PSYCHOLOGICAL SCIENCES - PhD PROGRAM
EDUCATIONAL ACTIVITIES 2024/2025

Delivery period	Type of course	Couse name/title	Instructor/Teacher	Hours	ECTS	Delivery method	Language	Mandatory Attendance yes/no	Course contents	Learning Goals
1st year 1st semester	METHODOLOGY	CURRENT ISSUES IN STATISTICAL INFERENCE FOR PSYCHOLOGY	MASSIMILIANO PASTORE	10	2	IN PERSON	ENGLISH	YES	The course is organized into four parts. It begins by addressing the primary challenges associated with statistical analysis in psychology, with a specific focus on the difficulties in using and interpreting statistical significance. The third part discusses both the replicability crisis and the reproducibility crisis. Finally, it presents new strategies for enhancing the quality of psychological research.	1) Enhancing the awareness of best practices in psychological research 2) Understanding the history of the replicability crisis and its ongoing consequences 3) Acquiring knowledge about current research practices related to open data and reproducibility
1st year 1st semester	METHODOLOGY	LINEAR AND MIXED EFFECT MODELS WITH SPSS	JEFF KIESNER	15	3	IN PERSON	ENGLISH	NO	This course will focus on theoretical and practical application of the general linear model with specific emphasis on the overlap between ANOVA/ANCOVA and parallel analyses conducted within a multiple regression context. The course will include both theoretical explanation and practical application using SPSS.	1) Understand the parallels and differences between ANOVA/ANCOVA and multiple regression 2) Perform ANCOVA/ANOVA in the context of multiple regression
1st year 1st semester	METHODOLOGY	BASICS OF STATISTICAL INFERENCE WITH R	UMBERTO GRANZIOL	20	4	IN PERSON	ENGLISH	YES	Statistical inference does not involve only the ability to read a p-value. It requires knowledge of what is being analyzed and how to program it properly. This course is designed to provide doctoral students with a comprehensive understanding of statistical inference by actively engaging them in practical exercises. It places a strong emphasis on how to find solutions to specific problems through the application of the R programming language. Furthermore, this course will enhance students' computational proficiency in the field of data science, covering key topics such as probability calculus, estimation, inference, and planned comparisons within the context of linear models.	1) Critical thinking for solving some statistical issues 2) Implementation of the R code for these solutions
1st year 1st semester	PROGRAMMING	BASICS OF R FOR DATA SCIENCE	ENRICO TOFFALINI	10	2	IN PERSON	ENGLISH	YES	R is an open-source programming languages used for statistical analysis and data science, that has rapidly become among the most used in academic settings. This course serves as a foundational introduction to the R language that lays the ground for many subsequent courses specialized on statistical analysis within this PhD program. Participants will gain proficiency in fundamental operations on data structures, including vectors, data frames, and lists. They will learn to import and export data, understand various data types. They will master basic concepts of programming such as performing iterations and loops, defining conditional statements, and defining custom functions. Moreover, students will be introduced to commonly used R packages for statistical analysis in social sciences.	1) Proficiency in essential operations on data structures, including vectors, data frames, and lists. 2) Fundamental programming concepts such as iterations, loops, conditional statements, and custom function definitions. 3) Introduction to commonly used R packages for data science and statistical analysis in social sciences.

