Program	Type of studies (cycle)	Third cycle
	Name of the program	SEE Doctoral Studies in Mathematical Sciences

Course

Course title	**Intelligent Systems**

Course code	Semester	Course status	ECTS credits	Contact hours
	I		10	30

Teaching staff		
	Teacher	Prof. Dr. Nedžad Dukić
	Other staff	Dr. Miroslav Marić

Course goals

We have tried to explore the full breadth of the field, which encompasses logic, probability, and continuous mathematics; perception, reasoning, learning, and action; and everything from microelectronic devices to robotic planetary explorers. The intended meaning of this rather empty phrase is that we have tried to synthesize what is now known into a common framework, rather than trying to explain each subfield of AI in its own historical context. We apologize to those whose subfields are, as a result, less recognizable.

The major are as follows:

- We place more emphasis on partially observable and nondeterministic environments, especially in the nonprobabilistic settings of search and planning. The concepts of *belief state* (a set of possible worlds) and *state estimation* (maintaining the belief state) are introduced in these settings;
- In addition to discussing the types of environments and types of agents, we now cover in more depth the types of *representations* that an agent can use. We distinguish among *atomic* representations (in which each state of the world is treated as a black box), *factored* representations (in which a state is a set of attribute/value pairs), and *structured* representations (in which the world consists of objects and relations between them).
- Our coverage of planning goes into more depth on contingent planning in partially observable environments and includes a new approach to hierarchical planning.
- We have added new material on first-order probabilistic models, including *open-universe* models for cases where there is uncertainty as to what objects exist.
- We have completely rewritten the introductory machine-learning, stressing a wider variety of more modern learning algorithms and placing them on a firmer theoretical footing.

Course content/topics

- The Foundations of Artificial Intelligence. Philosophy, Mathematics, Computers.
- Intelligent Agents
- Solving Problems by Searching
- Adversarial Search
- Knowledge, reasoning, and planning.
- Computers Games
- Inference in Propositional Logic and Inference in First-Order Logic
- Programming in Prolog
- Knowledge Representation
- Uncertain knowledge and reasoning
- Learning
- Inference in Fuzzy logic and modal logic
- Neural Networks
- Machine Learning

LITERATURE

1. Russel, Norvig: Artificial Intelligence: Modern Approach (2nd edition), Prentice Hall, 2002
2. Mitchell: Machine Learning, McGraw Hill, 1997
3. James A. Freeman, David M.Skapura: Neural Networks, Algorithms, Applications, an Programming

Grading

	Criterion	Points	Cut-off points
1.	Homework assignment	30	15
2.	Project	35	20
3	Final exam	35	20
	Total	100	55

Techniques, Addison-Wesley, 2001	Additional Literature George F. Luger: Artifcial Intelligence: Structures and Strategies for Complex Problem Solving. Addison-Wesley, 2008. Blay Whitby: Articial Intelligence, Oneworld Publications, 2003. Lecture Notes