2. Course Title: The theory of algorthms and data structures

3. Code:	**4. Type (lecture, lab etc.):** lecture+lab
5. Nr. of hours weekly: 4 hours (2 lectures+2 labs)	**6.**

7. Preconditions (max. 3 preceeding courses):

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8. How often is it offered: ☒Fall semester, ☐Spring semester, ☐both semesters

9. Maximal nr. of students:

10. Lecturer responsible (faculty, institute and department):

Dr. Kilián Imre (FAc. of Sciences, Institute of Informatics and Mathematics, Dept of Information Technology and Biorobotics)

11.Lecturers with their procentual rates:	Dr. Zaválnij Bogdán	100%

12. Course language: English

13. Learning outcomes:

The aim of the subject is that students may know the basic data structures, and their general algorithms, along with the most commonly used algorithm design paradigms.. Students, completing the course:

know the basic principles of the commonly used two families of data structures, namely the linear data structures (vectors, lists, collections), and the graphs, and they own the ability to represent them in computers, and to create appropriate algorithms for the most common tasks over them.

able to express and implement such algorithms

able to understand an algorithmic problem, and to decide the necessary algorithm creational paradigm, and to implement the algorithm

14. Course program, divided to 13 weeks:

1. hét: The concept of algorithms, their specification and implementation
2. hét: The efficiency of algorithms, and the mathematical means of characterizing them.
3. hét: The concept of types: simple, compound, finite, non-finite and scalar types.. Collection types.
4. hét: Linear data structures adatszerkezetek: tömb, verem és listaszerkezetek és műveleteik.
5. hét: Searching. Binary trees, hash tables and BTrees.
6. hét: Sorting (mergesort, insertion and quicksort).
7. hét: Heap data type and its operations. Heapsort and priority queues.
8. hét: The concept of graphs and their representation. Basic graph algorithms.
9. hét: Breadth-first and depth-first traversal of graphs
10. hét: Properties of traversal algorithms. Topological ordering. Strongly connected components and cliques.
11. hét: Shortest paths in weighted graphs. Dijkstra's and Bellman-Ford's algorithm
12. hét: Disjoint sets. Eager algorithms. Optimally weighted spawning trees.. Prim's and Kruskal's algorithm..
13. hét: Dynamic programming and its application for the optimization of chained-multiplication in matrices.

15. Special tasks during the semester:

16. Description of evaluation:

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17. Required reading:

1. T. Cormen, E. Leiserson, R. Rivest, Algorithms/New algorithms, MIT Press and McGraw-Hill. 1990.
2. Aho, Hopcroft, Ullman, Data structures and algorithms, Addison-Wesley 1983.

18. Proposed reading:

1. Knuth, D., The Art of Computer Programming. Addison-Wesley 2011.
2. N.Wirth: Algoriths+data structures=programs. Prentice Hall Series in Automatic Computation. 1985.

This course description has been made:	2017. március 15	**Made by:**	Dr. Kilián Imre lecturer
		Approved by:	