

Subject Outline

Subject Name	Programming and Data Analytics with Python
Subject Code	CP5805
Study Period	SP81
Study Mode	External
Campus	JCU Online
Subject Coordinator	Lindsay Ward

We acknowledge the Traditional Owners of the lands and waters where our University is located and actively seek to contribute and support the JCU Reconciliation Statement, which exemplifies respect for Australian Aboriginal and Torres Strait cultures, heritage, knowledge and the valuing of justice and equity for all Australians.

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Pre-requisites

Students must have completed 12 credit points worth of postgraduate subjects.

This subject outline has been prepared by Eugene McArdle for the College of Science and Engineering, Division of Information Technology, James Cook University. Updated 23 April 2019.

Subject outline preparation

This subject outline has been prepared by [Type here] for the College of [Type here], Division of [Type here], James Cook University. Updated [Type here].

Q1. This subject is offered across more than one campus and/or mode and/or teaching period within the one calendar year.	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Q2. If yes (Q1), the design of all offerings of this subject ensure the same learning outcomes and assessment types and weightings.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Q3. If no (Q2), [Type here] has authorised any variations, in terms of equivalence.		

Subject outline peer reviewer

Name	
Position	
Date reviewed	

Staff contact details

Teaching team	Staff member	Phone	Email	Consultation times*
Subject Coordinator	Lindsay Ward		Lindsay.ward@jcu.edu.au	By e-mail
Tutor 1	TBA			
Tutor 2	TBA			

*Other consultation times by appointment only.

Contents

1	Subject at a glance	4
1.1	Student participation requirements	4
1.2	Key dates	4
2	Subject details	5
2.1	Subject description	5
2.2	Subject learning outcomes	5
2.3	Learning and teaching in this subject	6
2.4	Student feedback on subject and teaching	6
2.5	Subject resources and special requirements	6
3	Assessment details	7
3.1	Requirements for successful completion of subject.....	7
3.2	Feedback on student learning.....	7
3.3	Assessment tasks.....	8
4	Submission and return of assessment.....	12
4.1	Submission of assessment.....	13
4.2	Return of assessment.....	14
5	Subject calendar	15

1 Subject at a glance

1.1 Student participation requirements

The JCU [Learning, Teaching and Assessment Policy](#) (4.3) indicates that, “a **3 credit point subject** will require a **130 hour work load** of study-related participation including class attendance over the duration of the study period, **irrespective of mode of delivery**”. This work load comprises **timetabled hours** and **other attendance requirements**, as well as **personal study hours**, including completion of online learning activities and assessment requirements. Note that “attendance at specified classes will be a mandatory requirement for satisfactory completion of some subjects” (Learning, Teaching and Assessment Policy, 5.10); and that additional hours may be required per week for those students in need of **English language, numeracy or other learning support**.

Other mandatory attendance requirements:

Students are expected to participate in the Learn Ultra discussion boards. Discussion boards give you a place to interact with staff and other students about subject content and topics, and help students to clarify and extend their understanding of key content. These are a forum for students to present their thoughts/ideas in an online version of an in-person classroom discussion and therefore the same courtesy rules apply.

While attendance in the Collaborate sessions is not mandatory, it is highly recommended. These sessions will provide you with the opportunity to have synchronous (at the same time) conversations with your Subject Coordinator (or your tutor) and with your fellow students from across the subject, to have your questions answered and to receive further clarification about any concerns or questions you may have.

Key subject activities	Time	Day & Date	Room/Location
O Week	Begins Monday 6th January to 29th February, online		
Weeks 1-6	Monday 13 – Sunday 9 January - Week 1 Monday 20 – Sunday 26 January - Week 2 Monday 27 Jan - Sunday 1 Feb - Week 3 Monday 3 - Sunday 9 Feb - Week 4 Monday 10 - Sunday 9 Feb - Week 5 Monday 17 - Sunday 23 Feb - Week 6		

For information regarding class registration, visit the [Class Registration Schedule](#).

