VIDZEMES AUGSTSKOLA

# FACULTY OF ENGINEERING
# STUDY COURSE DESCRIPTION

| | | | | | | |
|---|---|---|---|---|---|---|
| **Course Title**: | **BASICS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING** | | | | | |
| **Course code (VAIS):** | | | | | | |
| **Study programme:** | **Information technologies** | | | | | |
| **Level of Study programme:** | ☐ | 1st level professional higher education | | | | |
| | ☒ | Professional Bachelor | | | | |
| | ☐ | Professional Master | | | | |
| | ☐ | PhD level | | | | |
| **Type of Study programme:** | ☒ | Compulsory course (Part A) | | | | |
| | ☐ | Professional specialization courses (Part B, compulsory) | | | | |
| | ☐ | Professional specialization optional courses (Part B, optional) | | | | |
| | ☐ | Elective courses (Part C) | | | | |
| **Course Workload:** | **Credits** | | **ECTS** | **Academic hours** | **Contact hours** | **Independent work hours** |
| **FT** (in LV: **PL**) | 3 | | 3 | 80 | 32 | 48 |
| **PT** (in LV: **NL**) | 3 | | 3 | 80 | 10 | 70 |
| **Course Author/ Tutor:** | **Kaspars Osis** | | | | | |
| | Guest Assist. Prof., Dr.sc.ing. | | | | | |
| | kaspars.osis@va.lv | | | | | |
| | **Imelda Zadeja** | | | | | |
| | Guest Lect. Mg.comp. | | | | | |
| | imelda.zadeja@va.lv | | | | | |
| | Consultation: according to the schedule for each semester or per individual agreement. | | | | | |
| **Course Form:** | Full time (FT), Part time (PT) | | | | | |
| **Study year, semester:** | 1st year, 1st semester | | | | | |
| **Language:** | Latvian, English | | | | | |
| **Prerequisites for the Course:** | None. | | | | | |
| **Course Summary:** | The aim of this course is to provide concise overview of artificial intelligence (AI), machine learning (ML) and directly related fields both AI and ML are based on. This course will cover problem solving approaches, real world applications, types of ML and several ML methods (i.e. algorithms) used. To conclude, implications of AI are detailed. | | | | | |
| **Course Methods:** | Lectures, practical work activities, group work, theory test, final assessment (project work assignment) etc. | | | | | |
| **Assessment:** | Examination (project work assignment) | | | | | |
| **Requirements for Credits:** | 1. Successful completion of workshops/practical work assignments (at least 60% points of totally available).<br>2. Passed theoretical test.<br>3. Successful completion of project work assignment (at least 65% points of totally available).<br>Final assessment consists of: workshops/practical work assignments, group work evaluations; theoretical test; project work assignment and project work assignment presentation.<br><br>All practical work assignments have to be accepted (i.e. at least with 60% evaluation) in order to get the final evaluation within this course. 200 points system is used to come up | | | | | |

with final evaluation. Table below lists totally available points for each activity.

| Work assignment or activity | Points |
|---|---|
| Practical work assignments | 40 |
| Theoretical test | 20 |
| Participation in class work activities | 10 |
| Project work assignment (exam) | 65 |
| Project work assignment presentation (exam) | 15 |
| **Total** | **150** |

Final course evaluation (mark) calculation based on 150 points system is done as it follows below:

>= 93% (139-points) = 10 >= 75% (112-points) = 6
>= 90% (135-points) = 9 >= 70% (105-points) = 5
>= 85% (127-points) = 8 >= 65% (97-points) = 4
>= 80% (120-points) = 7 < 65% (97-points) = 3

Missing practical work assignment deadline: each missed day counts for subtraction of 5% from totally available points. It is required to acquire at least 60% from totally available points (not counting potential delay) in order to accept practical work assignment as done. There is provided a template which must be used for documenting practical work assignments – otherwise practical work assignment is not accepted for evaluation.

**Abiding by the Academic Ethics**

Students must abide by the academic and research ethics, Vidzeme University of Applied Sciences Ethics Regulations, incl.:
- study papers must be independently developed;
- the study work should reference all statements, ideas and data used that have been authored by someone else;
- appropriate data acquisition methods should be used in the acquisition of data, the research ethics must be respected, empirical data must be collected independently and cannot be distorted or falsified;
- the examination must be carried out by the student independently, without the use of supporting materials and/or consultations with other students, unless the lecturer states otherwise.

