



## ACE Network Subject Information Guide

### CSC2410 Computational Thinking with Python

Semester 2, 2023

#### Administration and contact details

<b>Host department</b>	School of Mathematics, Physics and Computing
<b>Host institution</b>	University of Southern Queensland
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#### Subject details

<b>Handbook entry URL</b>	<a href="https://alldowney.github.io/ModSimPy/">https://alldowney.github.io/ModSimPy/</a>
<b>Subject homepage URL</b>	<a href="https://www.unisq.edu.au/course/specification/2023/CSC2410-S2-2023-ONC-TWMBA.html">https://www.unisq.edu.au/course/specification/2023/CSC2410-S2-2023-ONC-TWMBA.html</a>
<b>Honours student hand-out URL</b>	
<b>Teaching period (start and end date):</b>	Start date: 11 July 2023 End date: 14 October 2023
<b>Exam period (start and end date):</b>	Start date: 4 October 2023 End date: 4 November 2023
<b>Contact hours per week:</b>	4 hours
<b>ACE enrolment closure date:</b>	
<b>Lecture day(s) and time(s):</b>	Wednesday 4-6pm and Thursday 12-2pm AEST
<b>Description of electronic access arrangements for students (for example, LMS)</b>	USQ Connect (Moodle)

## Subject content

### 1. Subject content description

Computational thinking is a core skill across many cross disciplinary fields. Future professionals in management roles as well as data analysts need to understand fundamental computational approaches to problem solving. The topics in this course are intended to introduce students not merely to the coding of computer programs, but algorithmic thinking, data management, the methodology of computer programming, and the principles of good program design including modularity, encapsulation and abstraction. The Python language is used because of its extensive application libraries and its effectiveness and popularity as a modern programming language.

This course covers fundamental computational problem solving concepts, tools and methodologies. Students will learn how to select an appropriate data type and apply the most appropriate technical processes for a given computational problem. They will also learn how to develop modular code which conforms to the basic principles and practices of software engineering.

Please note that while some coding experience is assumed knowledge (see below), this course focuses on fundamental aspects of computational thinking and coding in python.

### 2. Week-by-week topic overview

<b>Week 1:</b>	Introduction to modelling and simulation of physical systems. Intro to python programming. Software setup
<b>Week 2:</b>	Time series data and plotting of bike share system model. Python fundamentals: variables, functions, conditional statements and loops.
<b>Week 3:</b>	Iterative modelling and system metrics. Python fundamentals: function parameters, classes and objects.
<b>Week 4:</b>	Incremental development. Sweeping parameters. Python fundamentals: function return values, loops and arrays.
<b>Weeks:</b>	Extract data from web page with Pandas library. Model and simulate constant population growth.
<b>Week 6:</b>	Proportional growth model.
<b>Week 7:</b>	Quadratic growth and equilibrium. Python fundamentals: common problems with functions.
<b>Week 8:</b>	Comparing predictions.
<b>Week 9:</b>	Case Studies: Queueing theory, Predicting salmon populations, Tree growth. Python fundamentals: Pandas DataFrame and Series objects.



**Learning Outcome Descriptors at AQF Level 8**

**Knowledge**

K1: coherent and advanced knowledge of the underlying principles and concepts in one or more disciplines

K2: knowledge of research principles and methods

**Skills**

S1: cognitive skills to review, analyse, consolidate and synthesise knowledge to identify and provide solutions to complex problem with intellectual independence

S2: cognitive and technical skills to demonstrate a broad understanding of a body of knowledge and theoretical concepts with advanced understanding in some areas

S3: cognitive skills to exercise critical thinking and judgement in developing new understanding

S4: technical skills to design and use in a research project

S5: communication skills to present clear and coherent exposition of knowledge and ideas to a variety of audiences

**Application of Knowledge and Skills**

A1: with initiative and judgement in professional practice and/or scholarship

A2: to adapt knowledge and skills in diverse contexts

A3: with responsibility and accountability for own learning and practice and in collaboration with others within broad parameters

A4: to plan and execute project work and/or a piece of research and scholarship with some independence

## 5. Learning resources

Texts/Lecture notebooks:

The course readings and lecture notebooks are available on the USQ course StudyDesk.

Lectures notebooks use the Jupyter notebook format.

Software:

The course lectures, exercises and assignments use Python and Jupyter notebooks. Students are advised to install the open-source Anaconda Distribution which provides the necessary tools and libraries for the course.

## 6. Assessment

Exam/assignment/classwork breakdown					
Exam	50 %	Assignment	50 %	Class work	0 %
Assignment due dates		Assignment 1 (20%) 25 August 2023	Assignment 2 (30%) 29 September 2023	Click here to enter a date.	Click here to enter a date.
Approximate exam date				Start date: 4 October 2023 End date: 4 November 2023	

### Institution honours program details

Weight of subject in total honours assessment at host department	Click here to enter text.
Thesis/subject split at host department	Click here to enter text.
Honours grade ranges at host department	
H1	Enter range %
H2a	Enter range %
H2b	Enter range %
H3	Enter range %

### Institution masters program details

Weight of subject in total masters assessment at host department	Click here to enter text.
Thesis/subject split at host department	Click here to enter text.
Masters grade ranges at host department	
H1	Enter range %
H2a	Enter range %
H2b	Enter range %
H3	Enter range %