1.2 Key dates

Key dates	Date
Census date	See 2020 Study Period and Census Dates
Last date to withdraw without academic penalty	See 2020 Study Period and Census Dates

Key dates	Date
Assessment task 1 [Design Problem] [10%]	Due end of Week 1 11:59 PM AEST
Assessment task 2 [Weekly Reflective Journal] [10%]	Weeks 1-6, on Sunday ending each week (250-400 words per week) 11:59 PM AEST
Assessment task 3 [Data Analysis - Design] [20%]	Due end of Week 3 11:59 PM AEST
Assessment task 4 [Data Analysis - Implement] [30%]	Due end of Week 5 11:59 PM AEST
Assessment task 5 [Advanced Data Analysis] [30%]	Due end of Week 6 11:59 PM AEST

2 Subject details

2.1 Subject description

Students are introduced to fundamental principles and practices of computer programming in Python.

- Students learn and use problem-solving and software development techniques including planning, prototyping, version control, testing and debugging.
- Students develop procedural and object-oriented programs with console and graphical user interfaces.
- Students research and learn about developments in the field of programming languages and environments over recent times.
- Students also apply basic data visualisation with Python (Python visualisation libraries) and notions of data analysis with Python (e.g. NumPy and Pandas libraries).

2.2 Subject learning outcomes

Students who successfully complete this subject will be able to:

- Apply fundamental application development skills in a modern programming environment
- Develop and utilise best-practice coding techniques
- Adopt self-learning with modern support resources
- Understand and apply Python libraries to problems in data science

These outcomes will contribute to your overall achievement of **course learning outcomes**. Your course learning outcomes can be located in the entry for your course in the electronic [JCU Course and Subject Handbook 2020](#) (click on 'Course Information' bar/ select 'Undergraduate Courses' or 'Postgraduate Courses'/ select relevant course/ scroll down to 'Academic Requirements for Course Completion', 'Course learning outcomes').

2.3 Learning and teaching in this subject

As an online subject the majority of the learning will be done through the web-based materials. Each week you'll have some readings which will introduce you to the majority of the concepts, as well as some practical tasks starting week 1 and becoming more important as the course introduces more programming skills.

These practical tasks will be done after each topic, though you may read ahead if that suits your study style more. You should go back and complete all practical elements in order, since this is how you will learn programming. Learning to program involves learning to think like a computer, and how to communicate instructions in a programming language. This is similar to learning to speak a second language, and anyone who has done that can tell you that you don't get proficient at it by reading about it, you have to do it!

You will also have access to a tutor via email and discussion forums who can provide additional clarification if needed, as well as advice and guidance regarding your assessments. Your tutor is your first point of contact for any question regarding the content of this course.

As a postgraduate student you are responsible for your own learning, and you are expected to keep up with the weekly materials as well as following up any suggested readings and online resources as well as asking questions of your tutor.

2.4 Student feedback on subject and teaching

As part of our commitment at JCU to improving the quality of our courses and teaching, we regularly seek feedback on your learning experiences. Student feedback informs evaluation of subject and teaching strengths and areas that may need refinement or change. **Your JCU Subject and Teaching Surveys** provide a formal and confidential method for you to provide feedback about your subjects and the staff members teaching within them. These surveys are available to all students through [LearnJCU](#). You will receive an email invitation when the survey opens. We value your feedback and ask that you provide constructive feedback about your learning experiences for each of your subjects, in accordance with responsibilities outlined in the [Student Code of Conduct](#). Refrain from providing personal feedback on topics that do not affect your learning experiences. Malicious comments about staff are deemed unacceptable by the University.

2.5 Subject resources and special requirements

All subject readings and resources, including journal articles, book chapters, websites, videos, print and eTextbooks, are available to view online from your *Readings list* via your LearnJCU subject site. Textbooks listed in your *Readings list* include links to Co-op Bookshop purchasing details and library holdings. The JCU Library has limited print copies of prescribed textbooks for two-day loans, and options for viewing available eTextbooks online.

