Computer science and maths skills development

 **Are you ready for your studies?**

Your Masters programme does not require a formal qualification in computing, but some knowledge will be useful before you start studying. As everyone arrives with different experience, we have put together this summary of what we expect you to know, along with some suggestions of how you can prepare before you start studying on your academic modules. **If you have no or little previous programming experience, working through this page before starting the course will help you greatly in your first module.**

Below you can find a range of computer science (CS) and programming resources including short courses, websites, podcasts and coding practice tools. We've included this mix so that you can hopefully find something that suits you - we don't expect you to use them all! **You can also use these resources for extra support and practice opportunities during your course.**

**Note**: These resources are from external sources which are not supported by the University of York, and to use some of the resources you will need to create an account. It's up to you whether you want to use each resource - there's no requirement to do so.

**Computer Science basics**

It will be useful to have an overview of key computer science concepts before your course begins.

**Key resources**

**Before you start your programme**, please read Chapter 1 and section 2.1 - 2.6 of Chapter 2 of Goldschlager and Lister, Computer Science: A Modern Introduction (2nd Ed). You can access this book through the reading list (you may find the [Using a Reading List](https://onlinestudy.york.ac.uk/courses/408/pages/using-a-reading-list) page in the Study Skills unit useful).

These resources are also highly recommended to develop your knowledge:

* GCFGlobal's [Computer Science tutorial (Links to an external site.)](https://edu.gcfglobal.org/en/computer-science/) (you may also find the [Computer Basics tutorial (Links to an external site.)](https://edu.gcfglobal.org/en/computerbasics/) and [Basic Computer Skills (Links to an external site.)](https://edu.gcfglobal.org/en/basic-computer-skills/) tutorial useful)

**sign up needed?**no

**formats?**website only

Other resources that you might find useful:

**Khan Academy**

[Khan Academy (Links to an external site.)](https://www.khanacademy.org/computing/computer-science) teaches basic CS concepts through a combination of video mini-lectures, readings, multiple choice quizzes and practical coding exercises (using JavaScript).

The most relevant units for your course are:

* [Algorithms (Links to an external site.)](https://www.khanacademy.org/computing/computer-science/algorithms)
* [How Computers Work (Links to an external site.)](https://www.khanacademy.org/computing/computer-science/how-computers-work2)
* [Internet 101 (Links to an external site.)](https://www.khanacademy.org/computing/computer-science/internet-intro)

**sign up needed?** you don't need to create an account (but you can do if you want to track your progress)

**formats?** website, iOS and Android apps

**base.cs**

A project by [Vaidehi Joshi (Links to an external site.)](https://medium.com/@vaidehijoshi" \t "_blank) to explore basic CS concepts in an informal, accessible way. You could start at the beginning, or refer to specific topics as they arise in your course.

Available as the [base.cs blog (Links to an external site.)](https://medium.com/basecs" \t "_blank), or the [base.cs podcast (Links to an external site.)](https://www.codenewbie.org/basecs" \t "_blank)

**sign up needed?**no sign up needed on website

**formats?**blog: website or Medium app (sign up needed), podcast: website/your usual podcast app

**Programming basics**

You'll start the programme with a focus on writing Java programs and algorithms. It would be good if you know basic programming concepts such as:

* variables and their types
* control structures (e.g. if-statements, loops)
* subprograms (e.g. procedures, functions)
* compilation and debugging

**If you have never used Java, you will benefit greatly from doing some reading and trying out Java programming before your programme starts.** We will teach you from first principles, but the pace will be fast and you will find it easier to keep up if you have some experience of the basics beforehand. Tutorials and practical exercises are the best way for you to prepare. You can also read the first few chapters of the Java key text below:

**Module textbook**

You might find it useful to read the first few chapters of the textbook used in your Algorithms & Data Structures module before the course begins:

Charatan, Quentin and Kans, Aaron (2019) [Java in Two Semesters (Links to an external site.)](https://link.springer.com/book/10.1007%2F978-3-319-99420-8) (4th edition)

**sign up needed?**no, but you may need to log in using your University of York account

**formats?**download pdf from website

**Codecademy**

[Codecademy (Links to an external site.)](https://www.codecademy.com/catalog/subject/all) teaches programming through practical coding tutorials, so you learn by doing. There are many courses - here are some that you might find useful:

