Phase Two Bridging Work: A Level Computer Science

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Introduction to the course	GCSE Flashback	A level subject preparation tasks
A Level Computer Science (OCR H446) https://ocr.org.uk/qualifications/as-and-a-level/computer-science-h046-h446-from-2015/ **The aims of this qualification are to enable learners to develop:** • An understanding and ability to apply the fundamental principles and concepts of computer science, including: abstraction, decomposition, logic, algorithms and data representation • The ability to analyse problems in computational terms through practical experience of solving such problems, including writing programs to do so • The capacity to think creatively, innovatively, analytically, logically and critically • The capacity to see relationships between different aspects of computer science • Mathematical skills.	**Complete the following tasks to consolidate learning from your GCSE and develop skills that are crucial for A Level:** 163715-binary-truth-tables-checkpoint-tas 253510-problem-solving-and-programming 253513-data-types-data-structures-and-a	**You may want to extend your programming skills by completing some courses on Unifrog. Here is a shortlist of suggested courses focusing on Python and Java:** MOOC_Unifrog.pdf **And finally . . .** Please prepare a short presentation (1-3 minutes long) about "Why you would like to study A Level Computer Science". You might want to consider: • Introducing yourself and what your interests are. • Explain why you are interested in computing; cybersecurity, gaming, video-editing. • Explain what you are most looking forward to learning about.; developing better programming

Assessment is: • Component 1 – Computer Systems (2½ Hours Written Examination) • Component 2 – Algorithms and programming (2½ Hours Written Examination) • Component 3 – Programming Project **Resources I recommend:** ● Text book – PM Heathcote and RSU Heathcote, OCR AS and A Level Computer Science (2016) PG Online ISBN: 978-1-910523-05-6 **Resources you will need:** ● Folders/ dividers • Lined paper		skills, binary and hexadecimal, different algorithms, different programming theories and email to me by Friday 10 July.

Lesson Element

Truth Tables – Task Sheet

1. Write the truth tables for the expressions

   NOT (A AND B)

and ((NOT A) OR (NOT B))

2. What do you notice about these tables?

3. Design and create a program to output the value of a after the statement

   IF (a < b) OR (b < c) THEN a = b

   has been executed.

4. Decide on suitable test data for this program giving a reason for each combination of values for a, b and c, give your expected result and the actual result for each.

Values	Reason	Expected	Actual

KS4-KS5 Transition Guide

Checkpoint Task Student Activity

Problem solving and programming

RPG character simulator

Planet of Fightcraft wants you to build character classes for their new game.

Each character will have the following things:

- Name
- Type (Barbarian, Elf, Wizard, Dragon, Knight)
- Health
- Power
- Special attack power
- Speed

All characters start with 100 health

Different creatures have different power ratings (B: 70, E: 30, W: 50, D: 90, K: 60)

Different creatures have different special attack power ratings (B: 20, E: 60, W: 70, D: 40, K: 10)

Different creatures have different speed ratings (B: 50, E: 10, W: 30, D: 50, K: 60)

Tasks

1. Generate a random name: en-da-fu and el-kar-tuk could be names, so you could make a name generator which sticks together three syllables from ‘word banks’
2. Create the generic character class. Test to see if you can create multiple characters
3. Create subclasses corresponding to different types of creature (B, E, W, D & K)
4. Make a program that randomly generates 10 of these creatures to add into a list
5. Make a method in the character class that enables printing out of each character’s stats to the console
6. Create a menu system that lets you add and delete characters and print out the list until you are happy with the team
7. Create methods to let you edit any character’s stats and add this to your menu system
8. Create a way to save your team to a file and load it up again if needed

KS4-KS5 Transition Guide

Checkpoint Task Learner Activity

Data types, data structures and algorithms

Activity 1

Converting between denary, binary and hex

No.	Denary	Binary	Hex	Binary value plus 00011110
1	1			
2	5			
3	10			
4	22			
5	40			
6	77			
7	91			
8	121			
9	144			
10	168			
11	170			
12	200			
13	211			

Version 1

CAMBRIDGE UNIVERSITY PRESS
www.cambridge.org
OCR
Oxford Cambridge and RSA

Activity 2

Create a program that analyses a passage of text from a file and then counts:

- How many words
- The average length of a word
- How many times each word occurs
- How many words start with each letter of the alphabet?

