NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF SCIENCES
COMPUTER SCIENCE PROGRAM

CC421 – ARTIFICIAL INTELLIGENCE

I. GENERAL INFORMATION

CODE	: CC421 Artificial intelligence
SEMESTER	: 7
CREDITS	: 4
HOURS PER WEEK	: 6 (Theory – Laboratory)
PREREQUISITES	: CC332 Parallel Programming
CONDITION	: Mandatory

II. COURSE DESCRIPTION

This course covers fundamental topics in intelligent systems:
Representation of knowledge and reasoning, advanced knowledge search and reasoning.
Evaluate the possibilities of simulation of intelligence, for which the knowledge modeling techniques will be studied.
Build a notion of intelligence that supports the tasks of its simulation.

III. LEARNING UNITS

1. Fundamental Topics in Intelligent Systems

I: History of artificial intelligence.
II: Philosophical issues.
III: The Turing test.
IV: Searle's "Chinese room" thought experiment.
V: Typical themes in AI.
VI: Fundamental definitions.
VII: Optimal behavior vs. Behavior acting as a human.
VIII: Optimal reasoning vs. reasoning acting as a human.
IX: Philosophical questions.
X: Modeling the world.
XI: The role of heuristics.

2. Search and Satisfaction of Restriction

I: Space problems.
II: Search of brute force (respite first, depth first, depth first with iterative deepening).
III: Search for the best first (best first generic, Dijkstra algorithm, A *, admissibility of A *).
IV: Two-player games (minimum search, alpha-beta pruning).
V: Restriction satisfaction (backtracking or local search methods and tracking).

3. Representation of Knowledge and Reasoning

I: Non-monotechnical inference.
II: Probabilistic reasoning.
III: Bayes theorem.

4. Advanced Search

I: Genetic algorithms.
II: Simulated annealing.
III: Local search.

5. Advanced Representation of Knowledge and Reasoning

I: Uncertainty: a) Probabilistic reasoning. b) Bayesian networks. c) Fuzzy sets and theory of possibility. d) Theory of the decision.

6. Agents

I: Definition of agents.
II: Agent architecture: a) Simple reactive agents. b) Reactive gliders. c) Layered architectures. d) Examples of architectures and applications.
III: Theory of agents. a) Agreements. b) Intentions. c) Theoretical-decision agents. d) Markov decision processes (PDM).
IV: Agents that learn.
V: Multi-agent systems. a) Multiagent systems economically inspired. b) Collaborative agents. c) Teams of agents. d) Modeling agents. e) Multiagent learning.

7. Natural Language Processing

I: Deterministic and stochastic grammar.
II: Parsing algorithms.
III: Corpus-based methods.
IV: Information retrieval.
V: Translation of language.
VI: Speech recognition.

8. Machine Learning and Neural Networks

I: Definition and examples of machine learning.
II: Supervised learning.
III: Learning trees by decision.
IV: Neural networks of learning.
V: Learning networks by belief.
VI: Algorithm of the nearest neighbor.
VII: Theory of learning.
VIII: The problem of overfitting.

IX: Unsupervised learning.
X: Learning by reinforcement.

9. Robotics

I: Overview. a) Cutting-edge robot systems. b) Planning vs. Reactive control. c) Uncertainty in control. d) Senses e) Models of the world.
II: Configuration spaces.
III: Planning.
IV: Sense.
V: Robot programming.
VI: Navigation and control.

IV. BIBLIOGRAPHY

- Goldberg, D. Genetic Algorithms in Search, Optimization and Machine learning. Addison Wesley. 1989.
- Haykin, S. Neural networks: A Comprehensive Foundation. Prentice Hall. 1999.
- Nilsson, N. Artificial Intelligence: A new vision. McGraw-Hill 2001.
- Russell, S. and Norvig, P. Artificial Intelligence: A modern approach. Prentice Hall. 2003.
- Winston, P.H. and Horn, B.K. LISP 3a. ed .. Addison - Wesley, 1991.
- Guy L. Steele Common Lisp: The Language, 2nd edition. Publisher: Burlington, MA: Digital Press, © 1984.
- Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach: Editorial: Upper Saddle River, N.J. : Prentice Hall / Pearson Education, © 2003.
- T. Mitchell. Machine Learning McGraw Hill, 1997.
- Nilsson, Nils J. Artificial Intelligence. A new synthesis 1st Edition. McGraw Hill Interamericana de España, S.A.U. 2001.