

Module Title:	Quantitative Methods & Quality Control
Language of Instruction:	English
Credits:	10
NFQ Level:	6
Module Delivered In	6 programme(s)
Teaching & Learning Strategies:	This module will be delivered via two lectures of Quantitative Methods, two lectures of Quality Control and one computer practical per week. Students may be required to access the material via Blackboard in advance of the class to encourage active learning. Any course-related issue or questions that may arise will be discussed at lectures.
Module Aim:	The aim of this module is to develop further the students understanding of the mathematical concepts and techniques used in science and industry and their understanding of the role and benefits of quality systems in business.

Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Calculate and interpret summary statistical measures and display data using statistical graphs and charts.
LO2	Apply statistical tools to explore the relationship between variables.
LO3	Identify, analyse and solve statistical quality control problems.
LO4	Formulate, solve and interpret scientific problems using differential and integral calculus.
LO5	Demonstrate an ability to use computer software applications for data analysis, data reporting and mathematical analysis.

Pre-requisite learning
Module Recommendations <i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>
No recommendations listed
Incompatible Modules <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i>
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements <i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>
No requirements listed

Module Content & Assessment

Indicative Content
Statistics Sampling and probability distributions.
Probability Binomial and Poisson probability formulas.
Normal Distribution The Normal probability Distribution and Normal Probability Plots.
Process Capability Analysis Capability index, Cp and Cpk
Measures and Tests of Association Scatter diagrams. Pearson and Spearman correlation coefficients. Linear regression.
Hypothesis Testing Students t distribution sampling distribution of mean, one-sample t-test, F tests of variances and Chi squared test.
Calculus Review of basic calculus. Solve scientific problems using differential and integral calculus. Model scientific situations using elementary differential equations.
Basic Quality Concepts Definitions of Quality Control and Quality Assurance, stages of quality control, spiral of progress, specifications and tolerances, production permits and concessions, planning materials and methods. Flowcharting.
Organisation for Quality Quality system, Total Quality Management (TQM), Motivation for quality, Roles in quality, The quality inspector, Quality Circles, Sensory assessment panels, Triangle method
Sampling Sampling, Operating Characteristic for a single sampling plan, Acceptable Quality Level (AQL), Lot total percent defective (LTPD or RQL), producer's risk and consumer's risk, Average Outgoing Quality (AOQ) and Average Outgoing Quality Limit (AOQL)
Control Charts Control Charts, principles of Statistical Process Control (SPC), process control techniques, average and range charts (standard and US types), natural tolerance of a process, Pre-control chart, CUSUM chart, measles chart, multi-vari chart, attribute charts for defects and defectives, interpretation and design of charts
Economics of Quality Economics of Quality, quality costs, failure, appraisal and prevention costs, value of quality versus cost of quality, selection of most economical AQL, Pareto analysis, Vendor rating schemes, Cause and effect analysis.
Reliability Reliability calculations, failure rate, mean time to failure (MTTF), life-tests, design for reliability.

Assessment Breakdown	%
Continuous Assessment	10.00%
Practical	40.00%
End of Module Formal Examination	50.00%

Special Regulation
Students must achieve a minimum grade (35%) in both the practical/CA and final examination.

Continuous Assessment				
<i>Assessment Type</i>	<i>Assessment Description</i>	<i>Outcome addressed</i>	<i>% of total</i>	<i>Assessment Date</i>
Examination	Quantitative Methods and Quality Control assessments	1,2,3,4	10.00	n/a

No Project

Practical				
<i>Assessment Type</i>	<i>Assessment Description</i>	<i>Outcome addressed</i>	<i>% of total</i>	<i>Assessment Date</i>
Practical/Skills Evaluation	Computer practicals and assessments.	5	40.00	n/a

End of Module Formal Examination				
<i>Assessment Type</i>	<i>Assessment Description</i>	<i>Outcome addressed</i>	<i>% of total</i>	<i>Assessment Date</i>
Formal Exam	3 hour examination.	1,2,3,4	50.00	End-of-Semester

ITCarlow reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full Time		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	30 Weeks per Stage	4.00
Practicals	30 Weeks per Stage	1.00
Estimated Learner Hours	30 Weeks per Stage	2.67
Total Hours		230.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_SABTP_B	<u>Bachelor of Science (Honours) in Biosciences with Biopharmaceuticals</u>	2	Mandatory
CW_SABRE_B	<u>Bachelor of Science (Honours) in Brewing and Distilling</u>	2	Mandatory
CW_SASES_B	<u>Bachelor of Science (Honours) in Environmental Science</u>	2	Mandatory
CW_SAASC_D	<u>Bachelor of Science in Analytical Science</u>	2	Mandatory
CW_SABFQ_D	<u>Bachelor of Science in Biosciences</u>	2	Mandatory
CW_SASCI_C	<u>Higher Certificate in Science in Applied Biology or Applied Chemistry</u>	2	Mandatory