WESTERN SYDNEY
UNIVERSITY
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School of Computing, Engineering and Mathematics

Learning Guide

301107 Analytics Programming

Autumn 2019

Unit Details

Unit Code:	301107
Unit Name:	Analytics Programming
Credit Points:	10
Unit Level:	1
Assumed Knowledge:	Familiarity with computer software programs such as Excel.

Note: Students with any problems, concerns or doubts should discuss those with the Unit Coordinator as early as they can.

Unit Coordinator

Name: Nick Tothill
Phone: 4736 0956 (or extention 2956)
Location: KW.Y.2.09
Email: n.tothill@westernsydney.edu.au
Consultation Arrangement:
1200-1300 Monday
1200-1300 Thursday
Consultation locations will be advised on vuws

Contents

Note: The relevant Learning Guide Companion supplements this document

1 About Analytics Programming

1.1 An Introduction to this Unit

This unit covers the use of computers and computer programming for Data Science. After briefly considering spread-sheet systems, the unit will consider programming in the statistical system "R" in depth. Finally, other special purpose languages will be touched briefly (eg. SQL).

1.2 What is Expected of You

Study Load
A student is expected to study an hour per credit point a week. For example a 10 credit point unit would require 10 hours of study per week. This time includes the time spent within classes during lectures, tutorials or practicals.

Attendance
Lectures and tutorials are designed to scaffold learning and assist students to gain an understanding of the unit content, and subsequently to complete their assessment tasks. Students should note that attendance is considered critical for students to gain full value from this subject, and is closely correlated with student success and grades. Students are encouraged to participate in all class activities, as non-engagement may seriously undermine a students ability to satisfactorily complete the unit.

Online Learning Requirements
Unit materials will be made available on the unit's vUWS (E-Learning) site (https://vuws.westernsydney.edu.au/). You are expected to consult vUWS at least twice a week, as all unit announcements will be made via vUWS. Teaching and learning materials will be regularly updated and posted online by the teaching team.
vUWS.
Special Requirements
Essential Equipment:
Students require access to a computer.
Legislative Pre-Requisites:
Not Applicable

1.3 Changes to Unit as a Result of Past Student Feedback

The University values student feedback in order to improve the quality of its educational programs. The feedback provided helps us improve teaching methods and units of study. The survey results inform unit content and design, learning guides, teaching methods, assessment processes and teaching materials.

You are welcome to provide feedback that is related to the teaching of this unit. At the end of the semester you will be given the opportunity to complete a Student Feedback on Unit (SFU) questionnaire to assess the unit. You may also have the opportunity to complete a Student Feedback on Teaching (SFT) questionnaire to provide feedback for individual teaching staff.

As a result of student feedback, the following changes and improvements to this unit have recently been made:

- There is no feedback available from last year.

2 Assessment Information

2.1 Unit Learning Outcomes

	Outcome
1	Use Excel to manage and manipulate data
2	Manage and manipulate data using R and R-Studio; including reading and writing data files
3	Write R programs to conduct Data Science tasks
4	Use basic SQL to manage and manipulate data
5	Apply Simulation techniques to Data Science tasks
6	Write reports using Markdown and R-Markdown

2.2 Approach to Learning

Lectures: These sessions will be used to introduce concepts.

Practicals: These sessions will be used to reinforce concepts introduced in lecture sessions. The sessions are held in computer labs to allow the use of programming tools (e.g. the Rstudio GUI) for a variety of Data Science problems.

2.3   Contribution to Course Learning Outcomes

3734: Bachelor of Data Science

Course Learning Outcomes	ULO 1	ULO 2	ULO 3	ULO 4	ULO 5	ULO 6
1. collect or design the collection of data and extract, transform and load the data into an analysis system	Introduced	Introduced	Introduced	Introduced	Introduced	
2. visualise and present data to understand its information content and find patterns or trends	Introduced	Introduced	Introduced		Introduced	
3. build models and write computer code to make predictions, test hypotheses and validate conclusions drawn from the analysis process	Introduced	Introduced	Introduced	Introduced	Introduced	
4. formulate problems and use data ethically and responsibly to provide information and advice that is reliable, valid, timely and relevant for their chosen specialty.				Introduced	Introduced	Introduced
5. present results and define actions to be taken to generate impact in application domains			Introduced		Introduced	Introduced
6. provide interpretive and predictive reports for professional colleagues to inform decision-making						Introduced
7. advise on the technical validity and reliability of interpretations and predictions based on analysis of large data sets			Introduced		Introduced	
8. advise on the methods and ethics of data collection and use within a professional context.					Introduced	Introduced

2.4 Assessment Summary

The assessment items in this unit are designed to enable you to demonstrate that you have achieved the unit learning outcomes. Completion and submission of all assessment items which have been designated as mandatory or compulsory is essential to receive a passing grade.

