COURSE OUTLINE

GENERAL

SCHOOL	Sciences and Engineering		
ACADEMIC UNIT	Computer Science		
LEVEL OF STUDIES	1st Cycle		
COURSE CODE	MATH-329	**SEMESTER**	Fall, Spring
COURSE TITLE	Bayesian Statistics		

INDEPENDENT TEACHING ACTIVITIES *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*	**WEEKLY TEACHING HOURS**	**CREDITS**
	2.5	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special Background
PREREQUISITE COURSES:	MATH-225, MATH-280
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
COURSE WEBSITE (URL)	

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*

After completion of the course students are expected to be able to:

- Calculate the prior and posterior distributions from sample distributions.
- Evaluate estimators and test procedure using specific criteria.
- Use hypothesis tests in Bayesian inference and make conclusions.
- Use criteria in the development of optimal estimators and test procedures.
- Use the R Language in computational Bayesian Statistics.

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?

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

Analysis and synthesis of data with the use of the necessary technology, adapting to new situations, decision-making, working independently, working in an interdisciplinary environment, analytical, critical and quantitative thinking, synthesis of ideas.

SYLLABUS

- Introduction to Bayesian inference.
- Prior and posterior distributions.
- Conjugate and non-informative priors.
- Bayesian estimators, accuracy and evaluation.
- Bayesian Inference for Discrete Random Variables and the Normal Mean.
- Comparison of Bayesian and Frequentist Inferences on the Mean.
- Loss functions, expected posterior loss and optimal decisions.
- Computational Bayesian Statistics using Markov Chains.
- Large sample Bayesian approximation.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	*Use of ICT in teaching / Χρήση ΤΠΕ* *Communication with students / Επικοινωνία με Φοιτητές*
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *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*	

Activity	***Semester workload***
Lectures	35
Homework Assignments	53
Exam Preparation	60
Final Exam	2
Course total	***150***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *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* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	- Final Examination - Midterm Examinations - Assignments - Participation

ATTACHED BIBLIOGRAPHY

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Introduction to Bayesian Statistics	James M. Curran, William M. Bolstad	Wiley	2016	978-1118091562

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Bayesian Data Analysis	Andrew Gelman	Chapman & Hall	2016	978-1439840955
Bayesian Essentials with R	Jean-Michel Marin, Christian P. Robert	Springer	2013	978-3642310652
Applied Bayesian Statistics: With R and Open BUGS Examples	Mary Kathryn Cowles	Springer	2013	978-1461456957