



Syllabus

ALaRI

Master of Engineering in Embedded Systems Design

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SOFTWARE COMPILERS

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Dates of the course

First Quarter, October/November 2001, 36hours

Overview of the course

Course abstract

Intended for demanding compiler users rather than compiler designers, the course presents the essentials of compiler organization, alternating class and lab sessions.

Topics

- Building blocks and interfaces of front-ends and back-ends
- Front-ends: scanning, parsing, semantic analysis, Intermediate representations
- Optimization and program transformation: data-flow analysis, loop transformations

- Target dependent transformations: code generation, register allocation, parallelisation, scheduling.
- Interpreters: Abstract machines, ByteCode.

Laboratories

Lab sessions cover classical compiler-compiler tools for scanner and parser generation (flex, bison), tools for semantic analysis (Grammatica-Atelier), portable front-ends for C (SUIF), optimizers, advanced back-end modules (MachineSUIF and Trimaran), and abstract interpreters for Java ByteCode.

Timetable

Duration: 20 hours of class lectures + 16 hours of laboratory

Detailed planning

TOPIC	Detail	Class hours	Lab hours
Compiler architecture	Building blocks and interfaces	2	0
Front-ends		6	6
	Scanner, flex Parser, bison Semantic analysis, Grammatica		
Program transformation		4	4
	Data-flow analysis Reaching definitions Liveness analysis Loop transformations Lab (SUIF)		
Target dependent parts		6	4
	Register allocation Code generation Parallelisation Scheduling Lab (Trimaran, Machines SUIF)		
Interpreters			
	Byte Code machine	2	2
TOTALS		20	16

Textbooks

A. Appel, Modern compiler implementation in C, CUP, 1999

A. Appel, Modern compiler implementation in Java, CUP, 1999

Supplementary reading material:

S. Muchnick, Advanced compiler design and implementation, Morgan Kaufman, 1997

M. Scott, Programming language pragmatics, Morgan Kaufman, 2000.

Instructors

Prof. S. Crespi Reghizzi

Lab Assistants: Giampaolo Agosta, Vincenzo Martena

Notes on the Instructor

S. Crespi Reghizzi, a member of the faculty of Politecnico di Milano, Dept. of Electronics and Information, is engaged on basic and technological research on compilers. His interests encompass formal languages and automata, compiler optimization and parallelization, programming languages, and man-machine interfaces. He has written many scientific publications in the areas above. He is the chairman of the Ph.D. program in Information Technology of Politecnico di Milano, the director of CESTIA (CNR research center on computer and automation technology), and a lecturer on Formal Languages at Università Della Svizzera Italiana. He has been involved on research projects with several companies and universities, including Università di Pisa, UC (Berkeley, Los Angeles), Stanford University, Université de Paris, and Harvard University.