Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	**Statistics for the Public Sector** **M2 Economic Statistics – M1 Introduction to statistical methods**
Course code	27066 – other students code --- (M1)/--- (M2) Erasmus
Scientific sector	SECS-S/03 (M2) – SECS-S/01 (M1)
Degree	Master in Public Policies and Administration
Semester and academic year	1st semester 2019/2020 (M2) – 2nd semester 2019/2020 (M1)
Year	1
Credits	12 (6+6)
Modular	Yes

Total lecturing hours	72 (36 + 36)
Total lab hours	
Total exercise hours	42 – M2: 20 (*Preparatory Course*) + 6; M1: 16
Attendance	Suggested, but not required
Prerequisites	Students without a background in Statistics are encouraged to actively attend the *Preparatory Course* in Statistics for the Public Sector. It is scheduled at the beginning of the first semester, before Module M2 starts. At the end of the *Preparatory Course*, a final exam is scheduled. The final exam aims at checking the basic requirements to success the course of Statistics for the Public Sector. Therefore, the final exam will have no-negative impacts on students' path, as it is aimed at making aware students of their quantitative knowledge. In case of "not passed" outcome, the student will be got in touch with the Lecturing Assistant and the Principal Lecturer in order to properly bridge her/his knowledge gaps. In case of "pass with distinction" outcome, students are awarded up to an additional point for the final mark.
Course page	https://www.unibz.it/en/faculties/economics-management/master-public-sector/course-offering/

Specific educational objectives	**M2 Economic Statistics** The course refers to the typical educational activities and belongs to the scientific area of Applied Statistic. By the end of the study of this course the student should be able to - understand and use the most relevant economic statistics; - interpret and use the main tools from the index number theory and clustering methods. - develop the ability to perform basic quantitative economic analysis by means of the R software.

	M1 Introduction to statistical methods The course refers to the typical educational activities and belongs to the scientific area of Statistic. By the end of the study of this course the student should be able to - understand the logical reasoning underlying the construction of a sampling distribution and the implications for statistical inference; know the criteria for constructing good estimates of parameters; compute estimates of parameters from sample data; understand the philosophy and scientific principles underlying the hypothesis testing; carry out hypothesis tests for a variety of statistical problems; - understand and use descriptive and inferential statistics when i) there is a single quantitative response variable and a single explanatory variable and ii) there is a single quantitative response variable and a set of explanatory variables; - address statistical issues concerning concrete problems; - develop the ability to perform basic statistical data analysis by means of the R software.

Module 1	**M2 Economic Statistics**
Lecturer	**Marta Nai Ruscone** Office E310
Scientific sector of the lecturer	SECS-S/03
Teaching language	English
Office hours	Please refer to the lecturer's web page
Lecturing assistant	**Di Caterina Claudia**
Teaching assistant	Not foreseen
Office hours	Please refer to the Faculty Timetable
List of topics covered	**Economic Statistics** Economic data: Concepts, definitions and classification of economic statistics; Statistical indices, k-means and hierarchical clustering. Introduction to the R software.
Teaching format	Classroom-based lectures, Labs

Module 2	**M1 Introduction to statistical methods**
Lecturer	**Francesca Marta Lilja Di Lascio** Office E510a e-mail: Marta.DiLascio@unibz.it Tel: 0471/013285 https://www.unibz.it/en/faculties/economics-management/academic-staff/person/32845-francesca-marta-lilja-di-lascio

Scientific sector of the lecturer	SECS-S/01
Teaching language	English
Office hours	Please refer to the lecturer's web page
Lecturing assistant	**Maja Miletic / Massimo Cannas** Office E310
Teaching assistant	not foreseen
Office hours	Please refer to the lecturer's web page
List of topics covered	**Probability** Random variable, probability distribution for discrete and for continuous random variables. Expected value and variance. Linear combination of random variables. Some distributions for discrete random variables: Bernoulli and binomial. Some distributions for continuous random variables: Gaussian, Student-t, Chi-square, Fisher-Snedecor F. Standardized variables. Central limit theorem. **Statistical Inference** Inductive process under uncertainty. Sampling and sampling distributions of the mean, variance and proportion. Statistics, estimators and their properties. Choice of an estimator. Point estimation and confidence intervals for the mean, the variance and the proportion. Hypothesis testing. Type I error and type II error. Significance level and p-value. Hypothesis tests for the mean of a normal population and for a proportion. Hypothesis testing for two means of normal populations and in the case of large samples. Test of independence. **Statistical Models** Correlation, regression and causation. The simple linear regression model. The multivariate regression model. Inference for regression. **R software** Statistical data analysis by R.
Teaching format	Frontal lectures, exercises, lectures with computers

Learning outcomes	**M2 Economic Statistics** Knowledge and understanding: Knowledge of the basics of economic statistics. Applying knowledge and understanding: Ability to evaluate temporal changes in some relevant socio-economic phenomena, such as gross domestic product, unemployment, and industrial production; ability to analyse demography related issues.