To pass this unit you must:
- Attempt all assessment tasks
- Score a minimum of 50% of weighted score

Item	Weight	Due Date	ULOs Assessed	Threshold
Online Quizzes	20%	Weeks 4, 7, 10, 12 and 13	1, 2, 3, 4	No
Computer Test	40%	Week 14	2, 3, 4	No
Assignment	40%	Week 13	2, 3, 4, 5, 6	No

Feedback on Assessment
Feedback is an important part of the learning process that can improve your progress towards achieving the learning outcomes. Feedback is any written or spoken response made in relation to academic work such as an assessment task, a performance or product. It can be given to you by a teacher, an external assessor or student peer, and may be given individually or to a group of students. As a Western Sydney University student, it is your responsibility to seek out and act on feedback that is provided to you as a resource to further your learning.

In this unit you can expect verbal and written feedback within 2 weeks of any assessment submission. Further informal feedback will also be provided in lectures and/or tutorial sessions.

2.5 Assessment Details

2.5.1 Online Quizzes

Weight:	20%
Type of Collaboration:	Individual
Due:	Weeks 4, 7, 10, 12 and 13
Submission:	Online
Format:	30 minute online through vUWS. The quiz will be open for approximately one week.
Length:	5x 30 min
Curriculum Mode:	Quiz

The quiz will be based on the material covered in lectures and practicals. It may consist of multiple choice or short answer or numeric questions. Some questions may require the use of software to compute a solution.

Marking Criteria:

Criteria	High Distinction	Distinction	Credit	Pass	Unsatisfactory
mark	at least 85%	at least 75%	at least 65%	at least 50%	Less than 50%

2.5.2 Computer Test

Weight:	40%
Type of Collaboration:	Individual
Due:	Week 14
Submission:	In the lab
Format:	1 hour exam using computer software in the lab
Length:	Lab based 1 hour practical
Curriculum Mode:	Practical

The exam will consist of practical based questions using computer software and data sets.

Marking Criteria:

Criteria	High Distinction	Distinction	Credit	Pass	Unsatisfactory
mark	at least 85%	at least 75%	at least 65%	at least 50%	Less than 50%

2.5.3 Assignment

Weight:	40%
Type of Collaboration:	Individual
Due:	Week 13
Submission:	Online
Format:	Written report with results
Length:	3 weeks/approx. 2000 words
Curriculum Mode:	Practical

The Assignment will consist of a practical based activities and a written report, using techniques learnt in the first half of semester.

Marking Criteria:

Criteria	High Distinction	Distinction	Credit	Pass	Unsatisfactory
mark	at least 85%	at least 75%	at least 65%	at least 50%	Less than 50%

2.6   General Submission Requirements

Submission
  – All assignments must be submitted by the specified due date and time.
  – Complete your assignment and follow the individual assessment item instructions on how to submit. You must keep a copy of all assignments submitted for marking.

Turnitin

  – The Turnitin plagiarism prevention system may be used within this unit. Turnitin is accessed via logging into vUWS for the unit. If Turnitin is being used with this unit, this means that your assignments have to be submitted through the Turnitin system. Turnitin from iParadigms is a web-based text-matching software that identifies and reports on similarities between documents. It is also widely utilised as a tool to improve academic writing skills. Turnitin compares electronically submitted papers against the following:
      – Current and archived web: Turnitin currently contains over 24 billion web pages including archived pages

      – Student papers: including Western Sydney University student submissions since 2007

      – Scholarly literature: Turnitin has partnered with leading content publishers, including library databases, text-book publishers, digital reference collections and subscription-based publications (e.g. Gale, Proquest, Emerald and Sage)

  – Turnitin is used by over 30 universities in Australia and is increasingly seen as an industry standard. It is an important tool to assist students with their academic writing by promoting awareness of plagiarism.By submitting your assignment to Turnitin you will be certifying that:
      – I hold a copy of this assignment if the original is lost or damaged

      – No part of this assignment has been copied from any other student's work or from any other source except where due acknowledgement is made in the assignment

      – No part of the assignment has been written for me by any other person/s

      – I have complied with the specified word length for this assignment

      – I am aware that this work may be reproduced and submitted to plagiarism detection software programs for the purpose of detecting possible plagiarism (which may retain a copy on its database for future plagiarism checking).

