

Mathematics for Computer Scientists 2 (G52MC2) L01 : Intro

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What is this course about?

- The precise art of **formal reasoning**
- **Propositional logic** as the scaffolding of reasoning
- Foundational issues: **classical** vs **intuitionistic** logic
- Express yourself precisely using the language of **predicate logic**
- Proof techniques: reasoning by cases, proof by **induction**
- **Algebra**: reasoning with equality
- Use a proof assistant (**COQ**) to formalize proofs
- Reasoning about **programs and data structures**

What is COQ?

- COQ: a Proof Assistant based on the *Calculus of Inductive Constructions*
- Developed in France since 1989.
- Growing user community.
- Big proof developments:
 - Correctness of a C-compiler
 - 4 colour theorem

Why using a proof assistant?

- Avoid holes in paper proofs.
- Provide additional evidence that the construction is correct.
- Aid understanding.
- Formal certification of software and hardware.

- Download COQ from <http://coq.inria.fr/>
- Runs under MacOS, Windows, Linux
- coqtop : command line interface
- coqide : graphical user interface
- proof general : emacs interface
- coqtop and coqide installed on the lab machines

- Coq Reference manual:
`http://coq.inria.fr/V8.1p13/refman/`
- Coq Library doc:
`http://coq.inria.fr/library-eng.html`
- Coq FAQ: `http://coq.inria.fr/V8.1/faq.html`
- Course page:
`http://www.cs.nott.ac.uk/~txa/g52mc2/`
- *Coq'Art*, the book by Yves Bertot and Pierre Casteran (2004).
available in the library!

- Coq Labs: every Tuesday (1200 - 1300) in A32.
- Weekly coursework, 1st available on Tuesday.
- Subsequent courseworks: set Tuesday after the lecture, deadline next Tuesday before the lecture.
- Use online submission system (cw).
- Set 8 courseworks, count only the 5 best
- No extensions.
- Online coursework under exam conditions in December.
- Together: 50% of the marks.
- Coursework marks will be available on the webpage.
- Tutorials: start next week, keep registers.
- Paper exam (50 %).