Course description

Department/Unit /	KIV / UIR		Academic Year	2023/2024
Title	AI and Pattern Recognition		Type of completion	Exam
Accredited/Credits	Yes, 6 Cred.		Type of completion	Combined
Number of hours	Lecture 3 [Hours/Week] Tutorial 2 [Hours/Week]			

Occ/max	Status A	Status B	Status C			
Summer semester	67 / -	0 / -	0 / 43	Course credit prior to	Yes
Winter semester	0 / -	0 / -	0 / -	Counted into average	YES
Timetable	Yes			Min. (B+C) students	10
Language of instruction	Czech			Repeated registration	NO
Optional course	Yes			Semester taught	Summer semester
Evaluation scale	1|2|3|4			Internship duration	0
No. of hours of on-premise				Ev. sc. – cred.	S	N
Auto acc. of credit	No				
Periodicity	every year				
Specification periodicity					
Substituted course	None				
Preclusive courses	KIV/UIR-E and KKY/UI				
Prerequisite courses	N/A				
Informally recommended courses	KIV/PPA and KIV/ADT				
Courses depending on this Course	N/A				

Course objectives:

Students acquire basic methods and techniques used in main areas of artificial intelligence - problem solving, fundamentals of logic and logic programming, recognition methods and their applications, introduction to knowledge representation and knowledge systems.

Requirements on student

Credit - Students have to obtain a minimum amount of points from a seminar work (75%) and from a written test (60%).
Examination - A written examination. It is necessary to obtain a minimum amount of points (60%).

Due to the continuous updating of the course, approval from the course guarantor is required to obtain credit when re-enrolling in the course (see Article 24, Paragraph 3).

Notice:
The dates and form of verification for fulfilling the requirements may be adjusted in light of measures announced in connection with the development of the epidemiological situation in the Czech Republic.

Content

1. Introduction - basic concepts, motivation, (a little) history
2 - 3. Problem solving: uninformed and informed methods
4. Games, task decomposition, AND/OR graphs, evolutionary and genetic algorithms
5. Classification, recognition, clustering and regression - basic concepts
6. Feature-based recognition methods

7. Structural recognition methods
8. Neural networks
9. Introduction to knowledge representation
10. Nervous system, brain, senses, memory, language and speech
11. Intelligent agents
12. Natural language processing
13. Summary, discussion

Fields of study

Guarantors and lecturers

- **Guarantors:** doc. Ing. Pavel Král, Ph.D. (100%)
- **Lecturer:** doc. Ing. Pavel Král, Ph.D. (100%)
- **Tutorial lecturer:** Ing. Josef Baloun (100%), doc. Ing. Pavel Král, Ph.D. (100%), Ing. Jakub Šmíd (100%)

Literature

- **Basic:** Peter Norvig, Stuart Russell. *Artificial Intelligence: A Modern Approach, Global Edition*. 2021. ISBN 1292401133.
- **Recommended:** Lukasová, Alena. *Formální logika v umělé inteligenci*. Vyd. 1. Brno : Computer Press, 2003. ISBN 80-251-0023-5.
- **Recommended:** Kubík, A. *Inteligentní agenty - tvorba aplikačního software na bázi multiagentových systémů*. Brno, 2007.
- **Recommended:** Nilsson, Nils J. *Principles of Artificial Intelligence*. Springer Verlag, Berlin, 1982.
- **Recommended:** Mařík, Vladimír. *Umělá inteligence (1)*. Academia, Praha, 1993. ISBN 80-200-0496-3.
- **Recommended:** Mařík, Vladimír a kol. *Umělá inteligence (2)*. Academia, Praha, 1997.
- **Recommended:** Mařík, Vladimír a kol. *Umělá inteligence (3)*. Academia, Praha, 2001.
- **Recommended:** Mařík, Vladimír a kol. *Umělá inteligence (4)*. Academia, Praha, 2003.
- **Recommended:** V. Mařík, O. Štěpánková, J. Lažanský a kol. *Umělá inteligence (5)*. 2007.

