Purpose of this course

• To introduce computer programming using a high level programming language.

• Course:
  – Uses the C programming language
  – Course is practically based.
  – Lectures support laboratories
  – Labs run for all of Autumn and Spring Terms and weeks 2-5 of Summer Term
  – 12 Lectures over Autumn and Spring Terms
  – Two assessments
Administrative Details - Laboratory sessions

- Lab sessions are compulsory!
- Jonathan Dell is the lab co-ordinator
- Demonstrators are available for help – USE THEM!
- One, two-hour laboratory per student per week
- Two timetabled sessions per week: In Goodricke G/169
- Music students
  - Examples and assessments are music based using sound card MIDI interfaces
  - **Please bring personal stereo headphones**
- TO FIND OUT WHICH DAY YOU SHOULD ATTEND
  - PLEASE CHECK THE CLASS LISTS ON THE NOTICE BOARDS

### Autumn Term Timetable

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<th>Week</th>
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Lab work

• Much of the lab exercises relate to the creation and manipulation of graphical objects (stick men, projectiles,…)
• Music technology students have special exercises included in the lab scripts relating to MIDI

About learning

“The only learning which significantly influences behaviour is self-discovered, self-appropriated learning. Such self-discovered learning (i.e truth) that has been personally assimilated in experience cannot be directly communicated to another”

[adapted from ‘The Carl Rogers Reader’, (edited by Howard Kirschenbaum and Valerie Land Henderson), published by Houghton Mifflin Co.]
Microprocessor: what’s under the hood

- Inside every computer is a microprocessor made of millions of silicon transistors
- Processors carry out operations in binary
  - Basically they just carry out operations on binary numbers and move numbers between registers (memory)
- It is pretty hard to get a computer to do anything interesting if humans have to think about binary numbers
- Further reading:
  - http://en.wikipedia.org/wiki/Main_Page

Programming languages

- A programming language is used for instructing computers (to solve problems): high or low level
- **High level languages** use statements to express a required operation. They are easier to construct and resemble English
  - area = PI * radius * radius;
- **Assembler** (low level) represents machine code operations and data with mnemonics
  - SUB AX,BX
  - MOV CX,AX
  - MOV DX,0
- **Machine code** uses primitive operations (lowest level)
  - purely binary codes: processor specific
  - 0010101111000011
  - 1000101111001000
  - 101110100000000000000000
Pseudo-code: making tea

1. Program: make tea
2. Heat water
3. Warm teapot
4. Put tea in teapot
5. Fill teapot with hot water
6. Leave to stand
7. Pour tea

Making tea: more detail

1. Program: make tea
2. Heat water
   1. Fill electric kettle
   2. Switch on power
   3. Wait until water boils
3. Warm teapot
   1. Pour small amount of water from kettle into teapot
   2. Wait 1 minute
   3. Empty teapot
4. Put two teabags in teapot
5. Fill teapot with hot water
6. Leave to stand for 2 minutes
7. Pour tea
Making tea: even more detail

1. Comment: Program to make tea
2. Function Heat_water
   if kettle is not full
      Fill kettle
      Switch on power
   if water temperature < 100
      heat water
   else
      switch off power
3. Function: Warm teapot
   pour 100 ml of hot water from kettle into teapot
   While stopclock < 1
      wait
   Empty teapot

Making tea in C!

```c
void fill_kettle(void)
{
    /* need some code here */
}

int main(void)
{
    int kettle_full, power;
    double water_temperature;
    if (!kettle_full)
        fill_kettle();
    power=1;
    if (water_temperature>99.9)
        power=0;
    return 0;
}
```
Examples of Syntax

• C, statements must terminate with a semicolon. You can group multiple statements by surrounding them with braces {}, {}. Variables declared within braces are local to those braces and go out of scope when the closing brace is reached.

• The `if` statement
  
  ```c
  if ( <condition> ) <statement1>;
  if ( <condition> ) <statement1>;
  else <statement2>;
  ```

Why C, anyway?

• general purpose
• widely used
• good base for object oriented languages C++ and Java

• Overview of the C Programming Language
  • Developed in 1972 by Dennis Ritchie
  • High level
  • Block structured
  • Procedural
  • Small
  • Many additional libraries
  • Closely associated with the Unix operating system
In the bad old days there was no IDE!

- IDE stands for Integrated Development Environment
- It is a piece of software that allows you to:
  - Write your programs with a text editor
  - Compile your programs
  - Link in predefined libraries and other programs
  - Run your programs
  - Manage your programs
  - Debug your programs
  - Provides help about the language

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