SYLLABUS – A COURSE DESCRIPTION

I. General information

1. Course name: Artificial intelligence
2. Course code: AI
3. Course type (compulsory or optional): compulsory
4. Study programme name: Language, Mind, Technology
5. Cycle of studies (1st or 2nd cycle of studies or full master's programme): 2nd cycle
6. Educational profile (general academic profile or practical profile): general academic
7. Year of studies (if relevant): second
8. Type of classes and number of contact hours (e.g. lectures: 15 hours; practical classes: 30 hours): lecture: 30h lecture, 30h practical classes
9. Number of ECTS credits: 6
10. Name, surname, academic degree/title of the course lecturer/other teaching staff: Kacper Łodzikowski, MA; klodziko@amu.edu.pl
11. Language of classes: English
12. Online learning – yes (partly – online / fully – online) / no: no

II. Detailed information

1. Course aim (aims):

This course will prepare you for conducting Research & Development (R&D) projects that apply methods from the field of Artificial Intelligence (AI). You will be able to apply these knowledge & skills both in the academia and in business.

The course consists of the following main parts:

- Acquire the knowledge of the basic terms used in the broad field of AI, as well as the history of the field and the state of the art.
- Acquire the knowledge about the inner workings of the most popular machine learning algorithms as well as the technologies and processes used for working with them.
- Acquire the skills needed to create and present an AI R&D project proposal as well as to lead individual or teamwork in such a project.
- Acquire the knowledge & skills that will increase your chance of getting hired and succeeding in the field of AI R&D.

2. Pre-requisites in terms of knowledge, skills and social competences (if relevant):

- Proficiency in English
- Ability to search for and synthesise information
- Basic proficiency in at least one programming language
- Basic knowledge of mathematical analysis and statistical analysis

3. Course learning outcomes (EU) in terms of knowledge, skills and social competences and their reference to study programme learning outcomes (EK):

Course learning outcome symbol (EU)	**On successful completion of this course, a student will be able to:**	**Reference to study programme learning outcomes (EK)**
SI-01	Knows the basic terms used in the field of Artificial Intelligence (AI).	K_W04
SI-02	Knows the history of the field of AI. Knows modern practical applications of AI and their socio-economic challenges.	K_W05
SI-03	Has a general knowledge of the inner workings of the most popular machine learning algorithms as well as the technologies used for	K_W07, K_W09, K_W11, K_W13

	working with them.	
SI-04	Has a general knowledge of conducting AI Research & Development (R&D), including agile software development.	K_W08
SI-05	Can create an AI R&D project proposal.	K_U03, K_U04, K_UO7, K_UO19
SI-06	Can present an AI R&D project proposal to a wide target audience and defend his/her position.	K_UO09, K_UO13
SI-07	Is ready to manage his/her own AI R&D work as well as the work of a team.	K_K04, K_K05, K_K11
SI-08	Is ready to follow and share with others the best practices for working with AI.	K_K09, K_K10
SI-09	Is ready to self-assess his/her knowledge and skills as well as to develop them according to professional requirements.	K_K01

4. Learning content with reference to course learning outcomes (EU)

Course learning content:	**Course learning outcome symbol (EU)**
Introduction to Artificial Intelligence (AI): basic terms, history of the field, disciplines that contributed ideas and methods to AI	SI-01, SI-02
State of the art and practical applications of AI in science and business Socioeconomic challenges (e.g. discrimination and increasing inequality, human error vs. machine error, job losses, carbon footprint)	SI-02, SI-08
Machine learning approaches (supervised, semi-supervised, unsupervised, reinforced, active) Most popular problems solved with machine learning (regression, classification, clustering, anomaly detection, time series analysis) Machine learning model life cycle (data collection, data labelling, data & code versioning, data exploration & visualization, model training, inference) Most popular machine learning algorithms (linear regression, logistic regression, naïve Bayes classifier, support vector machine, decision trees and random forests, gradient boosting, *k*-nearest neighbours, *k*-means, probabilistic graphical models) Deep learning (artificial neural networks: feedforward, recurrent, convolutional, LSTM) Natural language processing: normalisation, n-gram models, sentiment analysis, vector semantics & embedding, neural language models, machine translation, written language generation, speech recognition and synthesis, automated scoring of spoken & written language) Practical aspects of model operationalisation (deployment, monitoring, scaling, managing data life cycle) Cloud data processing and machine learning (advantages & disadvantages, providers, practical considerations, e.g. best virtual machines for a given problem) Creating in-house models vs. reusing existing ones, incl. managed cloud services	SI-03
Legal aspects of R&D in Poland; intellectual property and patents AI R&D project life cycle; frameworks for managing such projects (e.g. TDSP) Agile software development methods (Scrum, Kanban), as used in the field of AI Practical challenges and most common mistakes in AI R&D projects Formal and informal requirements for model transparency in selected industries Legal aspects of data processing (GDPR, RODO, problematic cases) Managing R&D personnel (researchers, machine learning engineers) Administrative aspects of R&D in Poland (employment type, creative work, 50% revenue-earning costs) Industrial visit (AI R&D unit)	SI-04, SI-07, SI-09
Critical analysis of example R&D projects (in science and business) Presentation techniques for R&D project proposals (in science and business)	SI-05, SI-06, SI-07, SI-08, SI-09

