Algorithms & Data Structures [QUM71122]

Module Coordinator	Andonians Salmas, Vahe				
Programme(s)	Master in Applied Data Science				
Term	1st semester Q1				
Module Duration	1 Semester				
Compulsory/Elective Module	Compulsory Module				
Credits:	6				
Frequency	Annually				
Language	English				
Workload:	150 h	Contact hours:	37 Academic Hours	Independent Learning:	122 h
Prerequisites	Students need a laptop with Python 3 installed.				

Content	• ***Introduction to algorithms***
	• ***Introduction to Python***
	  • *Expressions*
	  • *Variables*
	  • *Conditions*
	  • *Iterations*
	• ***Functions, scoping, and abstraction in Python***
	  • *Functions and scoping*
	  • *Global Variables*
	  • *Files*
	  • *Modules*
	• ***Analyzing algorithms***
	• ***Introduction to git***
	• ***Sorting***
	  • *Merge Sort*
	  • *Quicksort*
	• ***Object oriented programming***
	• ***Elementary data structures***
	  • *Stacks and queues*
	  • *Linked lists*
	  • *Hash tables*
	  • *Binary search trees*
	• ***Structured types in Python***
	  • *Tuples*
	  • *Dictionaries*
	  • *Classes*
	  • *Functions as objects*
	• ***Introduction to NumPy***
	• ***Introduction to Pandas***				

<table>
<tr><td>Intended Learning Outcomes</td><td>Knowledge
By the time students finish the course, they will define, recognize and explain algorithms and data structures which together build the foundation of software engineering. Students practice the programming language Python.

Skills
Students will be able to design and analyze basic computational algorithms as narrative and further implement them in Python.

Competence
On successful completion of this module, students will demonstrate, apply and illustrate theorery and practice of the software engineering foundation. They will be able to solve an unknown problem theoretically using algorithms.</td></tr>
<tr><td>Forms of teaching, methods and support</td><td>Theory is explained during class and broadcasted using Zoom, students will apply this during class in individual and group assignments</td></tr>
<tr><td>Type of Assessment(s) and performance</td><td>
<table>
<tr><td>Type of Assessment</td><td>Duration</td><td>Performance Points</td><td>Due Date or Date of Exam</td></tr>
<tr><td>Individual assignments</td><td></td><td>50</td><td>4 assignments during courses</td></tr>
<tr><td>Group assignments</td><td></td><td>20</td><td>2 assignments during the course</td></tr>
<tr><td>Final exam</td><td></td><td>50</td><td>During exam week</td></tr>
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<tr><td>Recommended Literature</td><td>Students will be provided.</td></tr>
<tr><td>Module Structure</td><td>Session Topic Preparation
1 Introduction to algorithms
2 Introduction to Python
3 Functions, scoping, and abstraction in Python;
4 Analyzing algorithms;
sorting algorithms
5 Introduction to git;
sorting algorithms
6 Object Oriented Programming
7 Object Oriented Programming
8 Elementary data structures
9 Elementary data structures
10 Structured data types in Python
11 Introduction to NumPy and Pandas</td></tr>
<tr><td>Usability in other Modules/Programmes</td><td>This introductory course to Software Engineering using Python builds the foundation for all other courses using programming.</td></tr>
<tr><td>Last Approval Date</td><td>2019/09/06</td></tr>
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