

PSYCHOMETRICS – Code 800158

Academic Year 2018-19

COURSE INFORMATION

Undergraduate Studies: 0812 – Degree in Psychology (Studies Plan 2009-10)

Type: Compulsory

ECTS: 6.0

Module: Basic Psychological training

Area: Assessment and psychological diagnosis

Year: Second

Semester: 2

INSTRUCTOR INFORMATION

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Office number: Room 2105-O

Office hours: Tuesdays, 12:00 to 14:00 and 15:00 to 17:00

SYNOPSIS

COMPETENCIES

General competencies

GC6: Know and understand research methods and data analysis techniques.

GC14: Prepare oral and written psychological reports in different areas of activity.

Transversal competencies

TC1: Analysis and synthesis.

TC2: Preparation and defence of properly reasoned arguments.

TC3: Problem solving and decision making in Psychology.

TC5: Looking for information and data interpretation on social, scientific and ethical topics related to the field of Psychology.

TC6: Team work and collaboration with other professionals

TC7: Critical thinking and self- analysis.

TC9: Communication skills, learning how to communicate ideas to both, professional and non-professional audiences.

Specific competencies

SC17: Be able to measure and obtain relevant data for the evaluation of interventions.

SC18: Know how to analyse and interpret results of evaluations.

SC19: Know how to appropriately and accurately provide feedback to recipients.

TEACHING ACTIVITIES

CLASS SESSIONS

Class attendance is expected and useful for discussions not available elsewhere. I will present the topics in class with the help of slides. You will have copies of these slides (see below), which include text, formulas, and graphical displays. I will also illustrate the concepts and their implications with realistic exercises. Some practical class sessions will also involve computations with Microsoft Excel and other specialized software that is freely available.

MODULE MATERIALS

A booklet with printed copies of all the slides that I will use in class sessions is available at the copy shop (currently located on the ground floor in "Pabellón Lateral II"). The booklet also includes a selected set of exercises with answers. These exercises are meant to help you practice and prepare for the exam. You are expected to complete the exercises over the semester, but they will not be graded. I will also post additional materials on Campus Virtual along the semester and each new posting will be announced in class

ECTS BREAK-DOWN

This module is worth 6 ECTs, which implies 150 hours broken down as follows:

- 60 hours for class sessions (40% of the time).
- 75 hours for your own work (50% of the time).
- 15 hours for assessment (10% of the time).

BRIEF DESCRIPTION:

PRE-REQUISITES

Proficiency in statistics and probability is required to follow the module adequately. If you need to brush up on your statistics, read Crocker & Algina's chapter 2 (Statistical Concepts for Test Theory) or Allen & Yen's chapter 2 (A Review of Basic Statistical Concepts). [Full references below.]

OBJECTIVES

TOPICS

1. Psychometrics: Goals and historical notes
2. Test types and item formats
3. Item scores, test scores, and score scales
4. The process of test construction
5. Classical Test Theory
6. Reliability, and factors affecting it
7. Validity, and factors affecting it
8. Classical item analysis
9. Item Response Theory. 1. Models
10. Item Response Theory. 2. Parameter estimation
11. Response biases
12. Test equating
13. Test score bias and differential item functioning
14. Computerized adaptive testing
15. Generalizability theory Introduction to the scientific method

ASSESSMENT

Module grades arise from two sources: a final exam and a project/presentation that you will complete over the semester. Module grades arise from two sources: a final exam and a project/presentation that you will complete over the semester.

Final exam

An open-note exam will be administered at the end of the semester. The exam will consist of practical exercises. You must bring a calculator and statistical tables, and you may bring up to 10 hand-written pages only including formulas. You must bring a picture ID as proof of identity. The exam earns you a maximum of 6 points. A minimum score of 2 points on the exam is necessary (but not sufficient) to pass this module.

You should keep in mind that successfully answering the questions in the exam requires that you have developed specific problem-solving skills. You are unlikely to acquire such skills over a few crash study sessions right before the exam. Continued work throughout the semester is essential to develop those skills. Solving the exercises at the end of the booklet mentioned above should help you get in shape for the exam, which will consist of analogous exercises.