The aim of this exercise is to test your ability to develop algorithms.

Alison Faulkner	
Topic(s)	Computer Science / ICT
Completed	03/06/2020 13:10

Get started

Concurrent Programming in Java

On demand so get started any time
Rice University
Coursera

Quick facts

Overall World Ranking	Subject World Ranking	Workload	Certification?	Language
85th	135th in Engineering & Technology	Four weeks of study, 4-8 hours/week depending on past experience with sequential programming in Java	Yes	English

Course summary

This course teaches learners (industry professionals and students) the fundamental concepts of concurrent programming in the context of Java 8. Concurrent programming enables developers to efficiently and correctly mediate the use of shared resources in parallel programs. By the end of this course, you will learn how to use basic concurrency constructs in Java such as threads, locks, critical sections, atomic variables, isolation, actors, optimistic concurrency and concurrent collections, as well as their theoretical foundations (e.g., progress guarantees, deadlock, livelock, starvation, linearizability). Why take this course? • It is important for you to be aware of the theoretical foundations of concurrency to avoid common but subtle programming errors. • Java 8 has modernized many of the concurrency constructs since the early days of threads and locks. • During the course, you will have online access to the instructor and mentors to get individualized answers to your questions posted on the forums. • Each of the four modules in the course includes an assigned mini-project that will provide you with the necessary hands-on experience to use the concepts learned in the course on your own, after the course ends. The desired learning outcomes of this course are as follows: • Concurrency theory: progress guarantees, deadlock, livelock, starvation, linearizability • Use of threads and structured/unstructured locks in Java • Atomic variables and isolation • Optimistic concurrency and concurrent collections in Java (e.g., concurrent queues, concurrent hashmaps) • Actor model in Java Mastery of these concepts will enable you to immediately apply them in the context of concurrent Java programs, and will also help you master other concurrent programming system that you may encounter in the future (e.g., POSIX threads, .NET threads).

University overview

Located on a 300-acre forested campus in Houston, Rice University is consistently ranked among the top universities in the world. Rice has highly respected schools of Architecture, Business, Continuing Studies, Engineering, Humanities, Music, Natural Sciences and Social Sciences and is home to the Baker Institute for Public Policy. With 3,708 undergraduates and 2,374 graduate students, Rice's undergraduate student-to-faculty ratio is 6-to-1.

Key dates

Start date	Start any time
Duration	Flexible

Price information

The majority of MOOCs on Unifrog are free. Most platforms charge a small fee for access to certain tests and a certificate to prove you have completed one of their courses (details below), but you do not need this certificate to mention taking the course in your university Personal Statement or job application. Some platforms offer a small number of courses on a pay-for basis only. The exact cost will depend of the platform and the course chosen.

This is a Coursera course; if you'd like to access graded assignments and earn a Course Certificate, for most courses you'll be asked to pay a fee (or apply for Coursera's financial aid program). The cost varies but the most common is £34 / $50 / €40. You can also sign up to all courses in a specialisation by paying a monthly fee. More info here More info here

Get started

Parallel Programming in Java

On demand so get started any time
Rice University
Coursera

Quick facts

Overall World Ranking	Subject World Ranking	Workload	Certification?	Language
85th	135th in Engineering & Technology	Four weeks of study, 4-8 hours/week depending on past experience with sequential programming in Java	Yes	English

Course summary

This course teaches learners (industry professionals and students) the fundamental concepts of parallel programming in the context of Java 8. Parallel programming enables developers to use multicore computers to make their applications run faster by using multiple processors at the same time. By the end of this course, you will learn how to use popular parallel Java frameworks (such as ForkJoin, Stream, and Phaser) to write parallel programs for a wide range of multicore platforms including servers, desktops, or mobile devices, while also learning about their theoretical foundations including computation graphs, ideal parallelism, parallel speedup, Amdahl's Law, data races, and determinism. Why take this course? • All computers are multicore computers, so it is important for you to learn how to extend your knowledge of sequential Java programming to multicore parallelism. • Java 7 and Java 8 have introduced new frameworks for parallelism (ForkJoin, Stream) that have significantly changed the paradigms for parallel programming since the early days of Java. • Each of the four modules in the course includes an assigned mini-project that will provide you with the necessary hands-on experience to use the concepts learned in the course on your own, after the course ends. • During the course, you will have online access to the instructor and the mentors to get individualized answers to your questions posted on forums. The desired learning outcomes of this course are as follows: • Theory of parallelism: computation graphs, work, span, ideal parallelism, parallel speedup, Amdahl's Law, data races, and determinism • Task parallelism using Java's ForkJoin framework • Functional parallelism using Java's Future and Stream frameworks • Loop-level parallelism with extensions for barriers and iteration grouping (chunking) • Dataflow parallelism using the Phaser framework and data-driven tasks Mastery of these concepts will enable you to immediately apply them in the context of multicore Java programs, and will also provide the foundation for mastering other parallel programming systems that you may encounter in the future (e.g., C++11, OpenMP, .Net Task Parallel Library).

