

# Course description

<b>Course abbreviation:</b>	KIV/PRO	<b>Page:</b>	1 / 4
<b>Course name:</b>	Programming Strategies		
<b>Academic Year:</b>	2023/2024	<b>Printed:</b>	03.06.2024 09:52

<b>Department/Unit /</b>	KIV / PRO			<b>Academic Year</b>	2023/2024
<b>Title</b>	Programming Strategies			<b>Type of completion</b>	Exam
<b>Accredited/Credits</b>	Yes, 5 Cred.			<b>Type of completion</b>	Combined
<b>Number of hours</b>	Lecture 2 [Hours/Week] Tutorial 2 [Hours/Week]			<b>Course credit prior to</b>	YES
<b>Occ/max</b>	Status A	Status B	Status C	<b>Counted into average</b>	YES
<b>Summer semester</b>	0 / -	0 / -	0 / -	<b>Min. (B+C) students</b>	10
<b>Winter semester</b>	0 / -	39 / -	0 / -	<b>Repeated registration</b>	NO
<b>Timetable</b>	Yes			<b>Semester taught</b>	Winter semester
<b>Language of instruction</b>	Czech			<b>Internship duration</b>	0
<b>Optional course</b>	Yes			<b>Ev. sc. – cred.</b>	S N
<b>Evaluation scale</b>	1 2 3 4				
<b>No. of hours of on-premise</b>					
<b>Auto acc. of credit</b>	No				
<b>Periodicity</b>	K				
<b>Substituted course</b>	None				
<b>Preclusive courses</b>	KIV/PRO-E				
<b>Prerequisite courses</b>	N/A				
<b>Informally recommended courses</b>	N/A				
<b>Courses depending on this Course</b>	N/A				

## Course objectives:

To teach the students such algorithmic strategies which are not presented in the fundamental algorithmic courses, and improve knowledge of those which are already known to the students. To lead them to algorithmical thinking and to improvement of their ability to solve computer science problems.

## Requirements on student

Processing of a set of smaller projects from the area of algorithmics and programming and presentation of developed solutions to classmates together with a defence of the solution and discussion about it. The student chooses an amount, topics and a type of work (theoretical, presentational, implementational) him or herself from the given list in such a way to achieve at least the minimum required amount of points. Other points can be obtained for activity in seminars. Points are included to the exam.

## Content

1. Introduction into algorithms - correctness and efficacy of algorithms, robustness, analyses, problem solving
- 2.-6. Algorithmical strategies - brute force, greedy, incremental algorithms, divide & conquer, dynamic programming, backtracking
7. Randomized algorithms
8. Data stream algorithms
9. In-place and in situ algorithms
10. Heuristics and approximate solutions
11. Algorithmical complexity in real life
12. News and trends
13. Selected interesting "recreational" problems

<http://iason.zcu.cz/~kolinger/vyukaZCU.html>

**Fields of study**

Podklady přednášek v ČJ a AJ (soubory formátu pdf).  
 Namluvená česká verze přednášek (soubory formátu MP4).

**Guarantors and lecturers**

- **Guarantors:** Prof. Dr. Ing. Ivana Kolingerová (100%)
- **Lecturer:** Prof. Dr. Ing. Ivana Kolingerová (100%)
- **Tutorial lecturer:** Ing. Lukáš Hruďa (100%), Prof. Dr. Ing. Ivana Kolingerová (100%)

