

SYLLABUS¹

1. Information about the Program

1.1 Higher education institution	Politehnica University of Timișoara
1.2 Faculty ² / Department ³	Automation and Computers/ Computers
1.3 Chair	-
1.4 Domain of study	Computers and Information Technology
1.5 Study level	Bachelor
1.6 Study programme / Qualification	Computers / engineer

2. Information about the Course

2.1 Course	Algorithms design and analysis						
2.2 Lecturer	Conf. dr. ing. Ioana Sora						
2.3 Academic staff for seminars/labs	Conf. dr. ing. Ioana Sora						
2.4 Study year	2	2.5 Semester	2	2.6 Assessment type	E	2.7 Course type	Mandatory

3. Total time estimated (hours/ semester of didactical activities)

3.1 Hours / week	4	of which:	3.2 lecture hours	2	3.3 seminar/lab hours	2
3.4 Total curriculum hours	56	of which:	3.5 lecture hours	28	3.6 seminar/lab hours	28
Time distribution						hours
Study using manuals, support materials, bibliography and notes						14
Supplementary documentation in library, speciality electronic platforms and on site						14
Supplementary preparation for seminars/labs, homeworks, reviews, portofolios and essays						14
Tutoring activities						7
Exams						3
Other						
3.7 Total - hours of individual study						52
3.8 Total - hours per semester						108
a. Credits						5

4. Prerequisites (if appropriate)

4.1 curriculum	<ul style="list-style-type: none"> Computer programming, Object Oriented Programming, Programming Techniques, Data Structures and Algorithms
4.2 competencies	<ul style="list-style-type: none"> Operarea cu fundamente științifice, ingineresti și ale informaticii

5. Conditions (if appropriate)

5.1 for lectures	<ul style="list-style-type: none"> Average or big classroom. Materials: laptop, whiteboard, projector
5.2 for seminars/labs	<ul style="list-style-type: none"> 15-20 PCs, Programming environments for different languages (Java, C#, C++, C), whiteboard

1 Formularul corespunde Fișei Disciplinei promovată prin OMECTS 5703/18.12.2011 (Anexa3);
 2 Se înscrie numele facultății care gestionează programul de studiu căruia îi aparține disciplina;
 3 Se înscrie numele departamentului căruia i-a fost încredințată susținerea disciplinei și de care aparține titularul cursului;

6. Specific competencies acquired

Professional competencies ⁴	<ul style="list-style-type: none"> • Operarea cu fundamente științifice, ingineresti și ale informaticii • Proiectarea componentelor hardware, software și de comunicații • Soluționarea problemelor folosind instrumentele științei și ingineriei calculatoarelor • Îmbunătățirea performanțelor sistemelor hardware, software și de comunicații
Transversal competencies	<ul style="list-style-type: none"> • Comportarea onorabilă, responsabilă, etică, în spiritul legii pentru a asigura rezolvarea problemei • Demonstrarea spiritului de inițiativă și acțiune pentru actualizarea cunoștințelor profesionale, economice și de cultură organizațională

7. Objectives of the course (issued from the list of the competencies acquired)

7.1 Aim	<ul style="list-style-type: none"> • To provide an introduction to design and analysis of algorithms
7.2 Specific objectives	<ul style="list-style-type: none"> • Understanding and using the fundamental methods for algorithm design and analysis.

8. Content

8.1 Lecture	Hours	Instruction methods
1. Introduction	3	Slide-based presentations, discussions, examples.
1.1. Techniques for analyzing complexity of algorithms		
1.2. Proving the correctness of algorithms		
2. Design by induction	2	
3. Dynamic programming	2	
4. Binary Search Trees	2	
5. Balanced Binary Search Trees (AVL trees, Red-Black trees)	2	
6. Advanced Tree Data Structures	3	
7. Union-Find Data Structures	2	

⁴ Aspectul competențelor profesionale va fi tratat cf. Metodologiei OMECTS 5703/18.12.2011. Se vor prelua competențele care sunt precizate în Registrul Național al Calificărilor din Învățământul Superior RNCIS (http://www.rncis.ro/portal/page?_pageid=117,70218&_dad=portal&_schema=PORTAL) pentru domeniul de studiu de la pct. 1.4 și programul de studii de la pct. 1.6 din această fișă.

8. Algorithms for data compression 8.1. Huffman codes 8.2. LZW coding	2	
9. The Graph abstract data type	2	
10. Graph traversal algorithms	2	
11. Articulation points, biconnected components	2	
12. Minimum spanning trees	2	
13. Shortest paths	2	

References

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, *Introduction to Algorithms*, 3rd Ed, MIT Press, 2009.
2. Thomas Cormen, *Algorithms Unlocked*, MIT Press, 2013.
3. Udi Manber, *Introduction to Algorithms - A Creative Approach*, Addison Wesley 1989

8.2 Seminar/lab	Hours	Instruction methods
1. Techniques for analysing time complexity of algorithms	2	Short presentation, discussions, implementation
2. Proving correctness of algorithms	2	
3. Design by induction	2	
4. Dynamic programming	2	
5. Binary Search Trees	2	
6. Balanced Binary Search Trees	2	
7. Advanced Tree Data structures	4	
8. Algorithms for data compression	2	
9. Union-find data structures	2	
10. Graphs	2	
11. Minimum Spanning Trees	2	
12. Shortest Paths	2	

References

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, *Introduction to Algorithms*, 3rd Ed, MIT Press, 2009.
2. Thomas Cormen, *Algorithms Unlocked*, MIT Press, 2013.
3. Udi Manber, *Introduction to Algorithms - A Creative Approach*, Addison Wesley 1989.

9. Correlation between the course content and the requirements of the specialists in the field and the expectations of the main employers

The knowledge acquired is expected to be particularly useful to the students working in the field of software development.

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in final mark
10.4 Lecture	Answers to questions related to the content of the lectures	Written exam	66%

10.5 Seminar /labs	Solving the problems given during the labs	Describing the proposed solution, answering questions	20%
	Homeworks (assignments)	Describing the proposed solution, answering questions	10%
	Presence	Presence monitoring	4%
10.6 Minimal performance standards (minimal specific knowledge required for passing the exam, the means to assess mastering the specific knowledge)			
<ul style="list-style-type: none"> Minimum performance standard is to prove the understanding of the basic knowledge of algorithm design and analysis that contribute to problem solving. 			

11. International compatibility

1. MIT, Introduction to Algorithms, http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-introduction-to-algorithms-sma-5503-fall-2005/ 2. University of Stanford, Design and Analysis of Algorithms, http://web.stanford.edu/class/cs161/index.html 1.
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Date	Signature of the course instructor	Signatures of the academic staff for seminars/labs
	Conf. dr. ing. Ioana Sora	Conf. dr. ing. Ioana Sora

Date of approval in the Department	Signature of the Department Director
	Prof. dr. Ing. Vladimir Ioan CREȚU
