COURSE SYLLABUS AND COURSE REQUIREMENTS
ACADEMIC YEAR 2025/2026 SEMESTER SECOND

Course title	*ARTIFICIAL INTELLIGENCE*
Course Code	IVM436MLMI
Hours/Week: le/pr/lab	1/1/0
Credits	3
Degree Programme	Master of Engineering Information Technologist Program
Study Mode	
Requirements	final exam
Teaching Period	09.02.2026. – 15.05.2026
Prerequisites	none
Department(s)	Department of Cybersecurity and Networks
Course Director	Dr. Zsolt Ercsey
Teaching Staff	Dr. Zsolt Ercsey

COURSE DESCRIPTION

A short description of the course (max. 10 sentences).
Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description

The course is intended for master students in the Master of Engineering Information Technologist Program.

Artificial intelligence (AI) is an important research field that focuses on the modelling of intelligent human behaviour on a machine. The aim is to design and make a computer that can learn, reason, and solve problems autonomously, ie in such a way that the actions result reflects the result of the activities of human thinking. Even though artificial intelligence has been studied for quite a long time now, it is still a challenge to make a computer that is as intelligent as a human. There are some very specific fields where there are some success already since the Deep Blue system defeated the world chess champion, yet in other cases as well as in general, there are a lot of work in front of us.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

Goals, student learning outcome.
Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction

After the course, students will

- know the main areas of AI,
- have a glance into the current trends of AI,
- know the results achieved of AI,
- be able to typify AI problems,
- know what sort of techniques to use to solve specific AI problems.

Artificial intelligence include and involve a lot of fields such as problem representation, knowledge representation, combinatorial search, problem solving, expert systems, reasoning, planning, natural language understanding, computer vision, machine learning, genetic programming, neural nets, robotics and so on. Obviously, these fields have a continuous effect on AI back and forth and also on each other; problem solving itself should involve learning and its methods are useful for reasoning; while computer vision can be solved using methods developed in the field of pattern recognition.
In this course, the students will get familiar with the most fundamental knowledge for understanding artificial intelligence. Some basic search algorithms for problem solving will be introduced together with knowledge representation, reasoning and neural nets.
The Course includes:

- Practical problem solving tasks related to industrial projects suggested by leading companies.
- Presentations by the Students.

The course is based on continuous discussions; examine of case studies, actual topics, conventional and non-conventional situations. The students' verbal feedback is required.

Methods:

- Lectures about the fields of artificial intelligence.
- Discussion of event cases, situations.
- A short oral presentation by the Students at a fixed time during the semester.
- Tests by the Students at a fixed time during the semester.

2. COURSE CONTENT

Neptun: Instruction/Subjects/Subject Details/Syllabus/Subject content

	TOPICS
LECTURE	Topics related to event cases proposed by leading industrial partners. Discussion and presentations related to the tools and tasks selected by the students.
PRACTICE	*1. topic* *2. etc.*
LABORATORY PRACTICE	*1. topic* *2. etc.*

DETAILED SYLLABUS AND COURSE SCHEDULE

ACADEMIC HOLIDAYS INCLUDED

Specific schedule of 2025/2026 Second

LECTURE, PRACTICE, LABORATORY PRACTICE

week	Date, time, place	Topic
2.	19 February 2026, 11:15, A117	Discussion and presentations related to the tools and tasks selected by the students.
4.	5 March 2026, 11:15, A117	Discussion and presentations related to the tools and tasks selected by the students.
6.	19 March 2026, 11:15, A117	Discussion and presentations related to the tools and tasks selected by the students.
7.	26 March 2026, 11:15, A117	Discussion and presentations related to the tools and tasks selected by the students. Test.

3. ASSESSMENT AND EVALUATION

(Neptun: Instruction/Subjects/Subject Details/Syllabus/Examination and Evaluation System)

ATTENDANCE

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description.

According to the university code.

Method for monitoring attendance *(e.g.: attendance sheet / online test/ register, etc.)*

An attendance sheet is used.

ASSESSMENT

Cells of the appropriate type of requirement is to be filled out (course-units resulting in mid-term grade or examination). Cells of the other type can be deleted.

Course-unit with final examination

Mid-term assessments, performance evaluation and their weighting as a pre-requisite for taking the final exam

(The samples in the table to be deleted.)