	Making judgments: Ability to write a technical report on specific economic issues by analysing data and extracting the underlying dynamics. Communication skills: Ability to present in a consistent and precise way the results obtained from the statistical analysis. Learning skills: Ability to understand and analyse the economic data from a quantitative perspective. **M1 Introduction to statistical methods** Knowledge and understanding: Knowledge of the basics of the inferential statistical theory, from the estimation to the test of hypothesis. Knowledge of the procedure of simple and multivariate linear statistical modelling. Understanding of the R code in which a statistical problem is translated. Applying knowledge and understanding: Ability to perform statistical analysis of socio-economic data through both the descriptive and the inferential statistical tools as well as linear regression models. Ability to apply statistical techniques by using an appropriate statistical software. Making judgments: on the appropriateness of statistical tools to analyse data and on the results of a statistical analysis of concrete cases. Communication skills: to present in a consistent and precise way the results obtained from a statistical analysis of observed data. Learning skills: Ability to *i)* understand the logic of the statistical reasoning, *ii)* interpret the results of statistical analysis, and *iii)* address statistical issues concerning concrete problems.

Assessment	**M2 Economic Statistics** Project work on a case study (no written exam expected). Expected outcome: A technical report based on a quantitative analysis of economic data. Students are encouraged to work in group. The assessment method indicated is valid for both attending and non-attending students. **M1 Introduction to statistical methods** Written exam on a case study: students will have to solve theoretical, practical and computational issues concerning a given concrete problem. The assessment method indicated is valid for both

	attending and non-attending students.
Assessment language	English
Evaluation criteria and criteria for awarding marks	**M2 Economic Statistics** To pass the M2 module exam students must obtain a positive evaluation on the Project work. It is relevant for Project work: correctness and clarity of the Report, ability to interpret R outputs and to correctly write formal R code. **M1 Introduction to statistical methods** To pass the M1 module exam students must obtain a positive evaluation on the written exam. It is relevant for written exam: correctness and clarity of answers, ability to interpret R outputs and to correctly write formal R code. Pass with distinction in the Preparatory class: up to 1 point.

Required readings	**M2 Economic Statistics** *- Giovannini, E. (2008). Understanding economic statistics: an OECD perspective. Paris: Organisation for economic cooperation and development.* Available on the web at http://www.oecd.org/sdd/41746710.pdf *- T. Hothorn, B. S. Everitt, A handbook of statistical analyses using R, 2014. Chapman and Hall/CRC.* *- P. Newbold, W. L. Carlson, B. M. Thorne, Statistics for Business and Economics, Pearson, New York, 2013, 8th Ed.. ISBN 978-01-327-4565-9.* *- G. James, D. Witten, T. Hastie, R. Tibshirani, An introduction to statistical learning with applications in R, Springer Science. ISBN 978-14-614-7137-0* Chapter 10 (only 10.3 – 10.5 – 10.6.2) *- Lecture notes and R code of the labs will be provided.* **M1 Introduction to statistical methods** *- D. S. Moore, G. P. McCabe, B. A. Craig, Introduction to the Practice of Statistics, WH Freeman, New York, pp. 814, 2017, 9th Ed.. ISBN 978-13-190-1338-7. Chapters 2, 4-11.* *- P. Dalgaard, Introductory Statistics with R, Springer Verlag, pp. 364, New York, 2008, 2nd Ed.. ISBN: 978-03-877-9053-4. Chapters 3-6, 8, 11.* *- Lecture notes and R code of the labs will be provided.*
Supplementary readings	**M2 Economic Statistics** *- Further readings will be announced during the course.* **M1 Introduction to statistical methods** *- A. Agresti, B. Finlay, Statistical Methods for the Social Sciences, Pearson, New York, 2009, 4th Ed.. ISBN 978-01-302-7295-9.* *- T. Hastie, R. Tibshirani, J. Friedman, The elements of statistical learning, Springer Science + Business Media, LLC, 2009, 2nd Ed.. Available on the web at* https://web.stanford.edu/~hastie/Papers/ESLII.pdf. *- P. Newbold, W. L. Carlson, B. M. Thorne, Statistics for Business and Economics, Pearson, New York, 2013, 8th Ed.. ISBN 978-01-327-4565-9.*