Project/presentation

You will also be evaluated on the basis of a project that you will carry out throughout the semester, and for which you will give a presentation to the rest of the class at the end of the semester. Your active participation with questions or comments during the discussion that will follow each presentation is also required. This activity is not mandatory but earns you an absolute maximum of 4 extra points, although some simple projects (see below) will not earn you that maximum. You may decide to carry out your project individually or in a team with other classmates, but I will impose limits on the size of each team according to the project you choose to carry out. I am open to hearing about project proposals of any suitable type but, in principle, you have a choice among:

a) Development of a test or questionnaire for some attribute of your interest. Your instrument must be original, although other instruments may have already been developed to measure the same attribute. Development must follow all the steps in test construction, namely, creation of items, collection of data, reliability and validity studies, item analysis, and norming. You must also write a report (10–15 pages long) and present your results to the rest of the class at the end of the semester. 4/5 [maximum: 4 points.]

b) Participation in the process of data collection for the instruments being developed by other classmates (if any). This only involves administering the instrument to members of the target population and handing in the response sheets. [maximum: 2 points.]

c) Essay write-up. This involves preparing an essay paper (10–15 pages long) on a selected topic (e.g., alternative scoring modes for multiple-choice tests, item-writing rules, response biases, research on the optimal number of choices per item, ...). Suitable topics will become apparent during the first few class sessions. You must also give a presentation to the rest of the class at the end of the semester. [maximum: 3 points.]

d) Software presentation. This involves getting acquainted with one of the many freeware tools that have been developed to address computational issues in psychometrics. You must also write a short report (4–6 pages long) and give a presentation that should take the form of a practical class session similar to those that you will see me give. Some suitable software tools are listed in the booklet of slides, but others are also available and acceptable. [maximum: 3 points.]

Individuals or teams **must discuss their project choice with me during the week that starts on February 18th, at the latest.** I will understand that you give up on your option for these extra points if I do not hear from you by February 25th. I must approve the team size and I will notify you of the maximum number of points that your project will be worth. You must then brief me on your progress regularly during the semester so I can monitor your work and assess your performance. **Without such regular interaction, your project will not be graded.**

Subject to potential changes, and pending assignment of final dates, project presentations will take place during the evening hours (3 pm to 7 pm) from May 13th to May 17th. Thirty-minute presentations will be arranged to fill up the four hours in each session. You must attend all the presentations given in the session where your own is scheduled, and you are expected to contribute to the ensuing discussion. The written report of your project is due on May 24th but it is advisable that you have it ready by the time of your presentation so you can easily make changes or additions according to the discussion that will follow your presentation.

Final module grade

Your final module grade will be based on the sum of the points earned on the exam (a maximum of 6) and the points earned on your project/presentation (a maximum of 4). If your score on the exam is at least 2 points, grades will be assigned according to your sum score (ranging from 0 to 10) on the following scale:

[0–5]: Suspenso (SS)

[5–7]: Aprobado (AP)

[7–9]: Notable (NT)

[9–10]: Sobresaliente (SB)

No passing grade is required on the project/presentation, but note that you will receive a failing grade (SS) if you do not earn at least 2 points on the exam regardless of your score on the project. Note also that you cannot get a grade beyond AP if you decided against carrying out a project.

If you do not pass the module in May, there will be a resit examination in June or July but there is not a second chance for a project. However, if you did work on a project during the semester and gave a presentation but you did not get the maximum score it was worth, you have the option to improve your written report and hand in the new version at the time of the resit. An additional oral presentation is not required in these cases.

Plagiarism and cheating

Plagiarism or cheating are breaches of academic integrity and are penalized. Cheating on the final exam results in dismissal from the exam and an automatic failing grade on the module. The penalty for copying word for word or cutting and pasting material from other sources into your written report is to fail the assignment, with no consequences on your score on the exam.

RESOURCES

Textbooks and resources

There is no set text, but almost all textbooks on Psychometrics cover the module topics adequately. The following books are all available in the library (or free to download).

Allen, M.J. & Yen, W.M. (1979). *Introduction to measurement theory*. Monterey, CA: Brooks/Cole. [Reprinted by Waveland Press, Long Grove, IL, 2002.]