Additionally, you can find the most appropriate library subject resources, including dedicated discipline libguides, relevant databases and access to library services and staff through the *Your Library* tool, in your LearnJCU subject site.

Required Software

Jupyter Notebook – Freely available at www.jupyter.org

This runs in a browser, and is available either wholly online, or can be installed on Windows, Linux or Mac environments.

3 Assessment details

3.1 Requirements for successful completion of subject

In order to pass this subject, you must:

- Achieve an overall percentage of 50% or more;
- Make a reasonable attempt at every assessment item in the subject.

Assessment items and final grades will be reviewed through moderation processes ([Learning, Teaching and Assessment Policy](#), 5.13-5.18). It is important to be aware that assessment “is always subject to final ratification following the examination period and that no single result represents a final grade in a subject” (Learning, Teaching and Assessment Policy, 5.22.).

3.1.1 Inherent requirements [delete section if not applicable]

[Inherent requirements](#) are the fundamental abilities, attributes, skills and behaviours needed to achieve the learning outcomes of a course while preserving the academic integrity of the university’s learning, assessment and accreditation processes. Students and prospective students must be able to demonstrate that they have acquired or have the ability to acquire the inherent requirements for their degree.

Reasonable adjustments may be made to assist students manage additional circumstances impacting on their studies provided these do not change the academic integrity of a degree. Reasonable adjustments do not alter the need to be able to demonstrate the inherent requirements of the course. Students who believe they will experience challenges completing their degree or course because of their disability, health condition or other reason should discuss their concerns with an AccessAbility Services team member or a member of College staff, such as the Course Coordinator. In the case where it is determined that inherent requirements cannot be met with reasonable adjustments, the University staff can provide guidance regarding other study options.

3.2 Feedback on student learning

Feedback for all assessment items will be provided by tutors within 7 days of submission.

3.3 Assessment tasks

ASSESSMENT TASK 1: DESIGN PROBLEM

Aligned subject learning outcomes	Develop and utilise best-practice coding techniques
Group or individual	Individual
Weighting	10%
Due date	Due end of Week 1 11:59 PM AEST

ASSESSMENT TASK 1: DESCRIPTION

Students will be given a simple design problem to solve, and will fill out a template using the problem-solving skills taught in Week 1

ASSESSMENT TASK 1: CRITERIA SHEET

Criteria	Exemplary (75 – 100%)	Satisfactory (50 – 74%)	Poor (0-49%)
Proposes a complete solution	Solution addresses all aspects of the problem with only very minor lapses	Solution addresses most aspects of the problem, but there are large gaps or incomplete sections	Solution does not address any aspect of the problem in any detail
Function Breakdown	All identified functions are single purpose, and work together to solve the problem	Most identified functions are single purpose, but some are too large or incomplete.	There are either no functions identified, or all functions listed are incomplete or oversized
Function Design	All inputs and outputs are necessary and nothing was missed. Description is clear and complete.	Most inputs and outputs are necessary, and less than half the necessary data was missed. Descriptions are mostly clear and complete	Almost all inputs and outputs are either unnecessary or missing. Descriptions are not clear, or incomplete
Identifier naming	All variables and functions are well named for their use	Most variables and functions are well named for their use	Almost no variable or function is well named for its use

ASSESSMENT TASK 2: WEEKLY REFLECTIVE JOURNAL

Aligned subject learning outcomes	Adopt self-learning with modern support resources Understand and apply Python libraries to problems in data science
Group or individual	Individual
Weighting	10%
Due date	Weeks 1-6, at Sunday ending each week (250-400 words per week) 11:59 PM AEST

ASSESSMENT TASK 2: DESCRIPTION

Students are given reflective tasks (solve a problem, find a way to use a particular library or class etc.) to respond to in 250-400 words. Facilitator will provide rapid formative feedback on these individually.

