

DATA S7Z01: Statistics and Data Analysis

Module Details	
Module Code:	DATA S7Z01
Full Title:	Statistics and Data Analysis APPROVED
Valid From::	Semester 1 - 2018/19 (September 2018)
Language of Instruction:	English
Duration:	1 Semester
Credits::	7.5
Module Owner::	Arjan van Rossum
Departments:	Unknown
Module Description:	The aim of this module is to teach the student how to apply statistical methodology in the solution of practical problems and to make them aware of the key role of statistical methodology in the design and analysis of scientific and industrial experiments and investigations.

Module Learning Outcome		
On successful completion of this module the learner will be able to:		
#	Module Learning Outcome Description	
MLO1	Calculate, present and interpret numerical and graphical summaries of statistical data.	
MLO2	Recognise the key role of data collection and probabilistic methods in statistical inference and be able to apply simple probability models.	
MLO3	Describe the concept of sampling variation and be able to construct and interpret confidence intervals and tests of hypotheses in the one- and two-sample cases, including paired investigations.	
MLO4	Understand the key assumptions that underlie the standard statistical analyses and be able to diagnose violations of these assumptions.	
MLO5	Appreciate the key role of statistical methodology in scientific investigations and be able to summarise and communicate the results of statistical analysis in a non-technical language.	
MLO6	Develop a proficiency in the use of a Statistics' package and be familiar with the use of computer simulations, both as a learning tool in Statistics and as a method of quantifying sampling variation.	
Pre-requisite learning		
Module Recommendations <i>This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named DkIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).</i>		
55089	DATA S7Z01	Statistics and Data Analysis

Module Indicative Content	
Descriptive Statistics Tally charts and frequency distributions. Symmetrical and Skewed Distributions. Barcharts, histograms, boxplots, dotplots and scatterplots. Measures of central tendency and dispersion including five-number summaries. Accuracy and precision of measurements.	
Probability Approaches to probability. Events, sample spaces, random variables and probability distributions. Addition and multiplication laws. Normal, hypergeometric, binomial and poisson models. Computer simulations of probabilities and sampling variation. Normal probability plots.	
Confidence Intervals Sampling Variation. Estimation of percentages and means in the large and small sample cases. Z and t based intervals. Checking assumptions underlying confidence intervals,	
Hypothesis Testing Hypothesis testing of percentages and means in the large sample and small sample cases. Z and t based tests in the one-sample and two-sample and paired cases. Checking assumptions underlying hypothesis tests.	
Analysis of cross-classified tables. Display of data in tables. Two-by-two and r x c tables. Chi-square test for independence and goodness of fit.	
Software Applications Implement all of the above methods using Minitab. Also carry out simulations as an alternative to performing tests and as a learning tool in Statistics.	
Module Assessment	
Assessment Breakdown	%
Course Work	30.00%
Final Examination	70.00%
Module Special Regulation	

Assessments

Full Time On Campus			
Course Work			
Assessment Type	Class Test	% of Total Mark	15
Marks Out Of	0	Pass Mark	0
Timing	S1 Week 10	Learning Outcome	1,2,3,4,5
Duration in minutes	0		
Assessment Description Class test towards end of module.			
Assessment Type	Continuous Assessment	% of Total Mark	15
Marks Out Of	0	Pass Mark	0
Timing	n/a	Learning Outcome	1,2,3,4,6
Duration in minutes	0		
Assessment Description Minitab based computer laboratories.			
No Project			
No Practical			
Final Examination			
Assessment Type	Formal Exam	% of Total Mark	70
Marks Out Of	0	Pass Mark	0
Timing	End-of-Semester	Learning Outcome	1,2,3,4,5
Duration in minutes	0		
Assessment Description End-of-Semester Final Examination			
Reassessment Requirement			
A repeat examination Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.			
Reassessment Description Repeat assessments only in the case of excused absence.			

Module Workload

Workload: Full Time On Campus

<i>Workload Type</i>	<i>Contact Type</i>	<i>Workload Description</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>	<i>Hours</i>
Lecture	Contact	Main content delivery.	Every Week	3.00	3
Practical	Contact	Minitab Laboratory	Every Week	1.00	1
Independent Study	Non Contact	No Description	Every Week	8.00	8
Tutorial	Contact	Practice problems.	Every Week	1.00	1
				Total Weekly Learner Workload	13.00
				Total Weekly Contact Hours	5.00

This module has no Part Time On Campus workload.

Module Resources

Recommended Book Resources

David M Diez, Christopher D Barr, Mine Çetinkaya-Rundel. (2012), Open Intro Statistics, 2nd. 1 to 6, <https://www.openintro.org/>, Available under a Creative Commons License.

Mullins, Eamonn. (2003), Statistics for the Quality Control Chemistry Laboratory, Royal Society of Chemistry.

Stuart, Michael. (2003), An Introduction to Statistical Analysis for Business and Industry, Arnold, London.

Moore D.S. & McCabe G.. (1989), Introduction to the Practice of Statistics, Freeman and Co., New York.

Colin Weatherup. (2007), Experimental Statistics Using Minitab, Arima publishing..

Reilly, James. (2006), Using Statistics, Gill and Macmillan,.

Walpole, R., Myers, R. Myres, S. (2006), Probability and Statistics for Engineers & Scientists, 8th. Prentice Hall.

Townsend, John. (2002), Practical Statistics for Environmental and Biological Scientists, Wiley.

R.C. Campbell. (1989), Statistics for Biologists, 3rd edition. Cambridge University Press.

This module does not have any article/paper resources

Other Resources

<http://en.wikipedia.org/wiki/statistics>.

Website, stats4stem,
<http://www.stats4stem.org/index.html>

Website, <https://www.khanacademy.org/#Statistics>,
<https://www.khanacademy.org/#Statistics>

Website, <https://onlinecourses.science.psu.edu/stat414/node/3>,
<https://onlinecourses.science.psu.edu/stat414/node/3>

Website, <http://www.seeingstatistics.com/>,
<http://www.seeingstatistics.com/>

Website, <http://www.dur.ac.uk/stat.web/>,
<http://www.dur.ac.uk/stat.web/>

Website, <http://wiki.stat.ucla.edu/socr/index.php/EBook>,
<http://wiki.stat.ucla.edu/socr/index.php/EBook>

Website, <http://stattrek.com/ap-statistics/practice-test.aspx>,
<http://stattrek.com/ap-statistics/practice-test.aspx>

Website, <http://www.coursera.org>,
<http://www.coursera.org>