Type	Assessment	*Weighting as a proportion of the pre-requisite for taking the exam*
1. ***Presentations by the students***	*acceptable / not acceptable*	
2. ***Journal article format document (Homework)***	*acceptable / not acceptable*	
3. ***Test***	*acceptable above 40%*	

Requirements for the end-of-semester signature

(Eg.: mid-term assessment of 40%)

The mid-term performance accounts for 100 %.

Every student must choose either a tool or a task. Two students may not choose the same. The chosen tool or task must be presented in detail.

Tool

- Theoretical overview: description, how it works, advantages and disadvantages; its importance and timeliness. Minimum literature requirement: 1 scientific article per tool.
- Demonstration of the tool(s) in use: a general overview of the types of tasks it can solve (application examples).
- Detailed presentation of one selected task (application example)
    - Scope, type, amount, availability, etc. of the data used.
    - How have others solved the task? Minimum literature requirement: 3 scientific articles about the practical application.
    - During the solution, the student must use the tool(s) that were presented theoretically.
    - Presentation and interpretation of the results.

Task

- Theoretical overview: its importance and timeliness. Minimum literature requirement: 1 scientific article per task.
- Presentation of tools that can be used to solve the task: general overview.
- Detailed presentation of solving the task with one selected tool
    - Scope, type, amount, availability, etc. of the data used.
    - How have others solved the task? Minimum literature requirement: 3 scientific articles about solving the task.
    - During the practical example, the student must use a tool that was presented theoretically.
    - Presentation and interpretation of the results.

Expected outcome during the semester

- Preparing the slide show for a **35–45 minute presentation** (and uploading it to Teams) and delivering the presentation at a specified time.
- Preparing a **journal-article-format document** (and uploading it to Teams).

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1. Tools

a. Pawlak rough sets, Fuzzy LP, Monte Carlo Method, Interval arithmetic, Critical Path Method

b. Unsupervised learning, reinforcement learning

c. **(From this list, selecting at least 3 tools is mandatory)** Regression models: Linear Regression; Polynomial Regression; Lasso; Ridge; ElasticNet; BayesianRidge; SGDRegressor; PassiveAggressive; Tweedie; Quantile; Huber; Theil Sen; RANSAC; DecisionTree; RandomForest; ExtraTrees; GradientBoosting; HistGradientBoosting; SupportVector; NuSVR; K-Neighbors; RadiusNeighbors; MultiLayer Perceptron.

2. Tasks

a. cyber attack prediction, housing price prediction, multiperiod production planning, knapsack problem; travelling salesman problem; vehicle routing problem, maximal flow problem (incl. Ford–Fulkerson method), bin packing problem, circle packing problem, Gale–Shapley matching problem, human resource assignment problem, stock market prediction,

b. wind energy production prediction; solar power plant efficiency evaluation considering weather conditions; optimization of hydrogen energy production and storage systems; scheduling of energy-consuming systems; weather forecasting.

Instructions for preparations of the presentation + document

- For a **35–45 minute presentation**, the slide deck must contain at least **1 slide per minute**.
- Only scientific articles are acceptable whose publishing journal can be found in the **ScimagoJR** collection: https://www.scimagojr.com/
- Formatting requirements for the paper-format document submission are available at: https://submit.akademiai.com/pollack/index.php/pollack/information/authors

- Further guidelines on structuring your document are given at: https://doi.org/10.1016/j.eurger.2015.08.005 and https://www.elsevier.com/connect/11-steps-to-structuring-a-science-paper-editors-will-take-seriously

The presentations will be distributed among the students. The topics are subjects of the exam. After the presentations, questions can be addressed to the presenter.
In case the presentation is missed or it is not successfully performed, it is neglected. Presentations can only be completed during the Study Period. Should the presentation be missed or neglected, the Student cannot enter the Exam Period, ie it is grounds for failing the course.

Tests by the students. All tests are in writing. Tests are evaluated by points. Tests cover all or some of the main topics of the Course. No external aids are allowed to be used. In case the performance is below 40%, the test is said to be failed. In case the test is missed it is calculated as 0 points. No external aids are allowed to be used. Should the average of the tests be below 40%, the Student cannot enter the Exam Period, ie it is grounds for failing the course.