ASSESSMENT TASK 2: CRITERIA SHEET

Criteria	Exemplary (75 – 100%)	Satisfactory (50 – 74%)	Poor (0-49%)
Grammar and Communication	Meaning is clearly conveyed in the journal entry. There are only very minor lapses in clarity or grammar.	Meaning is mostly conveyed in the journal entry but there are some significant lapses in clarity or grammar.	Meaning is not conveyed in the journal entry. There are many significant lapses in clarity or grammar.
Questions and topic coverage	Responds to all questions and topics required. Very few small omissions.	Responds to most questions and topics required but there are some significant omissions	Responds to very few questions and topics required. There are many large omissions
Insight and Understanding	Demonstrates knowledge of key aspects of the questions and topics. Able to combine concepts to form conclusions	Demonstrates knowledge of most key aspects of the questions and topics. Some ability to combine concepts	Demonstrates very little knowledge of key aspects of the questions and topics. No ability to combine concepts in any way

ASSESSMENT TASK 3: DATA ANALYSIS - DESIGN

Aligned subject learning outcomes	Apply fundamental application development skills in a modern programming environment Develop and utilise best-practice coding techniques
Group or individual	Individual
Weighting	20%
Due date	Due end of Week 3 11:59 PM AEST

ASSESSMENT TASK 3: DESCRIPTION

Students will plan a solution to a more complex design problem involving:

- loading data from a file
- storing it in an appropriate data structure
- perform basic data analysis
- display results in a well-formatted way.

ASSESSMENT TASK 3: CRITERIA SHEET

Criteria	Exemplary (75 – 100%)	Satisfactory (50 – 74%)	Poor (0-49%)
Proposes strategies or partial solutions	The solution provided is completely correct and solves the problem.	The solution provided is mostly correct and solves most of the problem.	The solution provided is incorrect and does not solve the problem.
Effective and correct use of functions in the planned solution	The functions identified are appropriate and correctly used.	The functions identified are mostly appropriate and correctly used.	The functions identified are inappropriate or incorrectly used.
Appropriate use of problem-solving tools (including algorithm, IPO charts and condition/action tables) to communicate the planned solution	The flowchart or algorithm provided solves the problem, and is consistent with other parts of the planning documentation	The flowchart or algorithm provided mostly solves the problem, and is mostly consistent with other parts of the planning documentation	The flowchart or algorithm provided does not solve the problem, or is inconsistent with other parts of the planning documentation
Effective and correct use of variables in the planned solution	The variables identified are appropriate and correctly used.	The variables identified are mostly appropriate and correctly used.	The variables identified are mostly inappropriate or incorrectly used.
Effective and correct use of conditionals and loops in the planned solution.	The conditionals or loops identified are appropriate and correctly used.	The conditionals or loops identified are mostly appropriate and correctly used.	The conditionals or loops identified are inappropriate or incorrectly used.

ASSESSMENT TASK 4: DATA ANALYSIS - IMPLEMENT

Aligned subject learning outcomes	Apply fundamental application development skills in a modern programming environment Develop and utilize best-practice coding techniques Understand and apply Python libraries to problems in data science
Group or individual	Individual
Weighting	30%
Due date	Due end of Week 5 11:59 PM AEST

ASSESSMENT TASK 4: DESCRIPTION

Students will code the solution to the problem from Assessment 3, using the appropriate Python libraries

ASSESSMENT TASK 4: CRITERIA SHEET

Criteria	Exemplary (75 – 100%)	Satisfactory (50 – 74%)	Poor (0-49%)
Python Syntax	No errors in code that stop program running. Only very minor logic errors.	Only very minor errors in code that stop program running, or some logic errors.	Code will not run without significant work, or there are significant logic errors present
Effective and correct use of functions in the solution	The functions identified are appropriate and correctly used.	The functions identified are mostly appropriate and correctly used.	The functions identified are inappropriate or incorrectly used.
Effective and correct use of variables in the solution	The variables identified are appropriate and correctly used.	The variables identified are mostly appropriate and correctly used.	The variables identified are mostly inappropriate or incorrectly used.
Effective and correct use of conditionals and loops in the solution.	The conditionals or loops identified are appropriate and correctly used.	The conditionals or loops identified are mostly appropriate and correctly used.	The conditionals or loops identified are inappropriate or incorrectly used.