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1st year 2nd semester	METHODOLOGY	PSYCHOLOGICAL MEASUREMENT	LUCA STEFANUTTI	15	3	IN PERSON	ENGLISH	YES	The course is about measurement, both in general, across disciplines and in the special case of psychology. Naive psychological measurement is still in use, almost oblivion of the existence of a mathematical theory, named representational measurement theory (RMT), which offers a rigorous and comprehensive framework for measurement, valid for any empirical science. Extensive measurement (measurement in the physical sense) can only occur if a well specified set of conditions, known as the Hölder's conditions, hold true empirically. Such conditions do not hold with psychological attributes like intelligence, motivation, anxiety, emotional feelings, etc. Several alternatives to extensive measurement are offered by the RMT framework. Some of the most important for psychology (like ordinal measurement and conjoint measurement) are illustrated, both theoretically and in practice, with the help of examples taken from experimental, clinical, and social psychology.	1) Recognize and avoid the typical and pervasive biases of naive measurement 2) Establish artifact-independent (thus, meaningful) measurements 3) Apply various types of ordinal measurement to your data 4) Carry out a conjoint measurement study
1st year 2nd semester	METHODOLOGY	POWER AND DESIGN ANALYSIS	GIANMARCO ALTOÈ	5	1	IN PERSON	ENGLISH	YES	Power analysis is a fundamental statistical method for planning the sample size of a study. Its importance has recently been highlighted in addressing the replicability crisis in psychological research. This course aims to explain the theoretical foundations of power analysis and provide practical tools using the R software. Additionally, both the theoretical and practical aspects of design analysis, which can be seen as a useful extension of power analysis, will be discussed.	1) When and how to plan the sample size of a study 2) How to evaluate the results of a study taking into account several inferential risks 3) Implement power and design analysis using the R software
1st year 2nd semester	METHODOLOGY	EVALUATION OF OUTLIERS AND INFLUENTIAL CASES IN MULTIVARIATE PERSPECTIVE	GIANMARCO ALTOÈ	5	1	IN PERSON	ENGLISH	NO	Outliers (i.e., single observations that are distant from the others based on the variables of interest) and influential cases (i.e., single observations with a huge impact on the estimated parameters of a model) are ubiquitous in statistical analyses in psychology. In this course, based on practical examples, we will see how to define, identify, and handle univariate and multivariate outliers as well as influential cases. On a practical level, various statistical methods will be presented using the R software. These methods can easily be extended to other statistical software as well.	1) Evaluate the presence of outliers and influential cases in a statistical analyses 2) Handle outliers and influential cases appropriately 3) Implement the various methods learned using the R software
1st year 2nd semester	METHODOLOGY	QUESTIONABLE MEASUREMENT PRACTICES AND HOW TO AVOID THEM	TATIANA MARCI	5	1	IN PERSON	ENGLISH	YES	Although questionable measurement practices (QMPs) are common in psychological research and pose a potential threat to the validity of a study's conclusions, they have been largely neglected in the literature. In this course we will define QMPs, analyse examples of QMPs in the psychological literature, and highlight a series of questions that researchers can consider to identify and avoid them. We will discuss how measurement practices can be improved, and how transparency in measurement practices promotes rigorous research, allows careful evaluation of study conclusions, and is necessary for sound replication studies.	1) Assess the degree of validity of a psychological instrument 2) Identify and avoid questionable measurement practices

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1st year 2nd semester	METHODOLOGY	DATA VISUALISATION WITH GGPLOT2	MICHELE VICOVARO	5	1	IN PERSON	ENGLISH	NO	Proficiency in performing statistical analyses with R is a crucial skill for researchers in behavioral sciences. This skill should be complemented by the ability to construct informative and visually appealing graphs, as graphs are increasingly important for transparent and effective communication of scientific study findings. The ggplot2 package serves as a potent and adaptable tool within the R environment, facilitating the creation of meaningful and aesthetically pleasing graphs. Although its logic may initially appear complex, once you grasp the fundamentals, you will appreciate the high degree of control it offers over the graphs that you are planning to create for your forthcoming research papers.	1) Evaluation of the strengths and weaknesses of different graphical representations 2) Mastery of the ggplot2 programming language basics 3) Proficiency in crafting various types of graphs using ggplot2.
1st year 2nd semester	SOFT SKILLS	CRAFTING EFFECTIVE SCIENTIFIC PRESENTATIONS	FILIPPO GAMBAROTA	5	1	IN PERSON	ENGLISH	NO	Creating engaging and effective scientific presentations is a crucial skill for researchers This course is designed to guide on creating impactful scientific presentations tailored to various contexts. We will see how to organize a scientific presentation considering time constraints, type of audience (colleagues, students, general audience, etc.), and type of event (conference, lab meeting, thesis defense, etc.). We will see how to create the presentation practically with suggestions on slides organization, visual style, and how to include graphical elements (figures, diagrams, etc.). Finally, there will be suggestions on how to present effectively in terms of rhythm and voice tone.	1) Organizing a scientific presentation according to the specific aim and audience 2) Creating the presentation practically with common software 3) Doing the talk effectively
