



## RTU Course "Data Structures"

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**General data**

Code	DIP203
Course title	Data Structures
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Undergraduate Studies
Course type	Academic
Field of study	Computer Science
Responsible instructor	Natālija Prokofjeva
Academic staff	Igors Ščukins Lāsma Lēruma-Gūtmane
Volume of the course: parts and credits points	1 part, 3.0 Credit Points, 4.5 ECTS credits
Language of instruction	LV, EN
Annotation	Concept and classification of data structures. Abstract data structures. Basic data structures. Linear data structures: arrays, lists, tables, stacks, queues. Non-linear data structures: trees and graphs. Logical and physical data structures. Pointers and lists. Simple linked list specification, representation and design. Double linked lists and their usage.
Goals and objectives of the course in terms of competences and skills	The aim of the course is to introduce data types and data structure (DS) specifications for data structures and methods of presentation techniques, with efficient algorithms for work with commonly used data structures. To teach students to choose optimal DS and algorithms and use them in practice in software development process. Students should clearly understand the concepts of data structures, meaning and classification principles. Students learn the DS display types and technologies. Students learn the DS model building and description of data structure design and implementation, students must be able to use it all in practice.
Structure and tasks of independent studies	Completion of laboratory work
Recommended literature	1. Gunārs Matisons. Datu struktūras. Lekciju konspekts. – Rīga: RTU Izdevniecība, 2008. – 192 lpp. 2. J. Kopitovs, S. Ivanova. Datu struktūras un algoritmi: mācību grāmata. 3. labotais izd. – Rīga: Transporta un sakaru institūts, 2005. – 96 lpp. 3. Sedgewick R., Wayne K. Algorithms. 4th edition. 2011. Available at: <a href="http://algs4.cs.princeton.edu/home/">http://algs4.cs.princeton.edu/home/</a> 4. Fundamental data structures. Available at: <a href="http://en.wikipedia.org/wiki/Book:Fundamental_Data_Structures">http://en.wikipedia.org/wiki/Book:Fundamental_Data_Structures</a> 5. Morin P. Open Data Structures: An Introduction. 2013. Available at: <a href="http://opendatastructures.org/">http://opendatastructures.org/</a> 6. Daniel Stubbs, Neil W. Webre. Data Structures with Abstract Data Types and Pascal. Brooks/Cole Publ. Company, 1989, Ca, p.404. 7. Mark Allen Weiss. DATA STRUCTURES & ALGORITHM ANALYSIS IN JAVATM. Florida International University, 1999.
Course prerequisites	Computer Lessons I, II.

**Course outline**

Theme	Hours
Subject aims and objectives. Data structure concept. Data type concept. Structure of the data classification.	4
Character strings, instantiation techniques. Character string specification, display and creation.	4
Descriptor. Arrays, their types, specification, representation and creation. Special arrays.	4
Records, records with variants. The entry specification, representation and creation.	4
The concept of linear data structures and types. Lists, their characterization and processing operations.	4
Vector form displayed on the list. Single-linked lists. Double-linked lists. Circular lists.	4
Stack concept. Stack pair specification, representation and creation.	4
Row concept. Circular row creation. Deque concept.	4
The concept of tree data structures and characteristics. Tree classification.	4
Binary tree classification of the types of representation and the establishment of principles.	4
Graph concept. Bypassing graph and its implementation types. Graph representation techniques.	4
Chronologically ordered list. Classified lists and binary search algorithm.	4

**Learning outcomes and assessment**

Learning outcomes	Assessment methods
Knows general questions about values and arrays.	Completed computerized knowledge test (theme "Indicators and arrays), that has been positively evaluated.

Knows the character string processing operations and their algorithms.	Completed the computerized knowledge test (theme "Character strings"), that has been positively evaluated.
Knows the lists of the display models, specifications and processing operations.	Completed the computerized knowledge test (theme "Lists"), that has been positively evaluated.
Knows the stack and queue processing operations.	Completed the computerized knowledge test (theme "stack and row"),that has been positively evaluated.
Is able to create and manage special arrays.	Independently completed and positively evaluated first laboratory work.
Is able to create various types of linear lists and to implement their processing functions.	Independently completed and positively evaluated second laboratory work.
Is able to create different types of data structures and carry out the processing functions.	Independently completed and positively evaluated third laboratory work.
Knows data structure concept, meaning and classification principles, as well as the data structure representation types and technologies.	Passed examination for which a positive evaluation has been received.

***Study subject structure***

Part	CP	Hours per Week			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	2.0	0.0	1.0		*	