ASSESSMENT TASK 5: ADVANCED ANALYSIS

Aligned subject learning outcomes	Apply fundamental application development skills in a modern programming environment Develop and utilize best-practice coding techniques Understand and apply Python libraries to problems in data science
Group or individual	Individual
Weighting	30%
Due date	Due end of Week 6 11:59 PM AEST

ASSESSMENT TASK 5: DESCRIPTION

Students will be given another data set to analyse, and will perform more advanced analysis of it, including a visualisation.

ASSESSMENT TASK 5: CRITERIA SHEET

Criteria	Exemplary (75 – 100%)	Satisfactory (50 – 74%)	Poor (0-49%)
Proposes strategies or partial solutions	The solution provided is completely correct and solves the problem.	The solution provided is mostly correct and solves most of the problem.	The solution provided is incorrect and does not solve the problem.
Effective and correct use of functions in the solution	The functions identified are appropriate and correctly used.	The functions identified are mostly appropriate and correctly used.	The functions identified are inappropriate or incorrectly used.
Appropriate use of problem-solving tools to communicate the planned solution	The flowchart or algorithm provided solves the problem, and is consistent with other parts of the planning documentation	The flowchart or algorithm provided mostly solves the problem, and is mostly consistent with other parts of the planning documentation	The flowchart or algorithm provided does not solve the problem, or is inconsistent with other parts of the planning documentation
Effective and correct use of <i>pandas</i> library in the solution	The <i>pandas</i> elements used are appropriate and correctly used.	The <i>pandas</i> elements used are mostly appropriate and correctly used.	The <i>pandas</i> elements used are mostly inappropriate or incorrectly used.
Effective and correct use of conditionals and loops in the solution.	The conditionals or loops identified are appropriate and correctly used.	The conditionals or loops identified are mostly appropriate and correctly used.	The conditionals or loops identified are inappropriate or incorrectly used.

Appropriate use of visualisations	Visualisations used are correctly used and based off the data given	Visualisations used are mostly used correctly and based off the data given	Visualisations used are incorrectly used or not based off the data given
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4 Submission and return of assessment

4.1 Submission of assessment

All assessments are to be submitted through JCU Online. Further instructions will be included in the assessment description.

Note that the [Learning, Teaching and Assessment Policy](#) (5.22.3) outlines a uniform formula of penalties that will be imposed for submission of an assessment task after the due date. **This formula is 5% of the total possible marks for the assessment item per day including part-days, weekends and public holidays.** After 20 days, the assessment item thus would be awarded 0 marks (i.e. $5\% \times 20 = 100\%$ of total possible marks in penalties).

4.1.1 SafeAssign reports

Some assessments will make use of JCU Online's plagiarism detection system, SafeAssign.

Students are responsible to ensure assignment uploads are successful and to save a copy of the SafeAssign report for their own records. The date and time of online submission is recorded by Learn Ultra, and this is accepted as being the equivalent to a date stamp on a hard copy submission. If system-wide technical problems occur with SafeAssign or Learn Ultra on the due date, your subject coordinator will advise you by email and/or via announcement on Learn Ultra of any necessary changes to the normal processes of assessment submission.