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Preparation for laboratory testing; outcome analysis (1-8)	20
Contact hours	39
Preparation for an examination (30-60)	40
Preparation for formative assessments (2-20)	10
Practical training (number of hours)	26
Presentation preparation (report) (1-10)	5
Team project (50/number of students)	16
Total:	**156**

assessment methods

Knowledge - knowledge achieved by taking this course are verified by the following means:

Combined exam

Test

Individual presentation at a seminar

Seminar work

Skills - skills achieved by taking this course are verified by the following means:

Skills demonstration during practicum

Individual presentation at a seminar

Competences - competence achieved by taking this course are verified by the following means:

Seminar work

Individual presentation at a seminar

prerequisite

Knowledge - students are expected to possess the following knowledge before the course commences to finish it successfully:

to apply knowledge of mathematical analysis, linear algebra, probability theory, and mathematical statistics

to study specialized literature and recommended computer resources (manuals, Web pages etc.)

to create special program modules in higher programming languages (Java, C, C#, Prolog,...)

Skills - students are expected to possess the following skills before the course commences to finish it successfully:

používat získané znalosti z matematiky

samostatně studovat problematiku z dodaných studijních materiálů

aktivně používat znalosti z použití vyšších programovacích jazyků

vytvářet efektivní programové struktury ve vyšších programovacích jazycích

Competences - students are expected to possess the following competences before the course commences to finish it successfully:

N/A

N/A

N/A

N/A

N/A

N/A

N/A

má znalosti z oblasti vytváření efektivních programových struktur a jejich snadného ladění

teaching methods

Knowledge - the following training methods are used to achieve the required knowledge:

Interactive lecture

Laboratory work

E-learning

Self-study of literature

Skills - the following training methods are used to achieve the required skills:

Laboratory work

Skills demonstration

Individual study

Competences - the following training methods are used to achieve the required competences:

E-learning

Task-based study method

Self-study of literature

Students' portfolio

learning outcomes

Knowledge - knowledge resulting from the course:

basic knowledge about the artificial intelligence methods, methods of problem solving and recognition or classification

methods

to create efective techniques and programming tools solving the problems by specialized methods of artificial intelligence

to create good program documentation of the realized program system

Skills - skills resulting from the course:

efective use of techniques and programming tools for software development with the aim to create a specialized software for simulation and solving above mentioned methods

to propose simple logic systems and to verificate their features, to study the theory of logic systems and the implementation of such systems in specialized programming languages

to propose and develope knowledge based systems and procedures for knowledge derivation using the standard database systems

to apply modern systems for problem solving tasks (evolutionary and genetic algorithms, intelligent agents, modern software development techniques), to realize of such systems and verificate their properties

Competences - competences resulting from the course:

N/A

N/A

N/A

N/A

student dokáže vytvářet efektivní programové struktury podle zásad koncepce programových produktů pro oblast umělé inteligence

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Computer Science and Engineering	Bachelor	Full-time	Computer Science and Engineering	1	2019	2023	Povinné předměty	A	2	LS
Computer Science and Engineering	Bachelor	Full-time	Information Technologies	1	2018	2023	Oborové předměty - povinné	A	2	LS
Informatika	Bachelor	Full-time	Počítačové vědy	1	2023	2023	Povinné předměty	A	2	LS
Mathematics	Postgraduate Master	Full-time	Training Teachers of Mathematics at Higher Secondary Scholls	1	2018	2023	Informatika - odborné předměty	A	2	LS
Software Engineering	Bachelor	Full-time	Softwarové inženýrství	1	2023	2023	Povinné předměty	A	2	LS
Computer Science and Engineering	Postgraduate Master	Full-time	Information Systems	1	2018	2023	Doporučení výběrové předměty	C	1	LS