1st year 2nd semester	PROGRAMMING	BASICS OF MATLAB FOR DATA SCIENCE	LUCA STEFANUTTI	10	2	IN PERSON	ENGLISH	NO	Like Python, R, and still other languages, MATLAB is a high level scientific programming language that inherits the power of the C language, still remaining much simpler in its structure. The course introduces the student to the logic of "solving problems by programming" through the MATLAB programming language. Procedural programming mostly consists of applying algorithms to data structures. Basic data structures (like vectors, matrices, strings and lists) and fundamental algorithms (the pieces of code that "do the things") are illustrated in theory and through a series of practical examples. In a later step, algorithms and data structures are applied within the most important abstraction mechanism of the whole procedural programming framework, namely functions.	1) Using MATLAB on-line from virtually any device 2) Elementary programming skills for data analysis, text and string manipulation 3) Code debugging and testing 4) Managing large and complex data structures through vectors and matrices 5) Develop your own MATLAB functions
1st year 2nd semester	PROGRAMMING	BASICS OF PYTHON FOR DATA SCIENCE	ENRICO TOFFALINI	10	2	IN PERSON	ENGLISH	NO	Python is an open-source programming language that has emerged as a global leader in data science applications, particularly within industry contexts. This course aims to equip students with fundamental skills in using Python for data science. Participants will learn foundational concepts such as data manipulation, and basics of statistical modelling using Python's extensive ecosystem of powerful libraries, including NumPy, Pandas, Matplotlib, and Scikit-learn. Mainly through hands-on exercises, participants will get the basic skills for real-world data analysis, including data cleaning, visualization, and a bit of machine learning. By the end of the course, students will not only be able to translate familiar processes from R to Python but also gain insights into the expanded capabilities offered by Python.	1) Proficiency in fundamental data structure operations, encompassing data frames and lists, alongside mastering essential programming concepts like iterations and conditional statements (already mastered in R), now applied within the Python environment 2) Basics of machine learning and statistical analysis performed in Python 3) Knowledge of commonly used Python libraries for data science

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EDUCATIONAL ACTIVITIES 2024/2025

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2nd/3rd year ? semester	SOFT SKILLS	ADVANCING RESEARCH PARADIGMS: OPEN SCIENCE, OPEN SCIENCE, PRE-REGISTRATION AND MULTI-LAB STUDIES	GIULIA CALIGNANO	5	1	IN PERSON	ENGLISH	NO	TBA	TBA
2nd/3rd year ? semester	THEMATIC COURSE	NEUROPSYCHOLOGY OF VISION	LUCA BATTAGLINI	5	1	IN PERSON	ENGLISH	NO	This short course will focus on the rehabilitation of visual problems arising from brain damage (hemianopsia) or from improper development of the visual cortex during the critical period (amblyopia). Rehabilitation techniques and clinical cases will be presented.	1) Understand the basic structures and functions of the visual system, as well as neurovisual training that harnesses perceptual learning 2) Psychophysical assessment of visual functions
2nd/3rd year ? semester	THEMATIC COURSE	EVOLUTIONARY PSYCHOLOGY	PETER JONASON	10	1	ONLINE	ENGLISH	NO	What is the function of depression? Could it be "good" to be psychopathic? Why are there (and to what degree) pervasive sex differences in personality, sexuality, care for kin, motivations, job preferences, and visual spatial skills? Why are there so many features in common between such a broad range of species like orca, chimps, elephants, humans, and dogs? Evolutionary psychology is the attempt to understand why organisms—including humans—have psychological systems that have adapted to solve ancestral tasks related to survival and reproduction. Many (but not all) behaviors, attitudes, and cognitions today have their origins not in the development of the individual but, instead, in ancestral challenges that affected humans in general. Through this lens we might start to better understand some of the "darkest" aspects of the human condition like prejudice as well as some of the "lightest" like the love of a mother and a child.	1) Basics in evolutionary biology 2) How to apply evolutionary modes of thought to research questions 3) Get a critical survey of the field with emphasis on topics related to reproduction and survival1
2nd/3rd year 1st semester	METHODOLOGY	METHODOLOGY IN NEUROSCIENCES	SIMONE CUTINI	10	2	IN PERSON	ENGLISH	NO	Methodological issues are fundamental aspects that need to be taken into account in every phase of the experiment, starting from its planning up to the analysis of the data collected. In this course, we will study the most important methodological practices that must be performed in each phase. We will also see some of the most common and dangerous pitfalls that need to be avoided. We will tackle some topics in cognitive psychology, cognitive neuroscience that will be used as examples that can be applied in other research fields, together few statistical issues which all should be aware of.	1) How to plan and perform an experiment (including how to select the best experiment for your needs) 2) Use some tip and tricks to improve experiments and analyses 3) How to avoid common mistakes and bad practice
