Academic Preparations
for Future Networked Systems Strand

Document updated April 2024

The following details some of the pre-requisites of this strand. Some if these are for specific modules, while other apply to the strand as a whole.

CS7NS1 Scalable Computing

The students are expected to be competent programmers in at least one high level programming language (e.g. Haskell, Python, Java, C++, C# etc.), and ideally with some familiarity with functional programming styles. Previous experience with concurrent programming is beneficial but concurrency will be reviewed in the module. The module will use Haskell as a baseline programming language, and students will be expected to deliver working programmes in that language. No prior experience with Haskell is necessary. [Update: July 2018 :Note that the teaching team is changing on this module in 2018/19 – a new module descriptor will be in place shortly – it is likely that Haskell will not be used]

CS7NS2 Internet of Things

1 C Programming Language

You must be a competent programmer to take CS7NS2. The module will use the C programming language extensively so you should be familiar with either C or C++ before starting the module. If your programming experience has been with other languages, you should familiarise yourself with C before starting CS7NS2. There are many websites, textbooks, videos and online courses designed for experienced programmers to learn C. For example, C Programming on Wikibooks[1] provides a very concise C tutorial, structured around short examples of the syntax.

Another online tutorial is available on tutorialspoint.com. Learn C Programming[2] provides a comprehensive introduction to C that is particularly suited programmers with experience of other languages.

The Hamilton Library has a number of copies of C programming: absolute beginner's guide (Perry and Miller), although this book is aimed at novice programmers rather than experienced programmers who are learning C as a new language. Similarly, C How to Program (Deitel and Deitel) provides a comprehensive introduction to C programming, again aimed at novice programmers, although it may still be a useful starting point.

There are a number of C features and concepts that will be particularly relevant in CS7NS2 and you should familiarise yourself with these in particular:
- pointers, referencing and dereferencing (*, &)
- scope (local, global)
- storage classes (static, extern)
- preprocessor directives
  - conditional compilation (#ifdef, #ifndef, #endif)
  - macros (#define MS PER MINUTE 60000)
  - macros with parameters (#define square(x) ((x) * (x)))
- structures (struct)
- typedef
- pointers as function operands
- unions and bitfields
- bitwise operators (<<, <<, &, |, ^, ~)

[1]: https://en.wikibooks.org/wiki/C_Programming
[2]: https://www.tutorialspoint.com/cprogramming

2 Telecommunication and the Internet

Familiarity with some networking and telecommunication concepts will be required. In the context of the OSI model, the Network and Transport Layers (OSI layers 3 and 4) are most relevant. A good textbook such as Computer Networking: A Top-Down Approach (Kurose and Ross) is a good place to start.

3 Fundamentals of computer architecture

A knowledge of the fundamentals of computer architecture would be beneficial to students intending to take CS7NS2. In particular, a knowledge of basic processor architecture and operation (registers, ALU, program counter), memory read and write operations (loads and stores), memory-mapped devices, exceptions and interrupts would be useful.

The second half of Digital Design and Computer Architecture: ARM Edition (Harris and Harris) covers most of the above topics in the context of the ARM architecture.

CS7NS3 Next Generation Networks

TCP/IP protocol suite:

Students need to be familiar with the TCP/IP protocol suite. See

- https://en.wikipedia.org/wiki/Internet_protocol_suite
- https://tools.ietf.org/html/rfc1180
- http://cecs.wright.edu/~pmateti/InternetSecurity/Lectures/TCPIP/pmTCPIP.ppt

Fundamentals of Telecommunications:

- http://www.piscespacific.org/livesite/files/01_Fundamentals_of_Telecommunications.pdf

Management, Control & Data Plane:

- http://blog.ipspace.net/2013/08/management-control-and-data-planes-in.html

Fundamentals of Wireless Communications:

- https://drive.google.com/file/d/0B5nML0IEakO3QU5rd3FQWXcycVU/view?usp=sharing
- https://drive.google.com/file/d/0B5nML0IEakO3VEhmS2JSc2lBRjA/view?usp=sharing
- https://drive.google.com/file/d/0B5nML0IEakO3bC1IM0VaSkpZeEU/view?usp=sharing

Elective Modules

In addition, students take a small number of elective topics from a pool of modules available to all MSc students. Please review the module details to ensure you have the pre-requisites for taking a particular elective.

More details on all modules (mandatory and elective) are available at: https://teaching.scss.tcd.ie/m-sc-computer-science-future-networked-systems/

English Language Skills

The language of instruction and communication, on this programme is English. All students on the course are required to write and present in English, and will, by the end of the course, be required to produce works of a publishable quality.

If your undergraduate education has not been wholly in the English language, it is highly recommended that you consider taking one of the English for Academic Practice (EAP) courses offered in TCD. See: https://www.tcd.ie/slscs/english/trinity_in-sessional_programme/in-sessional_eap/index.php