

## AMAT210 - Statistics II

Course Title	STATISTICS II				
Course Code	AMAT210				
Course Type	Compulsory				
Level	Bachelor (1 <sup>st</sup> Cycle)				
Year / Semester	3 / Spring				
Teacher's Name	Dr Petroula Mavrikiou / Dr Elena Ketteni / Dr Eleni Tsolaki				
ECTS	6	Lectures / week	3	Laboratories / week	
Course Purpose	<p>The purpose of the course is to provide student with the knowledge of probability theory applied in inferential statistics and the capacity to apply their knowledge in the field, in practice. During the course students learn how to use inferential statistical techniques in order to solve business problems, learn how to analyse data and present results that can give solutions to a problem of an enterprise. Students Identify the functional area of the statistical analysis of an organization and they get basic knowledge of the statistical package of IBM SPSS.</p>				
Learning Outcomes	<ul style="list-style-type: none"> <li>• Know and identify the various kinds of sampling techniques (simple, stratified, and clustering).</li> <li>• Understand the difference between sampling from finite and infinite population.</li> <li>• Understand the sampling distribution of the mean.</li> <li>• Be able to recall the Normal distribution.</li> <li>• Understand, calculate and interpret interval estimation of the population mean for large sample with <math>\sigma</math> known.</li> <li>• Understand, calculate and interpret interval estimations of the population mean for large sample with <math>\sigma</math> unknown.</li> <li>• Understand, calculate and interpret interval estimations of the proportion for large sample.</li> <li>• Use the t-distribution and read the table of t-distribution.</li> <li>• Understand, calculate and interpret interval estimations of the population mean for small sample with <math>\sigma</math> known or unknown.</li> <li>• Determine interval estimation of the population proportion.</li> <li>• Determine interval estimation of the difference of two means.</li> <li>• Calculate basic sample size.</li> <li>• Understand the concept of hypothesis testing. Be in a position to state the null and alternative hypothesis.</li> <li>• Understand the meaning of the significant level.</li> <li>• Recognize the two types or errors (type I and II).</li> </ul>				

	<ul style="list-style-type: none"> <li>• Perform hypothesis testing for the population mean for sample size greater or equal to 30 (<math>\sigma</math> known and unknown)</li> <li>• Perform hypothesis testing for the population mean for sample size smaller than 30 (<math>\sigma</math> known and unknown)</li> <li>• Perform hypothesis testing for the population proportion</li> <li>• Perform hypothesis testing for the difference of two population means</li> <li>• Apply hypothesis testing for the population mean in Business Problems.</li> <li>• Distinguish the difference between independent and dependent variable.</li> <li>• Construct the scatter diagram.</li> <li>• Calculate the Pearson's coefficient and interpret the values of it.</li> <li>• Calculate the coefficient of determination and interpret the values of it.</li> <li>• Estimate the coefficients (<math>\beta_0</math> and <math>\beta_1</math>) of the simple linear regression model.</li> <li>• Apply regression, using data from the business environment.</li> <li>• Use regression to make forecasting and use statistics in practice.</li> <li>• Recognize the chi-square distribution and make use of its table.</li> <li>• Implement the chi square goodness of fit test with real data and interpret the results.</li> <li>• Construct contingency tables and implement the chi square test of association.</li> <li>• Interpret the results of the hypothesis testing's and explain the meaning of the statistical significance.</li> <li>• Be able to use elementary commands of the software package SPSS.</li> </ul>		
Prerequisites	AMAT112	Co-requisites	none
Course Content	<ul style="list-style-type: none"> <li>• Sampling and sampling distribution</li> </ul> <p>The various kinds of sampling techniques (simple, stratified, clustering). Sampling from finite and infinite population. Sampling distribution of the mean.</p> <ul style="list-style-type: none"> <li>• Interval estimation for the mean, the proportion, and the difference of two means</li> </ul> <p>Recall of the normal distribution. Point estimation of the population mean and variance. Interval estimation of the population mean for large sample with <math>\sigma</math> known and <math>\sigma</math> unknown. The t-distribution and the table of t-distribution. Interval estimations of the population mean for small sample with <math>\sigma</math> known or <math>\sigma</math> unknown. Interval estimation of the population proportion. Determining the sample size. Interval estimation for the difference of two means.</p> <ul style="list-style-type: none"> <li>• Hypothesis testing for continuous data- Hypothesis testing for the population mean, the proportion and the difference of two means</li> </ul> <p>Hypothesis testing. Null and alternative hypothesis. Significant level. Types or errors (type I and II). Hypothesis testing for the population mean for sample greater or equal to 30 (<math>\sigma</math> known and unknown) and hypothesis testing for the population mean for sample smaller than 30 (<math>\sigma</math> known and unknown). Finally, hypothesis testing for the proportion and the difference of two means.</p>		

	<ul style="list-style-type: none"> <li>• Hypothesis testing for nominal or ordinal data. Test of goodness of fit and test of independence</li> </ul> <p>Chi-square distribution and its table. Chi-square goodness of fit test. Contingency tables and the chi square test of association. Statistical significance.</p> <ul style="list-style-type: none"> <li>• Simple Linear Regression and Correlation.</li> </ul> <p>Correlation. Independent and dependent variables. Pearson's coefficient and the values of it. Scatter diagram. Coefficients (<math>\beta_0</math> and <math>\beta_1</math>) of the simple linear regression model. Regression, using data from the business environment. Forecasting.</p> <ul style="list-style-type: none"> <li>• SPSS</li> </ul> <p>Introduction to the software Statistical Package for the Social Science SPSS and/or Excel.</p>
Teaching Methodology	<p>The course is structured around lectures and tutorials on topics mainly related to inferential statistics. During the lectures, students are encouraged to participate in discussions and class work. At the same time, students are given problems and exercises to solve at home. At the end of the course students are taken to the lab for one session to get basic knowledge of the statistical package SPSS.</p>
Bibliography	<p><u>(a) Textbooks</u></p> <ul style="list-style-type: none"> <li>• Anderson D.R., Sweeny D.J., Williams T.A., Statistics for Business and Economics, South Western 2016, 13th Edition (Latest Edition)</li> <li>• S. Christian Albright, Wayne L. Winston, Business Analytics: Data Analysis &amp; Decision Making, Cengage Learning 2013, 5th Edition (Latest Edition)</li> <li>• Grimm L.G., Statistical Applications for the Behavioral Sciences, Wiley, 2018, 2<sup>nd</sup> Edition (Latest Edition)</li> </ul> <p><u>(b) References</u></p> <ul style="list-style-type: none"> <li>• Newbold, P., Carlson, W., Thorne, B., Statistics for Business and Economics, Prentice Hall 2003.</li> <li>• Milton, S., Arnold, J., Introduction to Probability and Statistics, McGraw-Hill, 2003</li> <li>• Mann P.S., Introductory Statistics, John Wiley, 2001</li> <li>• Johnson R.A., Bhattacharyya G.K., Statistics, Principles and Methods, Wiley Series, 2001</li> </ul> <p>Mavrikiou M. Petroula, Understanding, Essential Probability and Statistics: Some theory and applications, 2012</p>
Assessment	<p>Students are assessed with the Coursework which is consisted of two Mid-term exams with 40% weight, and a Final exam which weights 60%.</p>
Language	<p>English</p>