**COURSE OUTLINE**

1. **GENERAL**

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| **SCHOOL** | SCHOOL OF ENGINEERING | | | | |
| **ACADEMIC UNIT** | DEPARTMENT OF CIVIL ENGINEERING | | | | |
|  | UNIVERSITY OF PATRAS | | | | |
| **POSTGRADUATE PROGRAM: TITLE** | Master’s Degree "Design of Resilient, Sustainable and Intelligent Infrastructures".  Tracks:  (A) Resilient Materials, Structures and Geotechnical Infrastructures,  (B) Hydraulic and Environmental Engineering for Sustainable Infrastructures, and  (C) Intelligent Systems in Transportation and Construction Project Management | | | | |
| **LEVEL OF STUDIES** | GRADUATE PROGRAM | | | | |
| **COURSE CODE** | **GPOL\_C\_16012** | **SEMESTER** | | AUTUMN (A’) | |
| **COURSE TITLE** | Autonomy and Artificial Intelligence in Transportation | | | | |
| **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** |
|  | | | 3 | | 7.5 |
|  | | |  | |  |
| *Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).* | | |  | |  |
| **COURSE TYPE**  *general background,  special background, specialised general knowledge, skills development* | Special background | | | | |
| **PREREQUISITE COURSES:** | Smart cities, infrastructure and transportation or equivalent | | | | |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek | | | | |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | It can be offered | | | | |
| **COURSE WEBSITE (URL)** |  | | | | |

1. **LEARNING OUTCOMES**

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| **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* | |
| *Knowledge in Artificial Intelligence in Transportation Systems (AIT)*  *Knowledge in Autonomy in Intelligent Transportation Systems (ATS)*  *Skills in analysis of AIT and ATS data and problems*  *Competence in drawing conclusions from the analysis of AIT and ATS data/problems* | |
| **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*  *Adapting to new situations*  *Decision-making*  *Working independently*  *Team work*  *Working in an international environment*  *Working in an interdisciplinary environment*  *Production of new research ideas* | *Project planning and management*  *Respect for difference and multiculturalism*  *Respect for the natural environment*  *Showing social, professional and ethical responsibility and sensitivity to gender issues*  *Criticism and self-criticism*  *Production of free, creative and inductive thinking*  *……*  *Others…*  *…….* |
| *Search for information, analysis of data with the use of the necessary technology*  *Working independently*  *Teamwork*  *Working in an international environment*  *Production of new research ideas*  *Respect for the natural environment*  *Criticism and self-criticism*  *Promotion of free thinking* | |

1. **SYLLABUS**

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| * Pattern recognition. * Artificial intelligence framework. * Dynamic demand and supply in an autonomous framework. * Artificial intelligence models for incident management in real time. * Autonomous Transport Systems algorithms. * Self-organizing transport and infrastructure systems algorithms. * Modeling of autonomous intermodal, multimodal and transshipment hubs. * Autonomous micro-vehicles. * Intelligent and autonomous load. * Real-time location detection. |

1. **TEACHING and LEARNING METHODS - EVALUATION**

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| --- | --- |
| **DELIVERY** *Face-to-face, Distance learning, etc.* | *Face-to-face, Distance learning* |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY** *Use of ICT in teaching, laboratory education, communication with students* | *Use of ICT in teaching*  *Use of ICT in laboratory education*  *Use of ICT in communication with students* |
| **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 | 20 | | Seminars | 6 | | Laboratory practice | 20 | | Study & analysis of bibliography | 22 | | Interactive teaching | 19 | | Project | 71.5 | | Report presenting | 6 | | Report writing | 23 | | *Course total* | ***187.5*** | |
| **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 students.* | Language of evaluation: Greek & English  Methods of evaluation: Research comparative analysis, written work, oral examination, public presentation, final written report  Specific criteria are accessible to students |

1. **SUGGESTED BIBLIOGRAPHY**

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| *-*  https://www.arc-it.net (2020). Architecture Reference for Cooperative and Intelligent Transportation, ARC-IT 9.0, The National ITS Reference Architecture, U.S. Dept. of Transportation.  [Abduljabbar](https://sciprofiles.com/profile/512354), R., Dia, H., [Liyanage](https://sciprofiles.com/profile/552772), S. and Bagloee, S. (2019). Applications of Artificial Intelligence in Transport: An Overview. Sustainability, 11(1), 189, January, <https://doi.org/10.3390/su11010189>.  Chu, K., Lam, A., and Li, V. (2021). “Traffic Signal Control Using End-to-End Off-policy Deep Reinforcement Learning,” *IEEE Transactions on Intelligent Transport Systems*.  Orne, D. and Sussman, J. (1990). Intelligent Vehicle Highway Systems: Quantification of Benefits. Mobility 2000, College Station, Texas.  Saxton, L. (1993). Mobility 2000 and the roots of IVHS.  Stephanedes, Y.J. (2005). Intelligent Transportation Systems. Chapter 86, The Engineering Handbook, 2nd Edition, Ed. R. C. Dorf, CRC Press, Boca Raton, Florida, ISBN 0-8493-1586-7,  Texas Transportation Institute (1990). Mobility 2000 Workshop on Intelligent Vehicle/ Highway Systems, March 19-21, Dallas, Texas. College Station, Texas.  TRB (2007). Artificial Intelligence in Transportation: Information for Application. Transportation Research Circular, E-C113, Artifical Intelligence and Advanced Computing Applications Committee, Transportation Research Board, Wash. DC., January, ISSN 0097-8515. |