

# Napredni algoritmi i strukture podataka

Predavači i asistenti:

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|---------------------------|--|
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Administracija:

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Obavijesti:

- web-stranica predmeta <http://www.fer.hr/predmet/nasp>
- Zavod za primijenjeno računarstvo (III kat zgrade D)

# Literatura:

- većina gradiva može se naći u dvije knjige:
  - Adam Drozdek: Data Structures and Algorithms in C++, Thomson Course Technology 2005
  - Cormen, Leiserson, Rivest, Stein: Introduction to algorithms, 6<sup>th</sup> ed., MIT Press, 2005
- sve što je bilo preporučeno za ASP, npr.
  - Weiss: Data Structures and Algorithm Analysis in C, Addison Wesley, 1997
  - Sedgwick: Algorithms in C..., Addison-Wesley, 2001
  - D.E. Knuth, The Art of Computer Programming, Volumes 1-4, Addison-Wesley Professional
  - Wirth: Algorithms + Data Structures = Programs, Prentice-Hall, 1976
- sve što u naslovu ima *algorithm* ili *data structure*
- Internet i drugi izvori – oprezno!

## Dodatna literatura za uža područja:

- neuronske mreže
  - Simon Haykin: Neural Networks and Learning Machines, 3rd Edition, Prentice Hall 2009
  - E.K.P. Chong, S.H.Žak: An Introduction to Optimization, Wiley Interscience 2008, 3rd ed.
  - S.W. Smith: The Scientist and Engineer's Guide to Digital Signal Processing, California Technical Publishing, 1999
- optimizacije (linearno programiranje, genetski algoritmi)
  - E.K.P. Chong, S.H.Žak: ...
  - D.Kalpić, V.Mornar: Operacijska istraživanja, Biblioteka informacijsko društvo 1996.
  - Lawrence Davis: Handbook of Genetic algorithms, Van Nostrand Reinhold Company 1991
- stringovi
  - Dan Gusfield: Algorithms on Strings, Trees, and Sequences, Cambridge University Press, 1st edition 1997
  - S. Srbljić: Uvod u teoriju računarstva, Element Zagreb 2007.

# Predavanja

- Pohađanje predavanja je osnovno pravo i obaveza svakog studenta, ali tko neće, ne mora.
- Pohađanje ili nepohađanje predavanja nema nikakvog utjecaja na polaganje ispita i zajamčena prava studenata.
- Predavanja nikada nisu ista iz godine u godinu, a vi ih možete i pozvani ste prilagoditi ih sebi – zato postoje škole i nastavnici!

- Prisustvo (nazočnost) na predavanju se bilježi, ali samo da bismo brže upoznali studenata i time bolje prilagodili sve vidove našeg rada onima koji pokazuju istinsku želju za znanjem.
- Rad sa savjesnim studentima za nas je pravo zadovoljstvo i ostvarenje najplemenitije svrhe našeg životnog poziva!
- Savjetovanje (konzultacije): vrijeme i mjesto prema dogovoru.
- Razumljivo, tko ne pohađa predavanja ne može očekivati dodatni, pojedinačni rad nastavnika sa studentom, npr. savjetovanje.

## Ocjenjivanje – kontinuirana nastava:

- ukupno 100
- sudjelovanje u nastavi 8
- međuispit (prag 10,5 bodova) 42
- završni ispit (prag 15 bodova) 50
- za pozitivnu ocjenu (polaganje predmeta) treba ostvariti **barem 50** bodova i **barem 6 (2+2+2)** bodova iz laboratorijskih vježbi
- usmeni ispit u slučaju dvojbe *prolazak – pad* ili bilo kakvih nepredvidivih okolnosti

## Ocjenjivanje – ispitni rokovi

Uvjet za pristupanje: **barem 6 (2+2+2)** bodova iz laboratorijskih vježbi.

- ispiti su i pismeni i usmeni
  - udjeli: 50 bodova pismeni i 50 bodova usmeni
- za pristup usmenom ispitu potrebno je ostvariti barem 35 bodova na pismenom ispitu
- za pozitivnu ocjenu (polaganje predmeta), na ispitu treba ostvariti **ukupno barem 50** bodova

# Za usporedbu: MIT (<http://student.mit.edu/catalog/m6a.html>)

## **6.006 Introduction to Algorithms** (R. L. Rivest, S. Devadas)

Introduction to mathematical modeling of computational problems, as well as common algorithms, algorithmic paradigms, and data structures used to solve these problems. Emphasizes the relationship between algorithms and programming, and introduces basic performance measures and analysis techniques for these problems.

## **6.046J Design and Analysis of Algorithms** (C. E. Leiserson, M. Goemans)

Techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice. Topics include sorting; search trees, heaps, and hashing; divide-and-conquer; dynamic programming; greedy algorithms; amortized analysis; graph algorithms; and shortest paths. Advanced topics may include network flow; computational geometry; number-theoretic algorithms; polynomial and matrix calculations; caching; and parallel computing.

## **6.854J Advanced Algorithms** (D. R. Karger)

First-year graduate subject in algorithms. Emphasizes fundamental algorithms and advanced methods of algorithmic design, analysis, and implementation. Surveys a variety of computational models and the algorithms for them. Data structures, network flows, linear programming, computational geometry, approximation algorithms, online algorithms, parallel algorithms, external memory, streaming algorithms.



# Za usporedbu: Princeton

(<http://www.cs.princeton.edu/academics/catalog/grad>)

## **COS521 - Advanced Algorithm Design**

Advanced methods of algorithmic design and analysis; data structures, network flows, and linear programming. Solution of linear problems: Karmarkar and Ellipsoid algorithms. Probabilistic techniques. A selection of topics from on-line computation, approximation algorithms for NP-hard problems, number theoretic algorithms, geometric algorithms, and parallel computation.

## **COS525 - Mathematical Analysis of Algorithms**

Methods for determining the average-case performance of fundamental algorithms; ordinary and exponential generating functions, real asymptotics, complex asymptotics, singularity analysis, and Mellin transforms; and application to the analysis of Quicksort, hashing, binary tree search, digital search, communication protocols, multidimensional search, set merging, and other combinatorial algorithms. The course is intended to survey the major approaches and applications and to serve as an introduction to research in the field.

## **COS528 - Data Structures and Graph Algorithms**

Data structures and algorithms for graph and network problems, including disjoint set union, heaps, search trees, search on graphs, minimum spanning trees, shortest paths, network flows, and matchings. The intent of the course is to examine the most efficient algorithms known for a variety of combinatorial problems and to discover the principles underlying the design and analysis of these algorithms. The emphasis is on asymptotic worst-case and amortized analysis.

Slično i na Stanfordu.

(<http://cs.stanford.edu/courses>)