

## List of themes for the written exam “Evaluation of fundamental and specialty knowledge” for the bachelor degree exam

### Part 1. Algorithms and specifications. Classes of algorithms

- a. Search (sequential and binary search), sorting (selection, bubblesort, quicksort), backtracking method and divide et impera method;
- b. Algorithms and specifications. Write an algorithm starting from a given specification; recognize the algorithm in a given program. Given an algorithm it is required to: give its specification, give the result of its execution, give its correctness conforming to its specification;

### Part 2. Object oriented programming (OOP)

- a. OOP concepts in programming languages (C++, Java, C#): class and object, members of a class and access modifiers, constructors and destructors, derived classes, inheritance, method override, polymorphism, dynamic binding, abstract classes and interfaces;
- b. Class diagrams and object interactions in UML: packages, classes and interfaces, relationships between classes and interfaces, objects, messages.

### Part 3. Data structures

- a. Queues, stacks, lists, trees (binary trees). Specifications of typical operations (without implementations).
- b. Identify data structures and data types suitable (efficient) for solving the problems (only the data structures specified at a.)

### Part 4. Data bases

- a. Relational databases. First 2 normal forms of a relations
- b. Databases queries with relational algebraic operators
- c. Relational database management with SQL (Create table, Drop table, Alter table, Insert, Update, Delete)
- d. Relational database queries with SQL (Select)

### Part 5. Operating systems

- a. Structure and functions of operating systems
- b. File systems: hierarchical structure, links, case study Unix (Linux)
- c. Unix processes: create, functions fork, exec, exit, wait; communication through pipe and FIFO
- d. Command file interpreters with examples using sh (Unix)

### References:

#### Part 1, 2 and 3

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3. Frentiu, M., H.F. Pop, Serban G., *Programming Fundamentals*, Cluj University Press, 2006
4. Lambert, K.A., Nance, D.W., Naps, T.L. *Introduction to Computer Science with C++*, West Publishing Co., New-York, 1996
5. B. Stroustup, *The C++ Programming Language*, Addison Wesley, 1998
6. Eckel, B. *Thinking in C++*, www.bruceeckel.com
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8. Evans, E. *Domain-Driven Design: Tackling Complexity in the Heart of Software*, Addison Wesley 2003
9. Gamma, E, Helm, R. Johnson, Vlissides, J.: *Design Patterns - Elements of Reusable Object-Oriented Software*. Massachusetts: Addison-Wesley, 1994
10. Larman, C.: *Applying UML and Design Patterns: An Introduction to OO Analysis and Design*, Berlin: Prentice Hall, 2000

#### Part 3 and 4

11. Korth, H.F., Silbershatz, A., *Data Base System Concepts*. McGraw-Hill Book Compagny, 1986

12. Ramakrishnan, R., *Database Management Systems*. McGraw-Hill, 1998
13. Themstron, T. A. Weber, M. Hotek, *MS SQL Server 2008 - Database Development*, Self Paced Training Kit 2009
14. William Stallings, *Operating Systems: Internals and Design Principles*, 7th ed., Prentice Hall, 2011([www.WilliamStallings.com](http://www.WilliamStallings.com))
15. Tannenbaum, A. *Modern Operating Systems* 3rd Ed., Prentice Hall 2007
16. Silberschatz, A., Galvin, P. and Gagne, G. *Operating System Concepts*, John Wiley & Sons, Inc., 2002