Assignment 3**

**Hand out: Assignment 4 (due November 29)**

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**Week 11 (November 22): Common method variance and validity II**

Conway, J. M., & Lance, C. E. (2010). What reviewers should expect from authors regarding common method bias in organizational research. *Journal of Business and Psychology, 25*, 325-334.

Podsakoff, P. M., MacKenzie, S. B., Lee, J., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 5*, 879-903.

Spector, P. E. (2006). Method variance in organizational research: Truth or urban legend? *Organizational Research Methods, 9*, 221-232.

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**Week 12 (November 29): Item Response Theory**

Edwards, M. C. (2009). An introduction to item response theory using the need for cognition scale. *Social and Personality Compass, 3/4*, 507-529.

Sadler, P., & Woody, E. Z. (2004). Four decades of group hypnosis scales: What does item-response theory tell us about what we've been measuring? *The International Journal of Clinical and Experimental Hypnosis, 52*, 132-158.

Assignments:

**Hand in:** *Assignment 4*

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**Week 13 (December 1): Open book midterm II (Covering Weeks 8-12)**

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