PROGRAM: MSc and PhD in Computer Science
MODULE: Artificial Intelligence Planning
CODE: 54667-02 CREDITS: 02 TOTAL HOURS: 30 hours
VALID: From 2020/II

GOALS: A student who completes this course should be able to:

1. Understand the main formalisms used for automated planning and the assumptions behind these formalisms.
2. Understand modern algorithms to solve automated planning problems and basic optimization techniques that can be applied to these algorithms.
3. Apply automated planning systems to solve real-world problems

SYLLABUS:

Automated planning: formalisms and assumptions. Classical planning: formalisms and algorithms. HTN Planning: formalism and algorithms. Non-deterministic planning: formalisms and algorithms. Applications of automated planning.

UNIT: 01
CONTENT: Introduction and context

1.1. Search algorithms
1.2. Complexity of planning problems
1.3. Classical planning
1.4. Planning Heuristics

UNIT: 02
CONTENT: Hierarchical Planning

2.1 Hierarchical task network formalism
2.2 Problem formalization
2.3 Total Order and Partial Order forward decomposition Algorithms

UNIT: 03
CONTENT: Stochastic Planning

3.1 Decision Theory
3.2 Markov Decision Processes (MDP)
3.3 MDP solvers

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3.4 Reinforcement Learning

UNIT: 04
CONTENT: Applications of automated planning

4.1 Problem modeling
4.2 Planning in agent programming languages
4.3 Goal and Plan Recognition

REFERENCES

- TEXTBOOK(S)

1. GHALLAB, Malik; NAU, Dana and TRAVERSO, Paolo. Automated Planning: Theory and Practice. San Francisco: Morgan Kaufmann, 2004. 635 p.

- REFERENCE BOOK(S)

2. RUSSELL, S. J.; NORVIG, P. Artificial Intelligence – a Modern Approach. 3ed. New Jersey: Prentice Hall, 2003. 932p.
3. GEFFNER, H.; BONET, B. A Concise Introduction to Models and Methods for Automated Planning. Morgan & Claypool, 2013, 143p.
4. HASLUM, P.; LIPOVETZKY, N.; MAGAZZENI, D.; MUISE, Christian. An Introduction to the Planning Domain Definition Language. Morgan & Claypool, 2019, 168p.

- OTHER REFERENCES

5. Selected papers
6. Websites related to the course
7. https://github.com/pucrs-automated-planning

- SOFTWARE

8. Planning domains http://editor.planning.domains
9. PDDL4J http://pddl4j.sf.net
10. JSHOP2 http://www.cs.umd.edu/projects/shop/
11. JavaGP http://emplan.sourceforge.net

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