

PH502: Scientific Programming Concepts

Irish Centre for High End Computing (ICHEC)

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- These next few lectures we will discuss the standard libraries.
- We have already been using them but here is a more comprehensive treatment. But we cannot cover all the functionality.
- The standard libraries provide C with additional functionality.
- There are many other libraries that provide useful functions to both C and FORTRAN, *e.g.* FFTW, Lapack and HDF5.

- The Standard Library is a set of functions defined as part of the C ANSI standard.
- They will always be available for you to use.
- We will have a quick overview of some of the most useful bits you may need and also cover the Fortran equivalents.
- By the way, you already used the standard library: think `printf()`, `scanf()`, `tan()`, `malloc()`...

- Header Files: These are the files that are included at the top of any program. If we use any function inside a program, then the header file containing declaration or definition of that function ,has to be included. Like `printf()` is specified in `stdio.h`.
- Library Files: These are the files which the compiler uses in order to define the functions which have been used in the program and had been declared inside the header file. Like, `printf()` has its complete definition, like how it will work etc.
- A header file is included during the preprocessing stage. A library file is linked in by the linker.

- Each set of functions is prototyped in a *header* file, with the extension **.h**. We will cover the ones in bold:

assert.h	Diagnostics
ctype.h	Character Class Tests
errno.h	Error Codes Reported by (Some) Library Functions
float.h	Implementation-defined Floating-Point Limits
limits.h	Implementation-defined Limits
locale.h	Locale-specific Information
math.h	Mathematical Functions
setjmp.h	Non-local Jumps
signal.h	Signals
stdarg.h	Variable Argument Lists
stddef.h	Definitions of General Use
stdio.h	Input and Output
stdlib.h	Utility functions
string.h	String functions
time.h	Time and Date functions

- In order to use a function from the standard library, you need to include the header file where it is prototyped.
- This is done through the `#include` statement at the beginning of your code.

```
#include <stdio.h>  
#include <stdlib.h>
```

- `stdio.h` gives you access to a wide set of functions allowing the exchange of data between the program and its environment.
- The environment you're familiar with consists of the user's keyboard (for input) and the screen (for output).
- There's much more than that: in particular, you'll want to read/write from/into files.