Course description

Course abbreviation:	KIV/PT-E	Taabaiawaa				Page:	1/3	
Academic Year:	2023/2024	rechniques			Printed:	12.07.2025	10:51	
Department/Unit /	KIV / PT-E				Academic Year	2023/2024		
Title	Programming Techniques				Type of completion	Exam		
Accredited/Credits	Yes, 5 Cred.				Type of completion	Combined		
Number of hours	Lecture 3 [Ho	urs/Week] Tutor	rial 2 [Hours/We	eek]				
Occ/max	Status A	Status B	Status C		Course credit prior to	Yes		
Summer semester	0 / -	0 / -	0 / -		Counted into average	YES		
Winter semester	0 / -	0 / -	5 / -		Min. (B+C) students	10		
Timetable	Yes				Repeated registration	NO		
Language of instruction	English				Semester taught	Winter ser	nester	
Optional course	Yes				Internship duration	0		
Evaluation scale	1 2 3 4				Ev. sc. – cred.	S N		
No. of hours of on-premise								
Auto acc. of credit	No							
Periodicity	every year							
Specification periodicity								
Substituted course	None							
Preclusive courses	KIV/PT							
Prerequisite courses	N/A							
Informally recomn	nended courses	N/A						
Courses depending	on this Course	KSO/SBZIM						

Course objectives:

The aim of subject is to provide information to students in field od data structures (trees, fraphs, hashing tables, dictionaries) and algorithms } sorting, searching, sets and graphs algorithms, text-processing algorithms, basic compression and cryptography algorithms etc.) widely used in computer science.

Requirements on student

Credit: software implementation of given task, creation of programmer and user documentation Exam: written test (score atl least 50%), supplementary questions

Notice:

The dates and form of verification of compliance with the requirements may be adjusted with regard to the measures announced in connection with the development of the epidemiological situation in the Czech Republic.

Content

- 1. Complexity of algorithms revision and extension of knowledge. Abstract data types
- 2. Searching and sorting algorithm medians, quantils, bucket sort, radix sort, comparison of sorting algorithms
- 3. Data structures I stack, queue, list, dictionary, inverted list
- 4. Data structures II balanced searching trees (AVL, Red-Black, B), hash tables, graphs, sets
- 5. Graph algorithms shortest path (Dijkstra, Floyd-Warshall), minimum spanning tree (Prim-Jarnik, Kruskal), bipartite graphs 6. Sets algorithms generating of permutations and subsets
- 7. Text algorithms string agreement, aproximate agreement, shortest and longest common subsequence
- 8. Data compression I lossless algorithms (RLE, LZW, Huffman, arithmetic coding)
- 9. Data compression II lossy methods (JPEG, wavelet compression, fractal compression
- 10. Cryptography introduction, basic algorithms.

11. Programmer practice - using suitable data structures, effect of cache on program running, effect of floating point implementation of real numbers on calculation

Fields of study

Guarantors and lecturers

- Guarantors: Ing. Pavel Mautner, Ph.D. (100%)
- Lecturer: Ing. Pavel Mautner, Ph.D. (100%)
- Tutorial lecturer: Ing. Martin Červenka (100%)

Literature

Basic:Basic:	Töpfer, Pavel. <i>Algoritmy a programovací techniky</i> . 1. vyd. Praha : Prometheus, 1995. ISBN 80- 85849-83-6. Cormen, Thomas H. <i>Introduction to algorithms</i> . MIT Press, 2009. ISBN 978-0262033848.
• Recommended:	Sedgewick, Robert. <i>Algorithms in Java. Pts. 1-4, Fundamentals, data structures, sorting, searching.</i> 3rd ed Boston Addison-Wesley 2003 ISBN 0-201-36120-5
• Recommended:	Goodrich, Michael T.; Tamassia, Roberto. <i>Data structures and algorithms in Java</i> . John Wiley & Sons, 2005. ISBN 0-471-73884-0.
• Recommended:	McConnell, Steve. <i>Dokonalý kód : umění programování a techniky tvorby software</i> . Vyd. 1. Brno : Computer Press, 2005. ISBN 80-251-0849-X.
• Recommended:	Skiena, Steven S. <i>The algorithm design manual</i> . 2nd ed. New York : Springer, 2008. ISBN 978-1-848-00-069

Time requirements

All forms of study

Activities		Time requirements for activit	y [h]
Contact hours		65	
Preparation for an examination (30-60)		40	
Undergraduate study programme term essay (20-40)		30	
	Total:	135	

assessment methods

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

Written exam

Seminar work

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

Written exam

Skills demonstration during practicum

Seminar work

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

Skills demonstration during practicum

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:

algorithmize simple problems

programming in one of the basic programming languages (Java, C, Pascal)

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

analyze a simple task

create a simple program in a basic programming language

write and debug a simple program in the development environment for given language

create user and programmer documentation for that program

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

N/A

teaching methods

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

Lecture Practicum

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

Practicum

Individual study

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

Practicum

Individual study

learning outcomes

Knowledge - knowledge resulting from the course:

analyze the problem and choose appropriate data structures and algorithms

use and implement basic data structures used in informatics (stack, queue, search trees, dictionaries, hash tables, sets, graphs)

use and implement basic sorting and searching algorithms and graph algorithms (shortest path, minimum spanning tree, network flows)

use and implement text processing algorithms, combinatorial algorithms, and data compression algorithms

to enumerate and explain the basic cryptographic algorithms

Skills - skills resulting from the course:

analyze the problem and choose appropriate data structures and algorithms

create a program in one of the basic programming languages

create user and programmer documentation for the problem

evaluate the solution of the problem, eventually, suggest possible modifications of the solved problem that could not be realized

Course is included in study programmes: