

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 13th	Introduction	Classroom
2	Mar 15st	Control flow graphs	Classroom
3	Mar 20th	Dataflow analyses	Classroom
4	Mar 22nd	Algorithms to solve dataflow analyses	Classroom
5	Mar 27th	Lattice theory	Classroom
6	Mar 29th	Partial redundancy elimination	Classroom
7	Apr 03rd	Constraint based analysis	Classroom
8	Apr 05th	Pointer analysis	Classroom
9	Apr 10th	Loop optimizations	Classroom
10	Apr 12th	Static single assignment form	Classroom
11	Apr 17th	Sparse abstract interpretation	Classroom
12	Apr 19th	Tainted flow analysis	Classroom
13	Apr 24th	Paper discussion	Classroom
14	Apr 26th	Review class	Classroom
15	May 03rd	Midterm exam	Remote

Class	Date	Subject	Format
13	May 08th	Range analysis	Classroom
17	May 10th	Program slicing	Classroom
18	May 15th	Predictive Compilation	Classroom
19	May 17th	Operational semantics	Classroom
20	May 22nd	Type systems	Classroom
21	May 24th	Mechanical validation of theorems with Twelf	Classroom
22	May 29th	Type inference	Classroom
23	May 31st	Just-in-time compilers	Classroom
24	Jun 05th	Register allocation	Classroom
25	Jun 07th	SSA-based register allocation	Classroom
26	Jun 12th	Correctness	Classroom
27	Jun 14th	Divergence analysis	Classroom
28	Jun 19th	Paper discussion	Classroom
29	Jun 21st	Review class	Classroom
30	Jun 26th	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>.