Re-takes for the end-of-semester signature (PTE TVSz 50§(2))

The specific regulations for grade betterment and re-take must be read and applied according to the general Code of Studies and Examinations. E.g.: all the tests and the records to be submitted can be repeated/improved each at least once every semester, and the tests and home assignments can be repeated/improved at least once in the first two weeks of the examination period.

According to the general Code of Studies and Examinations. All the tests and the records to be submitted can be repeated/improved each at the end of the semester, and home assignments, i.e. the presentation can be repeated/improved in the first week of the examination period latest.

Type of examination *(written, oral):* *written and oral*

Pre-exam of the Students can be done during the Study Period in case the Student has met the requirements of the attendance and successfully performed the presentation. Pre-exams are equal to Exams taken in the Exam Period.
Exams of the Students can be done during the Exam Period. The exam will test the Students' knowledge and problem-solving skills on all preceding lectures of the Course as well as the Presentations held by other Students'. The exam has a written part, it is approximately 60 mins. It covers all or some of the main topics of the Course. In case the performance is below 40%, the exam is said to be failed. In case the achievement is above 40%, then the oral part of the exam is entered automatically.
No external aids are allowed to be used.

The exam is successful if the result is minimum 40 %. *(The minimum cannot exceed 40%.)*

Calculation of the grade *(TVSz 47§ (3))*

The mid-term performance accounts for ***0*** %, the performance at the exam accounts for ***100*** % in the calculation of the final grade.

Calculation of the final grade based on aggregate performance in percentage.

Course grade	Performance in %
excellent (5)	85 % …
good (4)	70 % ... 85 %
satisfactory (3)	55 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

The lower limit given at each grade belongs to that grade.

4. SPECIFIED LITERATURE

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

[1.] Ercsey Zsolt és Achs Ágnes (2019) *ARTIFICIAL INTELLIGENCE MESTERSÉGES INTELLIGENCIA EGYETEMI OKTATÁSI SEGÉDLET*, ISBN 978-963-429-195-4.
[2.] Storcz, Tamás (2019) *Intelligens rendszerek*. Pécs, Magyarország : Pollack Press ISBN: 9789634295570

[3.] F. Friedler, K. Tarján, Y.W. Huang, L.T. Fan (1992) Graph-theoretic approach to process synthesis: axioms and theorems. Chemical Engineering Science, Volume 47, Issue 8, 1992, Pages 1973-1988, ISSN 0009-2509, https://doi.org/10.1016/0009-2509(92)80315-4
[4.] F. Friedler, K. Tarjan, Y.W. Huang, L.T. Fan (1992) Combinatorial algorithms for process synthesis. Computers & Chemical Engineering, Volume 16, Supplement 1, 1992, Pages S313-S320, ISSN 0098-1354, https://doi.org/10.1016/S0098-1354(09)80037-9.
[5.] Stuart Russell, Peter Norvig (2005) Artificial Intelligence. A Modern Approach. Prentice Hall. 2003. ISBN 0137903952. (In Hungarian: Mesterséges intelligencia modern megközelítésben. Panem. 2005. ISBN 963 545 411 2.)

RECOMMENDED LITERATURE AND AVAILABILITY

[6.] Alison Cawsey (1998) The Essence of Artificial Intelligence. Prentice Hall. 1998. ISBN-13: 978-0135717790 (In Hungarian: Mesterséges intelligencia, alapismeretek. Panem. 2002. ISBN 963 545 285 3.)
[7.] Mesterséges intelligencia (1999). Szerkesztette: Futó Iván. Aula Kiadó. 1999. ISBN 963 9078 99 9.
[8.] Ercsey, Z., Kovács, Z. Multicommodity network flow model of a human resource allocation problem considering time periods. *Cent Eur J Oper Res* (2023). https://doi.org/10.1007/s10100-023-00868-y
[9.] Storcz, T.; Ercsey, Z.; Horváth, K.R.; Kovács, Z.; Dávid, B.; Kistelegdi, I. Energy Design Synthesis: Algorithmic Generation of Building Shape Configurations. *Energies* **2023**, *16*, 2254. https://doi.org/10.3390/en16052254