**Literature**

- **Basic:** Podklady k přednáškám a cvičením na I:\public\_html\vyukaZCU.html (Kolingerová, Ivana) - I:\public\_html\vyukaZCU.html >
- **Basic:** Příklady ze soutěže ACM Programming Contest (ACM) - <http://cm.baylor.edu/welcome.icpc> >
- **Basic:** Skiena, Steven S. *The algorithm design manual*. New York : Springer, 1998. ISBN 0-387-94860-0.
- **Recommended:** Hromkovič, Juraj. *Algorithmics for hard problems : introduction to combinatorial optimization, randomization, approximation, and heuristics*. 2nd ed. Berlin : Springer, 2003. ISBN 3-540-44134-4.
- **Recommended:** Moret, Bernard M. E.; Shapiro, H. D. *Algorithms from P to NP. Vol. 1, Design & efficiency*. Redwood City : Benjamin/Cummings Publishing, 1991. ISBN 0-8053-8008-6.
- **Recommended:** Rawlins, Gregory J. E. *Compared to what? : an introduction to the analysis of algorithms*. New York : Computer Science Press, 1992. ISBN 0-7167-8243-X.
- **Recommended:** Dvořák, Stanislav. *Dekompozice a rekursivní algoritmy*. Praha : Grada, 1992. ISBN 80-85424-76-2.
- **Recommended:** Gonnet, Gaston H.; Baeza-Yates, R. *Handbook of algorithms and data structures : in Pascal and C*. Wokingham : Addison-Wesley, ----. ISBN 0-201-41607-7.
- **Recommended:** Michalewicz, Z.; Fogel, D.B. *How to solve it: Modern Heuristics*. Springer-Verlag, 2000.

**Time requirements****All forms of study**

Activities	Time requirements for activity [h]
Contact hours	52
Preparation for an examination (30-60)	40
Presentation preparation (report) (1-10)	5
Individual project (40)	40
<b>Total:</b>	<b>137</b>

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

Written exam  
 Oral exam  
 Project  
 Individual presentation at a seminar

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

Project  
 Individual presentation at a seminar

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

samostatně vytvořit jednoduchý algoritmus

využívat v algoritmicizaci datové struktury pole, seznam, strom

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

programovat v jazyce Java nebo C nebo C++ nebo C# nebo Pascal/Delphi

samostatně studovat odbornou literaturu z oblasti informatiky

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

N/A

N/A

#### teaching methods

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

Lecture

Task-based study method

Individual study

Students' portfolio

Textual studies

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

Practicum

Task-based study method

Students' portfolio

Individual study

#### learning outcomes

**Knowledge - knowledge resulting from the course:**

- fundamental algorithmic strategies and their use to solve a particular problem with a particular type of data,
- knowledge of further modern methods, such as randomized, data stream and in-place algorithms,
- brief information about news and trends in the area of algorithmics,

**Skills - skills resulting from the course:**

- design of algorithms to solve particular problems.
- evaluation of suitability of an algorithm for a given problem
- understanding and shortened survey of a computer science text
- analysis of a simpler programming work with documentation

**Competences - competences resulting from the course:**

N/A

N/A

N/A

**Course is included in study programmes:**

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Computer Modelling in Mechanics	Bachelor	Full-time	Computer Modelling in Mechanics	1	2020	2023	Povinně volitelné předměty - skupina 4 (typ B)	B	3	ZS
Computer Modelling in Mechanics	Bachelor	Full-time	Computer Modelling in Mechanics	1	2023	2023	Povinně volitelné předměty - skupina 4 (typ B)	B	3	ZS

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	Povinně volitelné předměty	B	2	ZS
Computer Science and Engineering	Bachelor	Full-time	Information Technologies	1	2018	2023	Specializační předměty - povinně volitelné	B	2	ZS
Informatika	Bachelor	Full-time	Počítačové vědy	1	2023	2023	Skupina 1	B	3	ZS
Computer Modelling in Technology	Bachelor	Full-time	Computations and Design	1	2018	2023	Doporučené výběrové předměty	C	2	ZS
Computer Modelling in Technology	Bachelor	Full-time	Computations and Design	1	2023	2023	Doporučené výběrové předměty	C	2	ZS
Computer Modelling in Technology	Bachelor	Full-time	Computer Modelling	1	2023	2023	Doporučené výběrové předměty	C	2	ZS
Computer Modelling in Technology	Bachelor	Full-time	Computer Modelling	1	2018	2023	Doporučené výběrové předměty	C	2	ZS
Software Engineering	Bachelor	Full-time	Softwarové inženýrství	1	2023	2023	Skupina 6 - Doporučené předměty	C	3	ZS