In the event of non-compliance with the academic and research ethics, punishment is imposed in accordance with the ViA Ethics Regulations and the study course must be re-taken, unless the punishment is extramarital.

**Learning Outcomes; the evaluation methods and criteria**

| Learning Outcomes | The evaluation methods and criteria |
|---|---|
| **Knowledge** | |
| Knowledge on basic concepts of AI and ML, and related fields. | Exercises. Passed theoretical test. |
| Knowledge about AI problem solving and approaches. | Exercises Passed theoretical test. |
| Knowledge about different types of ML. | Exercises. Passed theoretical test. |
| Knowledge about implications of AI in different perspectives. | Exercises. Passed theoretical test. |
| **Skills** | |
| To develop understanding and work on exercises to distinguish between AI and ML, as well as subareas of ML. | Exercises. Course project development and presentation. |
| To develop understanding and work on exercises related with problem solving concepts in area of general problem solving, searching and games. | Exercises. Course project development and presentation. |

| | | |
|---|---|---|
| | To develop understanding and work on exercises about probability, odds, and Bayes rule. | Exercises. Course project development and presentation. |
| | To develop general understanding and work on exercises related with ML different algorithms such as the nearest neighbor classifier, regression (i.e. linear and logistic), neural networks (NN), convolutional neural networks (CNN) and Large Language Models (LLMs) – e.g. ChatGPT. | Exercises. Developed practical group work. Course project development and presentation |
| | **Competency** | |
| | Use correct AI and ML solutions terminology. | Course project development and presentation. |
| | Independently perform AI and ML application analysis to real world problems. | Course project development and presentation. |
| | To realize implications of AI in different aspects of real world. | Course project development and presentation. |
| | | |
| **Course Compulsory literature:** | 1. *Elements of AI*. Univeristy of Helsinki, MinnaLearn. Available at: https://elementsofai.com/ | |
| **Course additional literature:** | 1. Boden, M. A. *Artificial Intelligence: A Very Short Introduction*, Oxford University Press, Oxford, UK, 2018.<br>2. Theobald, O. *Machine Learning for Absolute Beginners: A Plain English Introduction*, 3rd edition, Sanage Publishing House Llp, 2024. | |
| **Course confirmation date:** | | |
| **Date of course description update:** | | |

## Study Course Plan for Full Time Students:

| Date | Theme | Academic hours | | Study Form/ Organization of independent work of students and task description |
|---|---|---|---|---|
| | | Contact hours | Independent work hours | |
| | Introduction. Introduction to basics of AI and related fields. | 4 | 4 | Theoretical lecture. Exercises. |
| | Concepts of searching and problem solving. AI support in problem solving. | 4 | 4 | Theoretical lecture. Exercises. |
| | Odds. Probability. The Bayes rule. Classification. | 4 | 4 | Theoretical lecture. Exercises. |
| | Introduction to machine learning. k-nearest neighbor. Regression. | 4 | 7 | Theoretical lecture. Exercises. |
| | Introduction to neural networks. | 4 | 6 | Theoretical lecture. Exercises. |

| | | | | |
|---|---|---|---|---|
| | | | | |
| | AI and implications. | 4 | 5 | Theoretical lecture. Exercises. |
| | Workshop. | 4 | 2 | Theoretical lecture. Exercises. Group work. |
| | Seminar (final examination). | 4 | 24 | Course project development and presentation. |
| | *Hours total:* | **32** | **48** | |

Note: lecturer keeps the rights to make changes in the course plan.

**Study Course Plan for <u>Part Time</u> Students:**

| **Date** | **Theme** | **Academic hours** | | **Study Form/ Organization of independent work of students and task description** |
|---|---|---|---|---|
| | | **Contact hours** | **Independent work hours** | |
| | Introduction. Introduction to basics of AI and related fields. | 2 | 15 | Theoretical lecture. Exercises. |
| | Concepts of searching and problem solving. AI support in problem solving.<br>Odds. Probability. The Bayes rule. Classification. | 2 | 15 | Theoretical lecture. Exercises. |
| | Introduction to machine learning. k-nearest neighbor. Regression. | 2 | 15 | Theoretical lecture. Exercises. |
| | Introduction to neural networks.<br>AI and implications. | 2 | 3 | Theoretical lecture. Exercises. Group work |
| | Seminar (final examination). | 2 | 22 | Course project development and presentation. |
| | *Hours total:* | **10** | **70** | |

Note: lecturer keeps the rights to make changes in the course plan.