

COURSE OUTLINE

GENERAL

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| SCHOOL | School of Science | | |
| ACADEMIC UNIT | Department of Mathematics | | |
| LEVEL OF STUDIES | UNDERGRADUATE | | |
| COURSE CODE | MAE731 | SEMESTER | 7th |
| COURSE TITLE | Decision Theory – Bayesian Theory | | |
| INDEPENDENT TEACHING ACTIVITIES <i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i> | | WEEKLY TEACHING HOURS | CREDITS |
| Lectures | | 3 | 6 |
| | | | |
| <i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i> | | | |
| COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i> | Specialised general knowledge | | |
| PREREQUISITE COURSES: | | | |
| LANGUAGE OF INSTRUCTION and EXAMINATIONS: | Greek | | |
| IS THE COURSE OFFERED TO ERASMUS STUDENTS | Yes (in English, reading Course) | | |
| COURSE WEBSITE (URL) | www.math.uoi.gr/~abatsidis/731.html | | |

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course consists of two modules: the Decision Theory and Bayes Theory. The Decision Theory deals with problems of decision-making. Object of Statistical Decision Theory is decisions about unknown numerical quantities (parameters) by utilizing the presence of

statistical knowledge. The aim of the course is the evaluation of the performance of the estimators subject to properties such as the unbiasedness, sufficiency, consistency etc. The second part of the course gives an introduction to Bayesian statistical approach. At the end of the course the student should be able to compare Bayes and classical approaches and evaluate the "performance" of different estimators by using various criteria.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

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| <i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i> | <i>Project planning and management</i> |
| <i>Adapting to new situations</i> | <i>Respect for difference and multiculturalism</i> |
| <i>Decision-making</i> | <i>Respect for the natural environment</i> |
| <i>Working independently</i> | <i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i> |
| <i>Team work</i> | <i>Criticism and self-criticism</i> |
| <i>Working in an international environment</i> | <i>Production of free, creative and inductive thinking</i> |
| <i>Working in an interdisciplinary environment</i> | <i>Others</i> |
| <i>Production of new research ideas</i> | |

Working independently
 Decision-making
 Production of free, creative and inductive thinking
 Criticism and self-criticism

SYLLABUS

Decision Theory: decision function, loss function, risk function, admissible and minimax estimators; Bayesian inference: Bayes estimators, Bayes confidence intervals, minimax and Bayes tests.

TEACHING and LEARNING METHODS - EVALUATION

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| DELIVERY <i>Face-to-face, Distance learning, etc.</i> | Classroom (face-to-face) | |
| USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i> | <i>Use of ICT in communication with students</i> | |
| TEACHING METHODS <i>The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials,</i> | Activity | Semester workload |
| | Lectures | 39 |
| | Working independently | 78 |
| | Exercises-Homework | 33 |
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| <p><i>placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i></p> <p><i>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</i></p> | | |
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| | Course total | 150 |
| <p>STUDENT PERFORMANCE EVALUATION</p> <p><i>Description of the evaluation procedure</i></p> <p><i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p> | <p>Final written exam in Greek (in case of Erasmus students in English) which includes resolving problems.</p> | |

ATTACHED BIBLIOGRAPHY

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| <p><i>- Suggested bibliography:</i></p> <p><i>Books in English</i></p> <p>Berger, J.O. (1985) Statistical decision theory and Bayesian analysis. Springer.</p> <p>Bernardo J. M. & Smith A. F. M., (1994). Bayesian Theory, Wiley, London.</p> <p><i>Books in Greek:</i></p> <p>Κ. Φερεντίνος (2005). Εκθετική οικογένεια κατανομών Θεωρία Bayes, Πανεπιστημιακές Παραδόσεις.</p> |
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