* [Learn How to Code (Links to an external site.)](https://www.codecademy.com/learn/learn-how-to-code): a basic introduction to key programming concepts, such as variables, functions and loops
* [Learn Java (Links to an external site.)](https://www.codecademy.com/learn/learn-java): get started with the language you will learn in the Algorithms and Data Structures module
* [Learn the Command Line (Links to an external site.)](https://www.codecademy.com/learn/learn-the-command-line): learn to efficiently access and modify files and folders on your computer without using your mouse (you will need to use the Command Line in your first module)

For later modules, you might find these courses useful:

* [Learn Git (Links to an external site.)](https://www.codecademy.com/learn/learn-git): an introduction to the version control tool Git

**sign up needed?**yes, you need to create a free account (be aware that some features require a Pro subscription)

**formats?**the tutorials only work on the website, but there is a basic complementary iOS and Android app too

**SoloLearn**

[SoloLearn's Java tutorial (Links to an external site.)](https://www.sololearn.com/Course/Java/) teaches the basic concepts and syntax needed to write code in Java. It works well on a mobile phone (online and offline) as well as a computer, so you can use it to practice almost anywhere you want.

There are different levels to work through, where you read about the concept and answer multiple choice questions or type in part of the code. On the website there is also a [code playground (Links to an external site.)](https://www.sololearn.com/Codes/) where you can get some more interactive coding practice.

**sign up needed?**yes, you need to create a free account.

**formats?**website, iOS and Android apps

**Java Beginners Tutorial**

If you prefer to learn from videos, you might find the [Java Beginners Tutorial YouTube channel (Links to an external site.)](https://www.youtube.com/channel/UCEQboKBIrkdhfENCy6rbH7g/videos) useful. Here you can find short videos on a range of Java concepts - you could start with the [Java Basics playlist (Links to an external site.)](https://www.youtube.com/playlist?list=PLwrxKQurWBrFgb7MElVKWWChl0Hnjo-KK), or refer to specific topics as they arise in your course.

**sign up needed?**no account needed, or sign into YouTube with your University of York account

**formats?**YouTube website, iOS and Android apps

**Maths for computer science**

It's expected that you have high school level mathematics, including a knowledge of:

* algebra and functions (e.g. logarithm, linear, quadratic, exponential)
* summations
* logic
* set and sequences

Make sure that you are comfortable with these topics before the course starts. Here are some resources that you may find useful:

**HELM Workbooks**

These workbook-based [tutorials by HELMLinks to an external site.](https://learn.lboro.ac.uk/archive/olmp/olmp_resources/pages/wbooks_fulllist.html)[download](https://learn.lboro.ac.uk/archive/olmp/olmp_resources/pages/wbooks_fulllist.html/download?download_frd=1)will help you with the maths you'll need for the Algorithms & Data Structures module:

* Tutorial 1: Basic Algebra
* Tutorial 2: Basic Functions (Basic concept of functions, The straight line, Some common functions)
* Tutorial 5: Functions and Modelling (Quadratic functions)
* Tutorial 6: Exponential and Logarithm Functions
* Tutorial 16: Sequences and Series (Sequences and series)
* Tutorial 35: Sets and Probability (Sets)

**sign up needed?**no account needed

**formats?**download pdfs from website

**Khan Academy**

[Khan Academy (Links to an external site.)](https://www.khanacademy.org/computing/computer-science) is also really useful for learning maths. There's a lot of material available - here are some units that are particularly relevant:

* [Introduction to Algebra (Links to an external site.)](https://www.khanacademy.org/math/algebra-home/alg-intro-to-algebra): an in-depth course with many algebra topics - pick what you need
* [Binary and hexadecimal number systems (Links to an external site.)](https://www.khanacademy.org/math/algebra-home/alg-intro-to-algebra/algebra-alternate-number-bases/v/number-systems-introduction): a very useful unit from the Introduction to Algebra course
* [Summation notation (Links to an external site.)](https://www.khanacademy.org/math/ap-calculus-ab/ab-integration-new/ab-6-3/v/sigma-notation-sum)
* [Introduction to arithmetic sequences (Links to an external site.)](https://www.khanacademy.org/math/algebra-home/alg-sequences/alg-introduction-to-arithmetic-squences/v/explicit-and-recursive-definitions-of-sequences)

**sign up needed?** you don't need to create an account (but you can do if you want to track your progress)

**formats?** website, iOS and Android apps