**MSc in Artificial Intelligence and Data Analytics**

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| **ΜΑΘΗΜΑ “Σχεδιασμός και χρονοπρογραμματισμός” AIDA202** | |
| **code** | **AIDA202** |
| **title** | **Planning and Scheduling** |
| **type (compulsory/optional)** | compulsory |
| **cycle (first/second/third)** | second |
| **year of study when the component is delivered (if applicable)** | 2022-23 |
| **semester/trimester when the component is delivered** | spring |
| **number of ECTS credits allocated** | 7,5 |
| **name of lecturer(s), with information about how, when and where to contact them.** | Ioannis Refanidis & Ilias Sakellariou |
| **learning outcomes** | Upon successful completion of the course, the student will have the ability to: ● be aware of the basic concepts of the problems of constraint satisfaction, the methods of their solution and in particular the consistency algorithms and the algorithms of universal constraints; ● model design problems using appropriate description languages (PDDL, PPDDL, etc.) ● use automated design and scheduling tools for knowledge engineering (model design, e.g. GIPO), validation (e.g., VAL), problem solving (a plethora of open source planners). Applications in robotics (ROSplan), motion design (OMPL), etc. Use of MiniZinc constraint problem modeling platform. ● to understand the significant interaction of consistency algorithms and methods (heuristic and non-heuristic) of search in combinatorial problems, ● model scheduling problems as constraint satisfaction problems, using cumulative/disjunctive/alternative ● use the MiniZinc platform to solve constraint satisfaction problems ● model design problems and select/use the appropriate algorithms for its solution ● combine design and scheduling algorithms to solve real-world problems |
| **mode of delivery (face-to-face/distance learning etc.)** | face to face |
| **prerequisites and co-requisites (if applicable)** |  |
| **course content** | ● Design problem description languages (PDDL+, SAS). Design of a partial layout, based on graphs, as a problem of satisfiability, hierarchical, in time, with resource constraints. ● Heuristic mechanisms and search algorithms.  ● Hierarchical design. ● Multi-agency design.  ● Probabilistic design, non-deterministic environments.  ● Design and robotics. Find paths and plan traffic.  ● Constraints satisfaction problems, arc consistency filtering algorithms and generalized arc consistency. Global constraints. Combining search and constraint filtrering. Search for an optimal solution. MiniZinc. Global constraints in scheduling problems (disjunctive, cumulative) and algorithms, alternative resources problems. Shift rostering and regular constraint. |
| **recommended or required reading and other learning resources/tools** | ● Automated Planning and Acting (1st edition, 2016), Malik Ghallab, Dana Nau and Paolo Traverso, Cambridge University Press. ● Automated Planning, theory and practice (1st edition, 2004), Malik Ghallab, Dana Nau, Paolo Traverso. ● A Concise Introduction to Models and Methods for Automated Planning (1st edition, 2013), Hector Geffner and Blai Bonet, Morgan & Claypool Publishers. ● International Conference on Automated Planning & Scheduling (ICAPS) proceedings, 2003-2020, AAAI (free). ● Principles of Constraint Programming 1st Edition, 1 edition (December 17, 2009), by Krzysztof Apt, Cambridge University Press. ● Planning Algorithms, Steven M. Lavalle. 2006. |
| **planned learning activities and teaching methods** | Lectures, with the use of ICT equipment |
| **assessment methods and criteria** | Projects and final written exams |
| **language of instruction** | Greek or English |