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Get started

Python Data Representations

On demand so get started any time
Rice University
Coursera

Quick facts

Overall World Ranking	Subject World Ranking	Workload	Certification?	Language
85th	135th in Engineering & Technology	This is a four week class with an expected workload of 5-7 hours per week.	Yes	English

Course summary

This course will continue the introduction to Python programming that started with Python Programming Essentials. We'll learn about different data representations, including strings, lists, and tuples, that form the core of all Python programs. We will also teach you how to access files, which will allow you to store and retrieve data within your programs. These concepts and skills will help you to manipulate data and write more complex Python programs. By the end of the course, you will be able to write Python programs that can manipulate data stored in files. This will extend your Python programming expertise, enabling you to write a wide range of scripts using Python This course uses Python 3. While most Python programs continue to use Python 2, Python 3 is the future of the Python programming language. This course introduces basic desktop Python development environments, allowing you to run Python programs directly on your computer. This choice enables a smooth transition from online development environments.

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Get started

Python Programming Essentials

On demand so get started any time
Rice University
Coursera

Quick facts

Overall World Ranking	Subject World Ranking	Workload	Certification?	Language
85th	135th in Engineering & Technology	This is a four week class with an expected workload of 5-7 hours per week.	Yes	English

Course summary

This course will introduce you to the wonderful world of Python programming! We'll learn about the essential elements of programming and how to construct basic Python programs. We will cover expressions, variables, functions, logic, and conditionals, which are foundational concepts in computer programming. We will also teach you how to use Python modules, which enable you to benefit from the vast array of functionality that is already a part of the Python language. These concepts and skills will help you to begin to think like a computer programmer and to understand how to go about writing Python programs. By the end of the course, you will be able to write short Python programs that are able to accomplish real, practical tasks. This course is the foundation for building expertise in Python programming. As the first course in a specialization, it provides the necessary building blocks for you to succeed at learning to write more complex Python programs. This course uses Python 3. While many Python programs continue to use Python 2, Python 3 is the future of the Python programming language. This first course will use a Python 3 version of the CodeSkulptor development environment, which is specifically designed to help beginning programmers learn quickly. CodeSkulptor runs within any modern web browser and does not require you to install any software, allowing you to start writing and running small programs immediately. In the later courses in this specialization, we will help you to move to more sophisticated desktop development environments.

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Key dates

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Duration	Flexible

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video Get started

Introduction to Computer Science and Programming Using Python

Already started so play catchup or get notified of next start date
Massachusetts Institute of Technology
edX

Quick facts

Overall World Ranking	Subject World Ranking	Workload	Certification?	Language
1st	1st in Engineering & Technology	9 weeks to complete	Check their site	English

Course summary

An introduction to computer science as a tool to solve real-world analytical problems using Python 3.5.

University overview

Massachusetts Institute of Technology is a coeducational, privately endowed research university founded in 1861 it is dedicated to advancing knowledge and educating students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century. Through MITx, the Institute furthers its commitment to improving education worldwide. MITx courses embody the inventiveness, openness, rigor and quality that are hallmarks of MIT, and many use materials developed for MIT residential courses in the Institute's five schools and 33 academic disciplines.

Key dates

Start date	3 Jun 2020
Duration	9 weeks

Price information

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This is an edX course; it is free to take the course, but if you'd like to and earn a verified certificate, for most courses you'll be asked to pay a fee. The cost varies but the most common is £39 / $49 / €43. More info here