MASTER 'S PROGRAMME
APPLIED MATHEMATICS - IN ENGLISH
1ST YEAR OF STUDY, 1ST SEMESTER

COURSE TITLE	**APPLIED STATISTICS**
COURSE CODE	**MA1StA**
COURSE TYPE	full attendance/tutorial
COURSE LEVEL	2nd cycle (master's degree)
YEAR OF STUDY, SEMESTER	1st year of study, 1st semester
NUMBER OF ECTS CREDITS	**7**
NUMBER OF HOURS PER WEEK	4 (2 lecture hours + 2 seminar/laboratory hours)
NAME OF LECTURE HOLDER	Dr. Stoleriu Iulian
NAME OF SEMINAR HOLDER	Dr. Stoleriu Iulian
PREREQUISITES	Curriculum: Probability Theory, Statistical Mathematics, Calculus Competencies: scientific computing with MATLAB Language: advanced level of English

A GENERAL AND COURSE-SPECIFIC COMPETENCES

General competences:

- ✓ Having a responsible attitude towards scientific research and teaching, being able to fully develop the personal potential in the professional career, respecting the principles of a rigorous and efficient work in order to fulfill complex tasks, respecting the ethical norms and principles in the professional activity
- ✓ Being able to work efficiently in a team and to coordinate and efficiently lead a team or an inter-disciplinary group
- ✓ Being able to make a selection of information resources and to use them efficiently in order to develop the professional activity and adapt it to the demands of a dynamical society

Course-specific competences:

- ✓ Manipulating notions, methods and mathematical models, specific techniques and technologies in scientific calculus and applications in economy and informatics
- ✓ Data processing, analysis and interpretation using mathematical, statistical and informatics tools
- ✓ Being able to develop, test and validate algorithms; implementation in high level programming languages
- ✓ Being able to construct and apply mathematical models for analysing and simulating some phenomena and processes
- ✓ Being able to develop, analyse and test computer systems and specific programming languages; being able to use them for solving problems in applied mathematics
- ✓ Being able to analyse and interpret some economic processes and phenomena

B LEARNING OUTCOMES

- ✓ Students will be familiarized to the terminology of Statistics and will be able to use computing tools in solving adequate statistical problems
- ✓ Students will be able to use notions from Statistics to solve some interdisciplinary problems
- ✓ After successfully completing this course, the students will be able to:
  - ✧ Identify different types of statistical data
  - ✧ Group and plot various statistical data
  - ✧ Determine some numerical and functional characteristics of data
  - ✧ Do inference on distribution parameters or on the distribution of observed data
  - ✧ Identify any correlation among data and determine the correlation relation

C LECTURE CONTENT

1. Brief review on Mathematical Statistics. Population, variables, samples, parameters, statistics, laws of Probability theory

	2. Descriptive statistics. Sampling data, organization and graphical representation of data 3. Statistics and their distributions. Sampling from a normal population 4. Parameter estimation (general considerations, maximum likelihood method, method of moments, minimum of the χ2) 5. Confidence intervals (one population, two populations) 6. Inferential statistics (parametric tests for one or two populations) 7. Inferential statistics (distribution tests, contingency tests) 8. Inferential statistics, non-parametric tests (sign test, runs test, tests for paired data, Wald-Wolfowitz test) 9. Inferential statistics, non-parametric tests (signed-rank test, rank-sum test) 10. Randomization tests 11. Correlation. Test for correlation coefficient 12. Simple linear regression 13. Multiple regression 14. ANOVA (one-way and two-way)
D	**RECOMMENDED READING FOR LECTURES**
	1. J.L. Devore, K.N. Berk, Modern Mathematical Statistics with Applications, second edition, Springer, 2012. 2. D. Wackerly, W.Mendenhall, R.L. Scheaffer, Mathematical Statistics With Applications, Duxbury Press, 7th edition, 2007. 3. M.R. Spiegel, L.J. Stephens, Schaum's Outline of Statistics, McGraw-Hill, 2007. 4. I. Stoleriu, Statistica prin MATLAB, Editura MatrixRom, Bucuresti, 2010.
E	**SEMINAR CONTENT**
	1. Graphical representation of data. Random experiments with MATLAB 2. Descriptive statistics with MATLAB 3. Parameter estimation 4. Sampling from a normal population distribution of the sample mean and sample variance 5. Confidence intervals with MATLAB (one and two populations) 6. Hypothesis testing with MATLAB (parametric tests for one or two samples) 7. Hypothesis testing with MATLAB (distribution tests, contingency tests) 8. Hypothesis testing with MATLAB (non-parametric tests) 9. Hypothesis testing with MATLAB (signed-rank test, rank-sum test) 10. Randomization tests (permutation tests, bootstrapping) 11. Tests for correlation coefficient 12. Simple non-parametric regression 13. Multiple Regression with MATLAB 14. ANOVA with MATLAB
F	**RECOMMENDED READING FOR SEMINARS**
	1. J.L. Devore, K.N. Berk, Modern Mathematical Statistics with Applications, second edition, Springer, 2012. 2. D. Wackerly, W.Mendenhall, R.L. Scheaffer, Mathematical Statistics With Applications, Duxbury Press, 7th edition, 2007. 3. M.R. Spiegel, L.J. Stephens, Schaum's Outline of Statistics, McGraw-Hill, 2007. 4. I. Stoleriu, Statistica prin MATLAB, Editura MatrixRom, Bucuresti, 2010.
G	**EDUCATION STYLE**
LEARNING AND TEACHING METHODS	Lectures: blackboard presentation Seminars/laboratory: exercises solved on the blackboard and PC simulations
ASSESSMENT METHODS	Course: weight in the final grade 90% (final examination) Seminary/laboratory: weight in the final grade 10% (class activity/homework) Minimal requirements: 1. Basic knowledge of various statistical notions and the ability to apply them in solving simple problems 2. The ability to use MATLAB functions for solving statistical problems 3. Interpretation of the results 4. Minimum grade 5
LANGUAGE OF INSTRUCTION	English