

## COURSE PLAN

<b>COURSE TITLE</b>	<b>Statistics 1&amp;2</b>
<b>AIMS OF THE COURSE</b>	<p>The emphasis of the half course Statistics 1 is on the application of statistical methods in management, economics and the social sciences. Attention will focus on the interpretation of tables and results and the appropriate way to approach statistical problems. Treatment is at an elementary mathematical level. Ideas of probability, inference and multivariate analysis are introduced and are further developed in the Statistics 2.</p> <p>The aim of the half course Statistics 2 is to develop students' knowledge of elementary statistical theory. The emphasis is on topics that are of importance in applications to econometrics, finance and the social sciences. Concepts and methods that provide the foundation for more specialised courses in statistics are introduced.</p>
<b>LEARNING OUTCOMES</b>	<p>At the end of the course and having completed the essential reading and activities, students should be able to:</p> <p>(Statistics 1)</p> <ul style="list-style-type: none"> <li>• be familiar with the key ideas of statistics that are accessible to a student with a moderate mathematical competence</li> <li>• routinely apply a variety of methods for explaining, summarising and presenting data and interpreting results clearly using appropriate diagrams, titles and labels when required</li> <li>• summarise the ideas of randomness and variability, and the way in which these link to probability theory to allow the systematic and logical collection of statistical techniques of great practical importance in many applied areas</li> <li>• have a grounding in probability theory and some grasp of the most common statistical methods</li> <li>• perform inference to test the significance of common measures such as means and proportions</li> </ul> <p>(Statistics 2)</p> <ul style="list-style-type: none"> <li>• compute probabilities of events, including for univariate and multivariate random variables</li> <li>• apply and be competent users of standard statistical operators and be able to recall a variety of well-known distributions</li> <li>• derive estimators of unknown parameters using method of moments, least squares and maximum likelihood estimation techniques, and analyse the statistical properties of estimators</li> <li>• be familiar with the fundamental concepts of statistical modelling, with an emphasis on analysis of variance models.</li> </ul>
<b>LIST OF TOPICS</b>	<b>Basic background:</b> Elementary summation signs, elementary probability, Venn and tree diagrams.

	<p><b>Data collection:</b> Elements of survey design, the stages of a survey, ideas of randomness, observation and experiment.</p> <p><b>Data presentation and analysis:</b> Descriptive statistics, measures of location and dispersion, pictorial and graphical representation.</p> <p><b>The Normal Distribution:</b> Estimation of mean, proportion, standard deviation, confidence intervals and hypothesis testing. Ideas of testing for differences between means and proportions. The use of Student's t.</p> <p><b>Probability theory:</b> Set theory: the basics; Axiomatic definition of probability; Classical probability and counting rules; Conditional probability and Bayes' theorem.</p> <p><b>Discrete probability distributions:</b> Probability distribution; Binomial distribution, Cumulative distribution function; Poisson distribution; Poisson approximation to the binomial; Expected value of a discrete random variable; Variance of a discrete random variable; Distributions related to the binomial distribution.</p> <p><b>Continuous probability distributions:</b> Probability density function and cumulative distribution function; Continuous uniform distribution; Exponential distribution; Normal distribution; Normal approximation to the binomial.</p> <p><b>Multivariate random variables:</b> Joint probability functions; Marginal distributions; Conditional distributions; Covariance and correlation; Independent random variables; Sums of random variables.</p> <p><b>Sampling distributions of statistics:</b> Random samples; Statistics and their sampling distributions; Sample mean from a normal population; The central limit theorem; Some common sampling distributions.</p> <p><b>Estimator properties:</b> Estimation criteria – bias, variance and mean squared error; Unbiased estimators.</p> <p><b>Point estimation:</b> Method of moments estimation; Least squares estimation; Maximum likelihood estimation.</p> <p><b>Analysis of variance:</b> One-way analysis of variance; Two-way analysis of variance.</p>
MANDATORY READINGS	<p>Newbold, P., W. Carlson and B. Thorne <i>Statistics for Business and Economics</i>. (Pearson Education, 2019) ninth edition [ISBN 978-1292315034]</p> <p>Larsen, R.J. and M.J. Marx (2017) <i>An Introduction to Mathematical Statistics and Its Applications</i>, Pearson Education, 6th edition.</p>
SEMESTRAL ASSESSMENT	<p>Activities in the classroom</p> <p>First pre-assessment test</p> <p>Second pre-assessment test</p>
LIST OF LECTURERS	<p>Radmila Dragutinović Mitrović, coordinator</p> <p>Vesna Rajić</p> <p>Ivana Ivković</p>