



# An Introduction to HPC and Scientific Computing

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**Oxford e-Research Centre**

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# Aims and learning outcomes

The aims of this CWM are to introduce you to scientific computing and High Performance computing (HPC).

It's more important that you pick up the basics of computing and programming during the week, because these are the building blocks for everything else.

This CWM isn't designed to turn you into a world class HPC programmer, that takes years.

This CWM is designed to give you the skills to continue to learn in this area and for you to have the ability to write your own computer codes and tackle basic problems.

Assessment for this course will focus on the final two practical sessions in the latter half of the week. The aim of the assessment is for you to demonstrate that you've picked up the basics from this course.

The assessment will be light because I'm keen for you to focus on the content rather than worrying about the assessment.

In all I hope you will find this a fun and interesting week long introduction to HPC and Scientific Computing!

# Locations and Timetable

## Locations

**Lectures** – these will be in **LR6** and slides available through git / canvas.

**Practical sessions** will in **Linux Lab B** (thom 6<sup>th</sup> floor) and available through git (more to come on that).

## Timetable – Approximately....

10:00 - 11:00 Morning lecture  
11:00 - 11:30 break  
11:30 - 13:00 Morning practical

13:00 - 14:00 lunch

14:00 - 15:00 Afternoon lecture  
15:00 - 15:30 break  
15:30 - 17:00 Afternoon practical

Lectures, demo's and practical sessions will be delivered by:

Wes Armour, Karel Adamek, Yishun Lu and Jack White.

Please, please, please do leave feedback for us (good or bad) <https://bit.ly/OXUNICWM> ☺

# Lectures

**Monday** - Here we have three lectures to begin with and finish with a practical session, this is because we'll need to introduce you to several different topics before you can complete a meaningful practical.

Morning lecture:	Introduction to computer architectures.
Morning lecture:	Introduction to the C programming language.
Afternoon demo:	Introduction to Linux, compilers and build systems.

## Tuesday

Morning demo / lecture:	Using repositories and good coding practices.
Afternoon lecture:	A deeper dive into C programming.

## Wednesday Morning

Morning lecture:	How to multi-task on CPUs using OpenMP.
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## Thursday

Morning lecture:	An introduction to GPUs and how to use them.
Afternoon lecture:	<b>Guest Lectures: Provided by NVIDIA</b>
Second afternoon lecture:	An introduction to the CUDA programming language.

## Friday

Morning lecture:	Scientific Computing using the CUDA programming language.
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# Practical Sessions

**Monday - Here we have one practical in the afternoon.**

Afternoon Practical: Linux, compiling C code and using Make.

## **Tuesday**

Morning Practical: Practical examples of using repositories for your projects.

Afternoon Practical: Practical examples using the C programming language.

## **Wednesday Morning**

Morning Practical: Practical examples of using OpenMP on CPUs.

## **Thursday**

Morning Practical: Practical examples of using GPUs for science and engineering.

## **Friday**

Morning Practical: Examples of CUDA programming.

Afternoon Practical: Assignment (email assignment to [wes.armour@eng.ox.ac.uk](mailto:wes.armour@eng.ox.ac.uk) **AT 17:00!**).

# Assignment

**The assignment is a fun thing, but you do get some marks for it...  
So please do complete the assignment!**

**The marking scheme is as follows:**

A total of 9 marks.

4 marks will be given for attendance, 5 marks for assignment work.

**Assignment marks will be given for:**

Good coding practices	- 2 marks.
Using a build system	- 1 mark.
Correct use of C/CUDA	- 1 mark.
Working code	- 1 mark.

And remember – please do send feedback!

<https://bit.ly/OXUNICWM>