Creating & presenting your own AI R&D project proposal	

5. Reading list:

- Almond, Russell, Robert Mislevy, Linda Steinberg, Duanli Yan and David Williamson. 2015. *Bayesian networks in educational assessment*. New York: Springer.
- Davis, Ernest and Gary Marcus. 2019. *Rebooting AI: Building artificial intelligence we can trust*. New York: Pantheon Books.
- Jurafsky, Daniel and James H. Martin. In press. *Speech and language processing: An Introduction to natural language processing, computational linguistics, and speech recognition*. (3rd edition) (web.stanford.edu/~jurafsky/slp3/) (date of access: 1 April 2021).
- Kochenderfer, Mykel J., Tim A. Wheeler and Kyle H. Wray. In press. *Algorithms for decision making*. (algorithmsbook.com) (date of access: 1 April 2021).
- Page, Scott E. 2018. *The model thinker: What you need to know to make data work for you*. New York: Basic Books.
- Russell, Stuart and Peter Norvig. 2021. *Artificial intelligence: A modern approach*. (4th edition.) Hoboken: Pearson.
- Silver, Nate. 2015. *The signal and the noise: Why so many predictions fail--but some don't*. New York: Penguin Press.
- Yan, Duanli, André A. Rupp and Peter W. Foltz (eds.). 2020. *Handbook of automated scoring: Theory into practice*. Boca Raton: CRC Press.

III. Additional information

1. Teaching and learning methods and activities to enable students to achieve the intended course learning outcomes (please indicate the appropriate methods and activities with a tick and/or suggest different methods)

Teaching and learning methods and activities	**X**
Lecture with a multimedia presentation	X
Interactive lecture	X
Problem – based lecture	X
Discussions	X
Text-based work	X
Case study work	X
Problem-based learning	
Educational simulation/game	
Task – solving learning (eg. calculation, artistic, practical tasks)	
Experiential work	X
Laboratory work	
Scientific inquiry method	
Workshop method	
Project work	X
Demonstration and observation	
Sound and/or video demonstration	X
Creative methods (eg. brainstorming, SWOT analysis, decision tree method, snowball technique, concept maps)	X
Group work	X
Other (please specify) -	
…	

2. Assessment methods to test if learning outcomes have been achieved (please indicate with a tick the appropriate methods for each LO and/or suggest different methods)

Assessment methods	**Course learning outcome symbol**					
Written exam						
Oral exam						
Open book exam						
Written test	SI-01	SI-02	SI-03	SI-04		
Oral test	SI-03	SI-04	SI-05	SI-06	SI-07	SI-08
Multiple choice test	SI-01	SI-02	SI-03	SI-04	SI-07	SI-08
Project	SI-05	SI-06	SI-07	SI-08	SI-09	
Essay	SI-05					
Report	SI-09					
Individual presentation	SI-06					
Practical exam (performance observation)						
Portfolio						
Other (please specify) -						
…						

3. Student workload and ECTS credits

Activity types		**Mean number of hours spent on each activity type**
Contact hours with the teacher as specified in the study programme		60
Independent study*	Preparation for classes	15
	Reading for classes	15
	Essay / report / presentation / demonstration preparation, etc.	20
	Project preparation	30
	Term paper preparation	
	Exam preparation	

	Other (please specify) – Midterm test preparation	10
	…	
Total hours		150
Total ECTS credits for the course		6

* please indicate the appropriate activity types and/or suggest different activities

4. Assessment criteria in accordance with AMU in Poznan's grading system:

Very good (bdb; 5,0):

Good plus (+db; 4,5):

Good (db; 4,0):

Satisfactory plus (+dst; 3,5):

Satisfactory (dst; 3,0):

Unsatisfactory (ndst; 2,0):