Self-Plagiarising

  – You are to ensure that no part of any submitted assignment for this unit or product has been submitted by yourself in another (previous or current) assessment from any unit, except where appropriately referenced, and with prior permission form the Lecturer/Tutor/Unit Co-ordinator of this unit.

Late Submission

  – If you submit a late assessment, without receiving approval for an extension of time, (see next item), you will be penalised by 10% per day for up to 10 days. In other words, marks equal to 10% of the assignment's weight will be deducted from the mark awarded.
  – For example, if the highest mark possible is 50, 5 marks will be deducted from your awarded mark for each late day.
  – Saturday and Sunday are counted as one calendar day each.
  – Assessments will not be accepted after the marked assessment task has been returned to students.
  – This is consistent with Clause 51 of the Western Sydney University's Assessment Policy - Criteria and Standards-Based Assessment.

Extension of Due Date for Submission
Extensions are only granted in exceptional circumstances. To apply for an extension of time, locate an application form via the Western Sydney University homepage or copy the following link:
https://www.westernsydney.edu.au/currentstudents/current_students/forms

Application forms must be submitted to the Unit Coordinator/Convenor. Requests for extension should be made as early as possible and submitted within policy deadlines. Appropriate, supporting documentation must be submitted with the application. An application for an extension does not automatically mean that an extension will be granted. Assessments will not be accepted after the marked assessment task has been returned to students.

Resubmission   Resubmission of assessment items will not normally be granted if requested.

Application for Special Consideration

It is strongly recommended that you attend all scheduled learning activities to support your learning. If you have suffered misadventure, illness, or you have experienced exceptional circumstances that have prevented your attendance at class or your completion and submission of assessment tasks, you may need to apply for Special Consideration via the Western Sydney University website. http://www.westernsydney.edu.au/currentstudents/current_students/services_and_facilities/special_consideration2 or the Student Centre/Sydney City Campus Reception. Special Consideration is not automatically granted. It is your responsibility to ensure that any missed content has been covered. Your lecturer will give you more information on how this must be done.

3 Teaching and Learning Activities

Weeks	Topic	Lecture	Prac/Lab	Assessments Due
Week 1 04-03-2019	Data handling for data science	Introduction to data science Manipulate data in Excel Introduction to R and RStudio		
Week 2 11-03-2019	The basics of R and data structure in R	Basic data structures Working environment History, workspace Saving scripts	R environment and basic data handling	
Week 3 18-03-2019	Data types	Vectors, matrices and arrays, lists, factors, tables, data frames, expressions	Dealing with different data types	
Week 4 25-03-2019	Data manipulation	Data handling	Getting data ready for analysis	- Online Quizzes
Week 5 01-04-2019	R programming 1	Flow control statements	Writing R scripts	
Week 6 08-04-2019	R programming 2	Functions Debugging using RStudio	Writing R functions	
Week 7 15-04-2019	Simulation using R	Basic data generating functions Math and stats functions	Using R builtin functions for simulation	- Online Quizzes
Week 8 22-04-2019				
Week 9 29-04-2019	Input & outputs	Standard input/output	Reading and writing data from and to files	
Week 10 06-05-2019	Graphics	R plotting functions	Visualising data using R plotting functions	- Online Quizzes
Week 11 13-05-2019	Accessing data using SQL	Basic database system, SQL	Accessing data from database systems	

Weeks	Topic	Lecture	Prac/Lab	Assessments Due
		Connecting to database systems in R using SQL		
Week 12 20-05-2019	Documenting with RMarkdown	RStudio reproducible reporting system	Reporting using rmarkdown	- Online Quizzes
Week 13 27-05-2019	Advanced topics	R extension Interfacing with other languages	Extending R functionalities	- Online Quizzes - Assignment
Week 14 03-06-2019				- Computer Test
Week 15 10-06-2019				
Week 16 17-06-2019				
Week 17 24-06-2019				

The above timetable should be used as a guide only, as it is subject to change. Students will be advised of any changes as they become known on the unit's vUWS site.

4 Learning Resources

4.1 Recommended Readings

Essential Reading

– Matloff, N. (2011). The Art of R Programming A Tour of Statistical Software Design. San Francisco: No Starch Press.

Additional Reading

– Dalgaard, P. (2008). Introductory statistics with R (2nd ed.). New York: Springer.
– Zumel, N., & Mount, J. (2014). Practical Data Science with R. Shelter Island, NY: Manning Publications.