"GHEORGHE ASACHI" TECHNICAL UNIVERSITY OF IAŞI
Faculty of Automatic Control and Computer Engineering
Department of Computer Science and Engineering
Competition for academic position of associate professor no. 11
Subjects: Algorithm design, Design paradigms for distributed applications

Thematic area
related to the the lecture from the thematic area
for the competition for the academic position of associate professor no. 11
from the posts of the staff of the Department of Computer Engineering
for the academic year 2024-2025

Algorithm design
- Algorithm evaluation. Amortized analysis.
- Divide-and-Conquer method.
- Greedy method.
- Dynamic programming method.
- Backtracking and Branch-and-Bound methods.
- Graph algorithms. Representation and systematic exploration.
- Topological sorting.
- Optimal paths in graphs. Dijkstra and Floyd-Warshall algorithms.
- Connected components.
- Spanning trees.

Design paradigms for distributed applications
- Enterprise platforms. Enterprise specifications.
- Enterprise clusters: architecture, partitions and sub-partitions, intelligent proxies, automatic discovery of nodes.
- Remote invocations, load-balancing, fail-over, fault tolerance, idempotent methods, resource replication.
- Design Patterns for the architecture of distributed applications.
- Design Patterns for the data transfer between sections of a distributed application.
- Design Patterns for transactions and persistence in distributed applications.
- Design Patterns for the client side in distributed applications.
- Layered architectures of distributed applications.
- Lightweight polymorphic object, lazy-loading, lazy-load groups.
- Anti-patterns.

Bibliography:

1) Dorel Lucanu, Mitică Craus: Proiectarea algoritmilor, Editura Polirom, 2008

2) Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein: Introduction to Algorithms, 4th Edition, MIT Press, 2022

3) Cristian A. Giumale: Introducere în analiza algoritmilor, Editura Polirom, 2004

4) C. Croitoru, Tehnici de baza in optimizarea combinatorie, Editura Univ. Al. I. Cuza Iasi, 1992

5) B.M.E. Moret, H.D. Shapiro: Algorithms from P to NP, Volume 1: Design & Efficiency, Benjamin/Cummings Publishing Company, Inc., 1991

6) Deepak Alur, John Crupi, Dan Malks: Core J2EE Patterns: Best Practices and Design Strategies, Second Edition, Sun Microsystems Press, 2003

7) Darren Broemmer: J2EE Best Practices. Java Design Patterns, Automation, and Performance, Wiley Publishing Inc., 2003

8) Cristian Butincu, Mitica Craus, Dan Galea: Architecting J2EE based Applications on Multiple Layers, International Journal of Computers, Communications & Control, Volume 1, Supplementare Issue - Proceedings of ICCCC 2006, Oradea, Romania, pp. 105-112, 2006

9) Bill Dudney, Stephen Asbury, Joseph Krozak, Kevin Wittkopf: J2EE AntiPatterns, Wiley, 2003

10) Floyd Marinescu: EJB Design Patterns, Advanced Patterns, Processes, and Idioms, Wiley Computer Publishing, John Wiley & Sons, Inc., 2002

11) Unmesh Joshi: Patterns of Distributed Systems, Addison-Wesley Professional, 2023.

12) Martin Kleppmann; Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems, O'Reilly Media, 2017

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