SafeAssign is a plagiarism detection tool within Learn Ultra that allows students to submit assignments as electronic documents and compares the content with assignments submitted by other students at JCU and over 2.5 billion other documents on the internet. A report is generated identifying segments of matching text, and the quantity matched, and this allows both the student and the Subject Coordinator to check the submitted assignment against the original identified sources. This report is not considered uncontested evidence of plagiarism; rather, it is a means of providing students with feedback on academic writing. Such feedback provides an opportunity for students to develop the knowledge and skills needed to approach assignments with academic integrity.

You should check your report from submission to the PLAGARISM CHECK dropbox, prior to submission to the FINAL dropbox, as this will help you to identify areas of plagiarism or areas that have not been accurately referenced within your assignment and rectify them prior to your final submission.

As part of the online submission process, the following Institution Release Statement is completed:

1. This assignment is my original work and no part has been copied/reproduced from any other person's work or from any other source, except where acknowledgement has been made (see Learning, Teaching and Assessment Policy 5.1).
2. This work has not been submitted previously for assessment and received a grade OR concurrently for assessment, either in whole or part, for this subject (unless part of integrated assessment design/approved by the Subject Coordinator), any other subject or any other course (see Learning, Teaching and Assessment Policy 5.9).
3. This assignment has not been written for me.

4. I hold a copy of this assignment and can produce a copy if requested.
5. This work may be used for the purposes of moderation and identifying plagiarism.
6. I give permission for a copy of this marked assignment to be retained by the College for benchmarking and course review and accreditation purposes.

4.2 Return of assessment

Marked assignments will be returned to students with 7 days of the submission date. The rubrics used for marking will provide some feedback to students, and additional feedback will be provided through comments to the student.

Rubrics and comments will be viewable through JCUOnline.

Please see the [Current Students](#) web page for links to all student resources and support services to optimise your academic and personal success.

Please see the [Learn Student Guide](#) web page for general advice on plagiarism, referencing and examinations. Here, you can also access individual and group assessment task cover sheets. Note that cover sheets are only required for hard copy submissions.

5 Subject calendar

Please note, the sequence of some topics may change due to staff availability, resourcing, or due to unforeseen circumstances.

Week/Date/Module		Content	Practical Tasks	Readings/Preparation	Relationship to Assessment
0	Orientation	JCU policies and procedures, preparing for your online course, meeting peers and your tutor	Introduce yourself in the discussion forum		
1	Intro to Problem Solving	Problem Solving and Programming, Problem Decomposition, Variables, Control Structure, Sequence, Flowcharts, Functions	Introductory Problem-Solving skills		A1 (Due), A2, A3
2	Problem Solving for Programming	Refreshing Functions, Selection, Repetition, Boolean Algebra, Lists, Lists and loops	Advanced Problem Solving Program Planning and Documentation		A2, A3
3	Programming Basics	Programming and Python 3, Variables and Math in Python, Input and Output, Going from Plans to Code, Testing and Errors, Functions, Selections, Repetitions, Python Modules	Introductory Python programming using Jupyter Notebook www.jupyter.org		A2, A4, A5
4	Data Structures and Manipulation	String Formatting, Lists and List Methods, Files for Input and Output, CSV files, Exception Handling, Tuples and Dictionaries List and Dictionary Comprehensions	String and List manipulation File Handling Exceptions		A2, A4, A5
5	Intro to the NumPy and pandas libraries	NumPy <ul style="list-style-type: none"> • Creating and using ndarrays • Indexing and Slicing • Boolean and Fancy Indexing • Array-oriented Programming pandas <ul style="list-style-type: none"> • Series and DataFrame objects • Index Objects • Reindexing, dropping, selection and filtering • Descriptive Statistics 	Practice with NumPy and pandas libraries		A2, A4 (Due), A5
6	Advanced pandas and Data Visualisation	Files and pandas, Introduction to data preparation and wrangling, Visualisations	Using pandas functions for: <ul style="list-style-type: none"> • Saving and Loading data • Data Preparation • Visualisation 		A2, A5 (Due)