

CANS Master, Spring 2012 Visiting Professors' Seminars

SEMINAR 22

Metaheuristics and approximation algorithms in computer networks (1 ECTS)
Prof Paola Festa (University of Napoli FEDERICO II, Italy)

DATES:

DELAYED

Course topics:

This course identifies topics that are both fundamental to computer networks and relevant to the design of the Internet of the future. The emphasis is always on insights that will be useful to the graduate student, whether he/she goes on for a PhD or joins a telecom company.

The course will cover advanced metaheuristics topics related to the most studied approaches such as genetic algorithms, simulated annealing, tabu search, variable neighborhood search, greedy randomized adaptive search procedures (GRASP), path relinking, and scatter search.

Comparison of the performance of metaheuristic vs. exact methods will allow students to understand when and why use approximate algorithms, whereas metaheuristics comparison will allow to understand why some metaheuristic perform better for some problems. Finally, advanced techniques and/or parameter tuning will be considered. Implementation issues will be discussed, illustrating how parallelism can be exploited.

Special attention will be devoted to hard combinatorial optimization problems arising in computer networks.

SEMINAR 25

Compilation for FPGA and the maxeler approach (2 ECTS)

Prof Veljko Milutinovic and Prof Sasa Stojanovic (University of Belgrade)

DATES:

May 14th from 14:00 to 19:00 h. room C6-E106

May 15th from 15:00 to 17:00 h. room C6-E106

May 16th to 18th from 15:00 to 16:00 h. room C6-E106

Course topics:

1. Nested loops with operations on array elements
2. Conditional processing of array elements
3. Iterative equation solver
4. Multiplication of two matrices stored in local DRAM
5. Pattern matching
6. Iterating through 3D data structures

SEMINAR 23

Optimization of large-scale computer networks (2 ECTS)

Prof Michal Pioro (Warsaw University of Technology, Poland)

DATES:

DELAYED

Course topics:

This course identifies and addresses topics that are both fundamental to computer networks and relevant to the design of the Internet of the future. The emphasis is put on insights that will be useful to graduate students, whether he/she goes on for a PhD or joins a company. The following topics will be covered:

I. Large-scale optimization

- I.1. Linear programming, integer programming and combinatorial optimization
- I.2. Branch and Bound (B&B) approach
- I.3. Relaxations and decomposition methods: Lagrangian relaxation, column generation, and Dantzig-Wolfe and Benders' decompositions.
- I.4. B&B “enriched” algorithms (branch and cut, branch and price)

II. Applications to computer networks

1. Network design problem modeling
2. Location and topological design
3. Restoration and protection design of resilient networks
4. Multi-hour and multi-time-period network modeling and design
5. Multi-layer networks: modeling and design

SEMINAR 24

Implementation of Multi-core programming models: advanced topics (3 ECTS)
Prof Dimitris Nikolopoulos (Queen's University, Belfast UK)

DATES:

May 24th to May 25th from 15:00 to 18:00 h. room C6-E106

May 29th to June 4th from 15:00 to 18:00 h. room C6-E106

June 5th from 15:00 to 17:00 h. room C6-E106

(Please note that May 28th is a festivity)

Course topics:

The course discusses selected advanced topics concerning the implementation of high-level parallel programming languages and models, for multi-core computing systems. We will explore implementation aspects of programming models that exploit various forms of structured or unstructured parallelism, using high-level language abstractions or directives. We will focus on programming models that expose a shared, global address space to programmers, which hides explicit communication from programmers (such as OpenMP, Cilk, TBB, task-based dataflow execution models, and Partitioned Global Address Space languages). The topics covered in the course concern mainly the implementation of the language's runtime system. The specific topics that the course discusses include:

- Efficient synchronization algorithms and mechanisms
- Scheduling for performance, locality and other optimization criteria
- Speculative execution
- Energy-efficient implementation of the runtime system
- Scalable memory management
- Memory models and programming model semantics
- Correctness and debugging issues
- Fault-tolerance and reliability
- Deterministic execution

SEMINAR 1

Issues in Computer Architecture and Microarchitecture for Future Computing Machines (3 ECTS)

Prof. Yale N. Patt (University of Texas at Austin, USA)

DATES:

June 18: 15:00 to 19:00 room C6-E106 (Intro, focus, calibration)

June 19: 15:00 to 18:00 room C6-E106 (Tradeoffs: ISA, Microarchitecture, System)

June 20: 15:00 to 18:00 room C6-E106 (Run-time mechanisms)

June 21: 15:00 to 18:00 room C6-E106 (Compile-time mechanisms)

June 22: 15:00 to 18:00 room C6-E106 (Parallelism: uniprocessor)

June 25: 15:00 to 18:00 room C6-E106 (Parallelism: multi-processor)

June 26: 15:00 to 18:00 room C6-E106 (State-of-the-art designs: GPUs and other)

July 02: 15:00 to 18:00 D6-114 (Mega-nonsense and the future)

July 04: 12:00 to 14:00 and 15:00 to 18:00 D6-114 (project presentations)

July 06: 15:00 to 16:00 D6-114 (discussion final exam)

Description:

This course identifies topics that are both fundamental to computer architecture and relevant to the design of microprocessors of the future. The emphasis is always on insights that will be useful to the graduate student, whether he/she goes on for a PhD or joins a microprocessor design team. We will deal with principles, tradeoffs, and implementation details. We will cover mechanism (e.g., trace caches, helper threads, branch prediction, bandwidth). We will discuss the implications of multi-core on future microprocessor design. We will examine current state of the art microprocessors. In addition to the class lectures/discussions, students will carry out an out-of-class project and make a presentation on what they learn to the class. There will be a written final examination that will be taken outside of class and turned in prior to the final class meeting.

SEMINAR 8

HiPEAC Summer School Seminars (3 ECTS)

Local organizer contact: Prof. Nacho Navarro (UPC)

ACACES 2012

Eighth International Summer School on Advanced Computer Architecture and
Compilation for High-Performance and Embedded Systems

July 8th to July 14th 2011 Fiuggi (Italy)

Organized by the HiPEAC Network of Excellence
<http://www.hipeac.net/summerschool>