

Static Program Analysis

Class codes:

- **DCC831** - Graduate program in computer science
- **DCC030** - Undergraduate program in computer science
- **DCC049** - Undergraduate program in information systems

Name of class: Static Program Analysis - (**Course given in English**)

Professor: Fernando Magno Quintão Pereira

Audience: grad/undergrad students

Syllabus: Program representations; Code optimizations; The data-flow monotone framework; constraint-based analyses; Alias and points-to analysis; Lattice theory; Abstract interpretation; Register allocation algorithms; Static single assignment form; Sparse data-flow analyses; Static analyses for GPUs; Dynamic analysis in JIT compilers; Automatic theorem verification; Type systems and type inference; The LLVM compilation infrastructure.

Class	Date	Subject	Format
1	Mar 29th	Introduction	Classroom
2	Mar 31st	Control flow graphs	Classroom
3	Apr 05th	Dataflow analyses	Classroom
4	Apr 07th	Algorithms to solve dataflow analyses	Classroom
5	Apr 12th	Lattice theory	Classroom
6	Apr 14th	Partial redundancy elimination	Classroom
7	Apr 19th	Constraint based analysis	Classroom
8	Apr 21st	Pointer analysis	Classroom
9	Apr 26th	Loop optimizations	Classroom
10	Apr 28th	Static single assignment form	Classroom
11	May 03rd	Sparse abstract interpretation	Classroom
12	May 05th	Tainted flow analysis	Classroom
13	May 12th	Paper discussion	Classroom
14	May 17th	Review class	Classroom
15	May 19th	Midterm exam	Remote

Class	Date	Subject	Format
13	May 24th	Range analysis	Classroom
17	May 26th	Program slicing	Classroom
18	May 31st	Predictive Compilation	Classroom
19	Jun 02nd	Operational semantics	Classroom
20	Jun 07th	Type systems	Classroom
21	Jun 09th	Mechanical validation of theorems with Twelf	Classroom
22	Jun 14th	Type inference	Classroom
23	Jun 16th	Just-in-time compilers	Classroom
24	Jun 21st	Register allocation	Classroom
25	Jun 28th	SSA-based register allocation	Classroom
26	Jun 30th	Correctness	Classroom
27	Jul 05th	Divergence analysis	Classroom
28	Jul 07th	Paper discussion	Classroom
29	Jul 12th	Review class	Classroom
30	Jul 14th	Final exam	Remote

Supporting material: <https://homepages.dcc.ufmg.br/~fernando/classes/dcc888>

Bibliography: Principles of Program Analysis, Nielsen & Nielsen. For more related books, see: <https://homepages.dcc.ufmg.br/~fernando/classes/dcc888/biblio.html>

Evaluation: Two take-home exams worth 20 points each. For examples, see: <https://homepages.dcc.ufmg.br/~fernando/classes/dcc888/grading.html>.

Project assignment:

<https://homepages.dcc.ufmg.br/~fernando/classes/dcc888/assignment/>.

Homeworks: 24 exercises, available at:

<https://homepages.dcc.ufmg.br/~fernando/classes/dcc888/ementa/>.

Online classes: videos on YouTube, with links available at:

<https://homepages.dcc.ufmg.br/~fernando/classes/dcc888/ementa/>.

Paper discussion: two sessions of paper discussion. For more info, see:

<https://homepages.dcc.ufmg.br/~fernando/classes/dcc888/discussion.html>.