2nd/3rd year 1st semester	METHODOLOGY	BAYESIAN DATA ANALYSIS IN PSYCHOLOGICAL RESEARCH	MASSIMILIANO PASTORE	10	2	IN PERSON	ENGLISH	NO	The objective of the course is to introduce the Bayesian approach in practical terms. It comprises three parts: 1) an introduction to probability, 2) the binomial model, and 3) the normal model. In the practical component, we will provide an overview of STAN along with examples demonstrating its application within the R environment.	1) The rationale for the Bayesian approach 2) Basics of using STAN

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2nd/3rd year 1st semester	METHODOLOGY	GENERALISED LINEAR MODELS	FILIPPO GAMBAROTA	15	3	IN PERSON	ENGLISH	NO	Generalized linear models (GLMs) are generalizations of ordinary linear regression where the data are assumed to be not normally distributed. In psychology, it is common to have categorical (e.g., binary) or strictly positive (e.g., counts or reaction times) variables that require appropriate models. In this course, we will see how GLMs are defined and formalized from a statistical point of view. Then we will implement the model in R with a particular focus on parameter interpretation. Moreover, we will implement Monte Carlo simulations to better understand the data generation process and estimate statistical properties (e.g., type-1 error and power).	1) Understand the statistical theory of GLMs 2) Fit and interpret a GLM using R 3) Implement Monte Carlo simulations for the most common GLMs
2nd/3rd year 1st semester	METHODOLOGY	STRUCTURAL EQUATION MODELING	TOMMASO FERACO	20	4	IN PERSON	ENGLISH	NO	Structural equation modeling (SEM) is a powerful statistical technique that enables the analysis of multivariate data and latent variables. In this course, we will delve into the theoretical and statistical underpinnings of latent variables, explore the fundamental principles of SEM, and equip you with the skills to specify, evaluate, and test SEM models in R, primarily utilizing the 'lavaan' package. Key topics covered in the course also include confirmatory factor analysis (CFA), the assessment of measurement invariance, path analysis, and power analysis for structural equation models.	1) Understand the principles of structural equation modeling and latent variables 2) Write, fit, and analyze a structural equation model in R 3) Implement a power analysis for structural equation models via simulation
2nd/3rd year 1st semester	METHODOLOGY	CONDUCTING SYSTEMATIC REVIEWS	ENRICO SELLA	5	1	IN PERSON	ENGLISH	NO	What is a systematic review? How do we formulate and develop a research question in a systematic review process? This methodology of evidence synthesis is commonly used in evidence-based decision-making in various fields, including psychological sciences. This course offers an introductory understanding of the systematic review process, from formulating a research question to synthesizing the evidence and reporting the findings. The key steps in conducting a systematic review, defining a review question, and developing a review protocol, as well as strategies for identifying relevant sources of evidence, will be covered. Furthermore, the course will provide recommended skills to assess the risk of bias and select appropriate methods for evidence synthesis.	1) Formulate the review question using systematic approach 2) Basic skills for literature search and study selection 3) Critical appraisal of included studies

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2nd/3rd year 1st semester	METHODOLOGY	INTRODUCTION TO ITEM RESPONSE THEORY	MARINA OTTAVIA EPIFANIA	15	3	IN PERSON	ENGLISH	NO	This course presents an Introduction to Item Response Theory (IRT) models for dichotomous responses (e.g., true vs. false, correct vs. incorrect) with practical applications in R. According to IRT models, the observed response of a person to an item is a function of the characteristics of the person (i.e., the latent trait) and of the characteristics of the items, as described by both person's and item parameters. Different IRT models are available according to the number of parameters used for describing the functioning of the items. In order for the parameters obtained with the application of IRT models to be interpretable, a set of assumptions need to be met. The test of these assumptions, the evaluation of the fit of the models, and the implications and meaning of the item parameters will be illustrated through practical examples on real and simulated data. Moreover, the potential of these models for the thorough investigation of the item functioning will be illustrated by presenting both the item and test information functions and the methods for the identification of differential item functioning. Finally, the development of short test forms based on the item information function will be briefly illustrated.	1) Difference between Classical Test Theory and Item Response Theory 2) Critical thinking on the applicability of IRT models 3) Apply different IRT models, interpret the model fit, and the meaning of the item parameters 4) Investigate the item functioning under different perspectives (e.g., item information, differential item functioning)
2nd/3rd year 1st semester	SOFT SKILLS	HOW TO WIN RESEARCH GRANTS	CHRISTIAN AGRILLO	5	1	IN PERSON	ENGLISH	NO	Publish or Perish? Not only. We can especially perish by the lack of funds. While we continuously focus on paper writing, we often neglect the importance of grant applications, especially at the beginning of our academic career. This course aims to fill this gap, showing different types of grants, and providing tips for a successful grant application. At the end of the course, PhD students will be invited to present a short grant application, with a particular focus on the budget.	1) What is the proper grant for my purpose? 2) Which is the language I have to use for grant panels and for the reviewers? 3) What is the structure of ERC-like grants? 4) Grant interview: how does it work? 5) How do we prepare the budget section?
