



<b>Title:</b>	Probability and Statistics <b>APPROVED</b>
<b>Long Title:</b>	Probability and Statistics
<b>Module Code:</b>	STAT7007
<b>Duration:</b>	1 Semester
<b>Credits:</b>	5
<b>NFQ Level:</b>	Intermediate
<b>Field of Study:</b>	Mathematics
<b>Valid From:</b>	Semester 1 - 2017/18 ( September 2017 )
<b>Module Delivered in</b>	<a href="#">4 programme(s)</a>
<b>Next Review Date:</b>	February 2022
<b>Module Coordinator:</b>	David Goulding
<b>Module Author:</b>	Robert Heffernan
<b>Module Description:</b>	This module is an introduction to probability and statistical inference. Statistics deals with the organisation, presentation and interpretation of data and methods from the theory of probability are used as tools in statistical analysis. The emphasis will be practical and will be assisted by a statistical software package.
<b>Learning Outcomes</b>	
<i>On successful completion of this module the learner will be able to:</i>	
LO1	Apply probability axioms and rules including Bayes theorem.
LO2	Use software to graphically display and numerically summarise data.
LO3	Use probability distributions to model random variables.
LO4	Understand the need for sampling and calculate a regression line.
LO5	Calculate and interpret both confidence intervals and hypothesis tests for both means and proportions.
<b>Pre-requisite learning</b>	
<b>Module Recommendations</b> <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 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).</i>	
<b>Incompatible Modules</b> <i>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.</i>	
No incompatible modules listed	
<b>Co-requisite Modules</b>	
No Co-requisite modules listed	
<b>Requirements</b> <i>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.</i>	
No requirements listed	

**Module Content & Assessment**

**Indicative Content**

**Probability**

Permutations and combinations. Classical, frequentist and axiomatic definitions. Laws of probability, independence, mutual exclusivity, conditional probability and Bayes' theorem. Tree diagrams.

**Review of Descriptive Statistics**

Presentation of data. Summary statistics. Histograms. Box plots. Use of software.

**Probability Distributions**

Random variables. Discrete vs Continuous. Expectation, mode, variance and standard deviation. Linearity of expectation. Binomial, Poisson and normal distributions. Use of software.

**Sampling Theory**

Sample statistics and sampling distributions. Central limit theorem. Confidence intervals for means and proportions. Determination of sample size. Hypothesis testing for small and large samples. Regression.

Assessment Breakdown	%
Course Work	30.00%
End of Module Formal Examination	70.00%

**Course Work**

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Short Answer Questions	In-class test: Probability, descriptive statistics and probability distributions.	1,3	15.0	Week 8
Practical/Skills Evaluation	Practical Laboratory Examination	2,3,4	15.0	Week 12

**End of Module Formal Examination**

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Formal Exam	End of Semester Final Examination	1,3,4,5	70.0	End-of-Semester

**Reassessment Requirement**

**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.

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

**Module Workload**

<b>Workload: Full Time</b>				
<i>Workload Type</i>	<i>Workload Description</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Exposition of theory illustrated by concrete examples	3.0	Every Week	3.00
Tutorial	Problem solving under the guidance of a tutor.	1.0	Every Second Week	0.50
Lab	Practical with software package	1.0	Every Second Week	0.50
Independent Learning	Completion of theory and practical exercises	3.0	Every Week	3.00
Total Hours				8.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				4.00

<b>Workload: Part Time</b>				
<i>Workload Type</i>	<i>Workload Description</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Exposition of theory illustrated by concrete examples	1.5	Every Week	1.50
Tutorial	Problem solving under the guidance of a tutor.	1.0	Every Second Week	0.50
Lab	Practical with software package	1.0	Every Second Week	0.50
Independent Learning	Completion of theory and practical exercises	5.0	Every Week	5.00
Total Hours				8.50
Total Weekly Learner Workload				7.50
Total Weekly Contact Hours				2.50

## Module Resources

### *Recommended Book Resources*

- O'Shea, T. L. 2013, *Essential Statistics for Researchers*, IT Tralee [ISBN: 0957505906]
- Kabacoff, R. 2015, *R in Action*, 2 Ed., Manning [ISBN: 9781617291388]

### *Supplementary Book Resources*

- Clarke G.M. and Cooke D. 1998, *A Basic Course in Statistics*, 4 Ed., Arnold [ISBN: 0340719958]
- Dalgaard, P 2002, *Introductory Statistics with R*, Springer [ISBN: 9780387954752]

*This module does not have any article/paper resources*

### *Other Resources*

- Website: *CIT Maths Online Project*  
<http://mathsonline.cit.ie>
- Q& A site for people studying stats at any level: *Cross Validated*  
<http://stats.stackexchange.com/>

**Module Delivered in**

<b>Programme Code</b>	<b>Programme</b>	<b>Semester</b>	<b>Delivery</b>
CR_KSDEV_8	<a href="#"><u>Bachelor of Science (Honours) in Software Development</u></a>	4	Mandatory
CR_KDNET_8	<a href="#"><u>Bachelor of Science (Honours) in Computer Systems</u></a>	4	Mandatory
CR_KCOMP_7	<a href="#"><u>Bachelor of Science in Software Development</u></a>	4	Mandatory
CR_KCOME_6	<a href="#"><u>Higher Certificate in Science in Software Development</u></a>	4	Mandatory