COURSE OUTLINE

(1) GENERAL

SCHOOLS	**ENGINEERING, NATURAL SCIENCES**		
ACADEMIC UNIT/UNITS	**COMPUTER ENGINEERING AND INFORMATICS DEPARTMENT, DEPARTMENT OF MATHEMATICS**		
TITLE OF MASTER'S DEGREE	*MSc in Data Driven Computing and Decision Making*		
LEVEL OF STUDIES	Postgraduate		
COURSE CODE	DDCD112	SEMESTER	Spring
COURSE TITLE	Intelligent Decision Systems		

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
Lectures	2	
Recitation sections	1	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).	Total	7.5

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialised general knowledge, skills development
PREREQUISITE COURSES:	No prerequisites
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Instruction may be given in English if foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/CEID1099/

(2) 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 the successful completion of the course, the student:

- Will be able to represent knowledge with first-order symbolic rules and produce conclusions.
- Will be able to distinguish between different conflict resolution strategies in a rule-based reasoning system.
- Will be able to represent knowledge with fuzzy rules.
- Will be able to design and implement rule-based systems for decision making.
- Will be able to design and implement fuzzy rule-based systems for decision making.
- Will be able to compare and apply machine learning algorithms to data sets for rule extraction.
- Will be able to experiment with different feed-forward neural network architectures for classification models production.
- Will be able to evaluate performance of classification systems based on specific metrics.
- Will be able to represent knowledge with hybrid representation schemes, like

neurosymbolic and neurofuzzy approaches.

In general, the student will have obtained advanced skills for the design and implementation of reasoning and decision-making rule-based systems.

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

Search for, analysis and synthesis of data and information, with the use of the necessary technology

Decision-making

Working independently

Production of new research ideas

Production of free, creative and inductive thinking

(3) SYLLABUS

Intelligent Decision Systems-Definition. Expert Systems. Production Rules. CLIPS tool. Uncertain Rules. Fuzzy Rules-Fuzzy Expert Systems. FuzzyCLIPS tool. Machine Learning-Methods for Extracting Rules from Data. Neural Networks. WEKA tool. Hybrid Systems. Neuro-Symbolic Approaches. Neuro-Fuzzy Approaches.

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 (lectures in electronic form, Internet sources, use of software tools for training etc.) and in communication with students (mailing list, course web site).
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: 26 Recitation sections: 13 Use of tools: 39 Project implementation: 110 Course total: ***188***
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*	A combined project: Preprocessing of data related to a classification problem. Production of rules by various rule extraction machine learning methods/algorithms. Construction of corresponding rule-based intelligent systems. Conversion to fuzzy rule-based systems. Creation of a neural network for classification. Evaluation and comparison of all the above systems. Project will be presented in the class and will be assessed.

students.	Language of evaluation: Greek (English if needed, e.g., Erasmus+ students)

(4) ATTACHED BIBLIOGRAPHY

Suggested bibliography:

- M. Sasikumar, S. Ramani, S. Muthu Raman, K.S.R. Anjaneyulu and R. Chandrasekar. A Practical Introduction to Rule Based Expert Systems. Narosa Publishing House, 2007.
- Crina Crosan and Ajith Abraham. Intelligent Systems. Springer, 2011.
- Ian H. Witten, Eibe Frank and Mark A. Hall. Data Mining, Practical Machine Learning Tools and Technologies. 3rd Edition. Elsevier and Morgan Kaufmann, 2011.
- Lior Rokach and Oded Maimon. Data Mining with Decision Trees, Theory and Applications. 2nd Edition. World Scientific, 2015.

Internet resources will be also given for each thematic section.