Baker, F.B. (2001). *The basics of item response theory* (2nd edition). College Park, MD: ERIC. (originally published in 1985). Free download at <http://echo.edres.org:8080/irt/baker/final.pdf>

Crocker & Algina is your best pick as a reference book. The table underneath the list of textbooks enumerates relevant chapters in each book for each of the module topics.

Crocker, L. & Algina, J. (1986). *Introduction to classical & modern test theory*. New York: Holt, Rinehart and Winston. [Reprinted by Cengage Learning, Mason, OH, 2006.]

de Gruijter, D.N.M. & van der Kamp, L.J.Th. (2008). *Statistical test theory for the behavioral sciences*. Boca Raton, FL: Chapman & Hall.

Furr, R.M. & Bacharach, V.R. (2008). *Psychometrics. An introduction*. Thousand Oaks, CA: Sage.

Gulliksen, H. (1950). *Theory of mental tests*. New York: Wiley. [Reprinted by Erlbaum, Hillsdale, NJ, 1987.]

Hambleton, R.K. & Swaminathan, H. (1985). *Item response theory: Principles and applications*. Boston, MA: Kluwer-Nijhoff.

McDonald, R.P. (1999). *Test theory: A unified treatment*. Mahwah, NJ: Erlbaum.

	Psychometrics	Test types & item formats	Scores & scales	Test construction	Classical test theory	Reliability	Validity	Item analysis	IRT models	IRT parameter estimation	Response biases	Test equating	Test bias & DIF
Crocker & Algina	ch. 1		ch. 5, 17 & 19	ch. 4	ch. 6	ch. 7	ch. 10	ch. 14	ch. 15	ch. 15		ch. 20	ch. 16
Gulliksen			ch. 18		ch. 2, ch. 3	ch. 4, 6, 7, 8, 10, 15 & 16	ch. 9 & 11	ch. 21				ch. 19	
de Gruijter & van der Kamp					ch. 2	ch. 3 & 4	ch. 7	pp. 92-98	ch. 9	ch. 9		ch. 11	pp. 182-189
Allen & Yen		ch. 6	ch. 7	ch. 6	ch. 3	ch. 4	ch. 5		ch. 11				
Furr & Bacharach	ch. 1		pp. 46-60		ch. 5	ch. 6 & 7	ch. 8 & 9		ch. 13		ch. 10		ch. 11
McDonald		ch. 2	ch. 3 & 4		ch. 5	ch. 6 & 7	ch. 10	ch. 11	ch. 12 & 13			ch. 16	
Baker									✓	✓			
Hambleton & Swaminathan									✓	✓			

The following books (in Spanish) are also available in the library and are a good source of exercises.

- Barbero García, M.I. & García-Cueto, E. (1988). *Psicometría: Problemas*. Madrid: UNED.
- García Cueto, E. (1993). *Introducción a la psicometría*. Madrid: Siglo XXI.
- Hogan, T.P. (2004). *Pruebas psicológicas. Una introducción práctica*. México: Manual Moderno.
- Martínez Arias, M.R. (1996). *Psicometría: Teoría de los tests psicológicos y educativos*. Madrid: Síntesis.
- Martínez Arias, M.R., Hernández Lloreda, M.J. & Hernández Lloreda, M.V. (2006). *Psicometría*. Madrid: Alianza.
- Muñiz, J. (1996). *Teoría clásica de los tests*. Madrid: Pirámide.
- Muñiz, J. (1990). *Teoría de respuesta a los ítems: Un nuevo enfoque en la evaluación psicológica y educativa*. Madrid: Pirámide.
- Muñiz, J. (1997). *Introducción a la teoría de respuesta a los ítems*. Madrid: Pirámide.
- Muñiz, J., Fidalgo, M., García-Cueto, E., Martínez, R. & Moreno, R. (2005). *Análisis de los ítems*. Madrid: La Muralla.
- Santisteban Requena, C. (1990). *Psicometría. Teoría y práctica en la construcción de tests*. Madrid: Norma.
- Santisteban Requena, C. (2009). *Principios de psicometría*. Madrid: Síntesis.