

Informatics 1 Semester 1 2008–9

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What is Informatics?

“Informatics is the study of the structure, behaviour, and interactions of natural and engineered computational systems.”

This encompasses:

Computer science: the analysis of computation; the design and use of computing systems

Artificial intelligence: understanding, modelling and emulating intelligent behaviour

Cognitive science: the computational study of natural cognitive systems

Some issues in Informatics research

Moore's Law

The number of transistors that can be placed inexpensively on an integrated circuit doubles in size every two years.

This was observed by Intel co-founder G.E. Moore in 1965. He predicted this trend would continue for a further ten years.

It has continued for 43 years.

Question: For how much longer can Moore's law continue before fundamental physical limitations are reached?

Question: What other factors are likely to play a role, e.g., economics, power efficiency, reliability? Will new technologies help?

Biological computation

Question: Can we recreate the extraordinary power of biological computational systems (such as the brain) by building biological computers?

Question: Can we use the power of current computational technologies as a tool for simulating and studying biological systems?

The latter question connects informatics with the field of **systems biology**. This is a major focus of research in the School of Informatics.

Computational efficiency

Question: Is it possible to efficiently compute the prime factorization of a large integer?

If the answer to this question is shown to be positive then much current encryption technology will become unsafe.

Question: Can one mathematically prove that no such efficient computation is possible?

This is related to the mathematical question of whether the equality

$$P = NP$$

holds between two important computational complexity classes.

There is a \$1,000,000 prize for solving this mathematical question:

<http://www.claymath.org/millennium/>

Quantum computation

A quantum computer would exploit the astonishing properties of quantum mechanics in physics to perform a remarkable kind of massively parallel computation (based on the notion of quantum superposition).

Shor's algorithm developed in 1994 shows that it is possible for quantum computers to efficiently find the prime factorization of an integer.

Question: Is it possible to build a quantum computer?

Many more questions

Question What is intelligent behaviour? For example, how do we see, think, solve problems, communicate?

Question How can we imitate intelligence in computer systems?

Question How can we best interact with computer systems?

Question How do we specify what computer systems should do and how can we be sure that they do it?

In addressing such areas and questions, informatics connects with: engineering, mathematics, physics, chemistry, biology, linguistics, psychology, philosophy, ...

Informatics 1

Informatics 1 is composed of four courses, two in Semester 1 and two in Semester 2.

Semester 1

Computation and Logic

Introduces the notions of computation and specification using finite-state systems and propositional logic

Functional Programming

Provides an introduction to programming, and uses examples related to Computation and Logic, and across the breadth of Informatics

Semester 2

Data and Analysis

Provides an introduction to collecting, representing and interpreting data across a range of Informatics.

Object-oriented Programming

Will enable you to develop programs in Java that support experimentation, simulation and exploration in relation to Informatics

Semester 1 Course activities

Lectures

4 lectures per week:

- Functional Programming: Monday 2pm (AT LT1) and Tuesday 11am (AT LT3)
- Computation & Logic: Thursday 11am (AT LT3) and Friday 2pm (AT LT1)

You are strongly encouraged to attend all lectures.

Course Notes

Copies available from the Informatics Teaching Office, 4.02, Appleton Tower.

Computer Laboratories and Lab Week

Tomorrow's Inf1 lecture (2pm Friday 26th September AT LT1) is a special introductory lecture to the Informatics computer system.

This will be followed by a special assisted session (3-5pm) in the computer laboratories intended for students who feel they will most benefit from assistance.

Next week, 29 September to 3rd October, is Informatics 1 **Lab Week**. All students are required to use the Computer Labs during Lab Week, and to submit an answer to the Lab Week Exercise (which will be handed out in the first Functional Programming Lecture on Monday 29th).

Computing facilities for Informatics 1 are available in the Computer Laboratories on Levels 4 and 5 of Appleton Tower.

Demonstrators are available in labs to help with computing-related problems, and offer general assistance with questions on course material and exercises (for any of the Informatics 1 courses).

Informatics 1 demonstrators are available at the times below.

Monday	3–5pm	Computer Lab West, AT Level 5
Tuesday	2–5pm	CLW
Wednesday	2–5pm	CLW
Thursday	2–5pm	Computer Lab South, AT Level 5
Friday	3–5pm	CLW

Tutorials

Two one-hour tutorials each week:

- Computation and Logic on Tuesday/Wednesday
- Functional Programming on Thursday/Friday

Tutorials provide a forum for in-depth discussion and analysis of course material in a small group. They are based around weekly exercise sheets. Attempted solutions to exercises should be brought to tutorials and will be discussed there.

Attendance at tutorials is **compulsory**.

Because next week (Week 2) is Lab Week there are no tutorials.

Tutorials start in Week 3 and run until the end of Week 11

You will be contacted by email next week with your assigned tutorial times. You should change this only if you cannot attend it because of a timetable clash.

(It is **very important** that you regularly check your SMS email account)

Assessment

Functional Programming

This is assessed in two components.

- A **programming class test** held in the lecture on Monday 27th October. This contributes **10%** to the mark for the course.
- A two-hour computer-based **programming exam**, held during the exam period (8–19 December). This contributes **90%** to the mark for the course.

A mock programming exam will be held in Week 10.

Computation and Logic

This is assessed by:

- A two-hour **written exam**, held during the exam period (8–19 December). This contributes the full **100%** of the mark for the module.

Requirements for passing

For both FP and CL the **pass mark** is 40% (this is a University standard).

Feedback on progress

The following mechanisms will allow you to assess your progress on the courses as they progress.

- **Tutorial exercises.** These will be discussed weekly in tutorials. They provide a means for obtaining rapid feedback on your progress, and also for highlighting areas that need attention.
- **The Programming Class Test** of 27th October will be marked and returned to you.
- A **coursework assignment** on Computation and Logic, which will be handed out in Week 8, and must be handed in by noon on Friday 21st November (Week 9). Marked solutions will be available for discussion in Week 11 tutorials.
- The **mock programming exam** in Week 10. This will be marked and returned to you in Week 11 tutorials.

For more detailed information, **read course guide!**

This will be kept up-to-date on the Informatics 1 homepage:

<http://www.inf.ed.ac.uk/teaching/courses/inf1/>

You should look at this webpage frequently. The Informatics student page

<http://www.inf.ed.ac.uk/teaching/>

is another useful source of information.

Other important ways to keep in touch:

- Read email regularly — we may use email to contact you.
- Read and contribute to the Inf1 newsgroups. (See webpage for details).

Be a Class Rep!

Class representatives are appointed to represent the views of students to staff.

By conveying student opinion about the courses, or by alerting staff to student issues that they are unaware of, class reps can make a real difference to how Informatics 1 functions.

The duties of a class rep include:

- Being available and approachable to receive feedback, comments and suggestions about the course from other students.
- Attending a mid-semester staff-student liaison meeting along with all Informatics 1 staff.

Class reps will be appointed during one of the early lectures.