2nd/3rd year 1st semester	SOFT SKILLS	CAREER COUNSELING	NICOLA CELLINI	10	2	IN PERSON	ENGLISH	NO	Navigating through a doctoral school and surviving academia is not a trivial task. This course is designed to provide doctoral students with knowledge and tools to successfully navigate through this complex system. The first part of the course will provide information about how the Italian academic system works, such as the actual regulations about career steps, national scientific habilitation, and scientific disciplinary sectors. The second part of the course will focus on providing advice and suggestions for developing an optimal curriculum (CV), and to provide information on what to expect at the end of the doctoral program. The last part of the course will focus on writing the right CV for the different types of use (e.g., grant, award, post-doc application).	1) Understanding the academic system and its (implicit and explicit) regulations 2) How to plan an academic or an extra-academic career, during and after the PhD 3) How to write a successful CV

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2nd/3rd year 1st semester	SOFT SKILLS	OUTSIDE ACADEMIA	ALESSIA BASTIANELLI	5	1	IN PERSON	ENGLISH	NO	What skills does the PhD program in Psychological Science offer that can be useful outside academia? With a solid foundation in psychology and statistics, pioneering spin-offs and start-ups can be established in both fields, applying academic rigor and knowledge to practical applications in small company settings. The course will provide practical examples in HR Analytics, demonstrating how data collection and analysis tools can drive informed decision-making and enhance employee well-being in organizational settings.	1) Understanding the variety of job-market opportunities outside academia 2) Developing essential skills for founding a spin-off 3) Learning to translate academic knowledge into tangible solutions
2nd/3rd year 2nd semester	METHODOLOGY	INTRODUCTION TO META-ANALYSIS WITH APPLICATION IN R	GIANMARCO ALTOÈ	5	1	IN PERSON	ENGLISH	NO	Meta-analysis is a statistical method that allows for the quantitative synthesis of the results from multiple studies. These studies can involve existing literature or can be pre-planned studies following the same protocol (i.e., multi-lab studies). Currently, meta-analysis has assumed a crucial role in science and is indispensable in the toolkit of a psychologist researcher. This course will present various statistical models of meta-analysis from both a theoretical and applied perspective (using R software). Special emphasis will be placed on the critical interpretation of meta-analysis findings.	1) Approach scientific questions with a meta analytical mindset 2) Use the most appropriate meta analysis models and create their associated graphical representations through the R software 3) Evaluate the critical aspects of a meta analysis
2nd/3rd year 2nd semester	METHODOLOGY	DATA SIMULATION IN PSYCHOLOGICAL STUDIES	MASSIMILIANO PASTORE	10	2	IN PERSON	ENGLISH	NO	Data simulation plays a crucial role in comprehending and assessing models for data analysis. This course naturally extends from Power and Design Analysis, aiming to provide practical application tools. It will feature examples of simulations for linear, logistic, and reaction time models within the R environment.	1) Principles of data simulation 2) Simulation techniques for normal (univariate and multivariate), dichotomous, and non-normal variables 3) A priori power analysis
2nd/3rd year 2nd semester	SOFT SKILLS	PUBLISHING IN HIGH-IMPACT JOURNALS	MARA CADINU	15	3	IN PERSON	ENGLISH	NO	Practical exercises - using each student's own area of research as training ground - will accompany traditional teaching in order to help doctoral students develop the basic skills needed for publishing in top international journals. Students will be asked to bring to class the following parts of one of their own unpublished manuscripts: abstract, first paragraph of introduction, aims & hypothesis section of introduction, first and last paragraph of discussion section.	1) To write a good first paragraph of an introduction 2) To write a good abstract 3) To write aims & hypothesis section of introduction
2nd/3rd year 2nd semester	THEMATIC COURSE	PSYCHONEUROENDOCRINOLOGY	JEFF KIESNER	5	1	IN PERSON	ENGLISH	NO	This short course will focus on the links between psychological states and experiences, endocrinological changes, and neurological changes. One specific model that will be examined are the hormonal, neurological, and psychological changes across the menstrual cycle.	1) Understand the basic structures and functions of the steroidal signaling and how it effects the neurological system 2) Understand the complexity of steroid changes on neurological and psychological functioning
2nd/3rd year - 2nd semester	PROGRAMMING	BASICS OF LINUX FOR DATA SCIENCE	FRANCESCO VESPIGNANI	5	?	IN PERSON	ENGLISH	NO	TBA	TBA