CIT Institiúid Teicneolaíochta Chorcaí
Cork Institute of Technology

STAT8009: Statistics and Data Analysis

Module Details

Short Title:	Statistics and Data Analysis APPROVED
Full Title:	Statistics and Data Analysis

Module Code:	STAT8009	**NFQ Level:**	Advanced	**ECTS Credits:**	5.0

Valid From:	Semester 1 - 2014/15 (September 2014)

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Description:	This module provides the learner with advanced training in statistical methods relevant to data analysis in the design and planning of experiments as part of the research process. It will address statistical methodologies and applications to research.

Learning Outcomes:

On successful completion of this module the learner will be able to

1. Use statistics to reduce complex situations to manageable formats in order to describe, explain or model them.
2. Derive descriptive statistics for various data types.
3. Perform statistical tests on two sample data.
4. Set up and analyse data sets in both a parametric and non-parametric way for two and more samples.
5. Use multiple regression as a statistical technique to allow prediction of a score on one variable on the basis of the scores on several other variables.
6. Communicate effectively research findings in a clear concise manner using correct terminology based on output from a statistical package.

Pre-requisite learning

Module Recommendations
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 CIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).

No recommendations listed

Incompatible Modules
These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.

No incompatible modules listed

Requirements
This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed. You may not enrol on this module if you have not acquired the learning specified in this section.

No requirements listed

Co-requisites

No co-requisites listed listed

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Module Content & Assessment

Indicative Content

- **Overview**
  Statistics fills the crucial gap between information and knowledge. Society cannot be run effectively on the basis of hunches or trial and error. This topic highlights which statistics to use, why to use those statistics, and when to use them.

- **Introduction to data analysis**
  Through using appropriate descriptive statistics, it is possible to make sense of data collected and tell a research story coherently and with justification. This entails deriving the correct measures of centrality/variation, if applicable. Along with interpreting bar charts, pie charts, histograms, stem-and-leaf plots, boxplots.

- **Statistical inference (two samples)**
  Understand the idea behind hypothesis testing through worked examples of test of normality/differences/relationships with various types of data - i.e., Independent and related t-tests; Mann Whitney and Wilcoxon test; Pearson and Spearman Rank correlation.

- **Multi-variable analysis**
  Set-up and analyse various data sets in both a parametric and non-parametric way. In the case of non-parametric data, suitable data transformations will be investigated prior to the use of parametric tests. One-way Analysis of Variance (ANOVA) with suitable posthoc testing. Between and within subjects factorial experiments. Investigation of the effect size of a result and the power to a test.

- **Multiple regression**
  Scatterplots and partial regression plots. Test for homoscedasticity. Detect for multicollinearity and outliers. Check that the residuals (errors) are approximately normally distributed. Interpret regression equations and use them to make predictions.

Assessment Breakdown	%
Course Work	100.0%
End of Semester Formal Examination	0%

Coursework Breakdown

Type	Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Descriptive statistics	1,2,6	20.0	Week 5
Practical/Skills Evaluation	Statistical inference (two samples)	3,6	30.0	Week 7
Practical/Skills Evaluation	Multi-variable analysis	4,6	30.0	Week 10
Practical/Skills Evaluation	Multiple regression	5,6	20.0	Sem End

Reassessment Requirement

Coursework Only
This module is reassessed solely on the basis of re-submitted coursework. There is no repeat written examination.

The institute reserves the right to alter the nature and timings of assessment

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Module Workload & Resources

Workload	Full-time			
Type	*Description*	*Hours*	*Frequency*	*Average Weekly Learner Workload*
Lecture	Statistical theory and application	4.0	Every Second Week	2.00
Lecturer-Supervised Learning (Contact)	Laboratory workshops	4.0	Every Second Week	2.00
Independent & Directed Learning (Non-contact)	Data analysis	3.0	Every Week	3.00
			Total Weekly Learner Workload	7.00
			Total Weekly Contact Hours	4.00

Workload	Part-time mode			
Type	*Description*	*Hours*	*Frequency*	*Average Weekly Learner Workload*
Lecture	Statistical theory and application	4.0	Every Second Week	2.00
Lecturer-Supervised Learning (Contact)	Laboratory workshops	4.0	Every Second Week	2.00
Independent & Directed Learning (Non-contact)	Data analysis	3.0	Every Week	3.00
			Part-Time Total Weekly Learner Workload	7.00
			Part-Time Total Weekly Contact Hours	4.00

Resources

Recommended Book Resources

- **Tadhg L. O'Shea 2013, *Essential Statistics for Researchers* [ISBN: 978-0-9575059-0-2]**
- **Colin Gray, Paul R Kinnear, 2010, *IBM SPSS Statistics 19 Made Simple* [ISBN: 9781848720695]**
- **Joseph F. Hair, Jr.... [et al.] 2010, *Multivariate data analysis*, 7 Ed., Prentice Hall Upper Saddle River, NJ [ISBN: 978-0138132637]**
- **Warren J. Ewens, Gregory R. Grant (Contributor) 2010, *Statistical Methods in Bioinformatics*, 2nd Ed., Springer [ISBN: 978-1441923028]**
- **Alan Grafen, Rosie Hails 2002, *Modern statistics for the life sciences*, 1st Ed., Oxford University Press [ISBN: 978-0199252312]**

Supplementary Book Resources

- **Calvin Dytham, 2010, *Choosing and Using Statistics*, 3rd Ed. [ISBN: 978-1405198394]**
- **Helmut van Emden, 2008, *Statistics for Terrified Biologists*, 1st Ed., Blackwell publishing [ISBN: 978-1405149563]**

Other Resources

- **Website: *SPSS Statistics for Students: The Basics* http://www.ssc.wisc.edu/sscc/pubs/spss_s tudents1.htm**