

University of the West of Scotland

Module Descriptor

Session: 2022/23

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Title of Module: Statistical Quality Control

Code: QUAL11002	SCQF Level: 11 (Scottish Credit and Qualifications Framework)	Credit Points: 20	ECTS: 10 (European Credit Transfer Scheme)
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	Farhad Anvari		

Summary of Module

A review of data handling (types of data, variation, randomness, sampling, frequency distributions, histograms, time series, summary statistics, etc.) is intended to bring all students up to an acceptable level of interaction with data analysis.

Concept of probability. Probability rules. Probability distributions - hypergeometric, binomial, geometric, Poisson, exponential, normal. Probability plots. Confidence intervals. Concept of expectation. Central limit theorem.

Acceptance sampling. Single sampling plans: Acceptable Quality Level, Producer's Risk, Limiting Quality, Consumer's Risk, Operating Characteristic, Rectifying Inspection, Average Outgoing Quality, Average Outgoing Quality Limit, Average Total Inspection. Double sampling plans: Operating Characteristic, Average Sample Number.

Control charts: X bar and range charts for variables, p charts and c charts for attributes, discussion of CUSUM control charts and time weighted charts. Decision rules are introduced and examined. Opportunities are given to decide, use, and select a suitable type of chart, and to construct and use the chart. Average Run Length.

Capability indices (Cp index and Cpk index): their calculation, interpretation, and limitations.

Design of experiments (hypothesis testing): t tests, chi squared test.

Metrology: Identify the importance of measurement, relationship between standards and measurement in a quality process, identification of quality characteristics of a product or service, effect of instrument characteristics on measurement results, GR&R studies.

Six Sigma approaches will be discussed, with examples.

This module will develop a range of graduate attributes, including numeracy skills, problem formulation, problem-solving skills, and the ability to present a clear argument.

- This module has been reviewed and updated, taking cognisance of the University's Curriculum Framework principles. Examples of this are found within the module such as active and engaging tutorial activity with contemporary industry examples of modular content, module assessment which reflects industry activities, learning synergies across modules and levels of study and recorded lecture content supporting students to organise their own study time.

Module Delivery Method

Face-To-Face	Blended	Fully Online	HybridC	HybridO	Work-based Learning
✓		✓			

Face-To-Face

Term used to describe the traditional classroom environment where the students and the lecturer meet synchronously in the same room for the

whole provision.

Blended

A mode of delivery of a module or a programme that involves online and face-to-face delivery of learning, teaching and assessment activities, student support and feedback. A programme may be considered "blended" if it includes a combination of face-to-face, online and blended modules. If an online programme has any compulsory face-to-face and campus elements it must be described as blended with clearly articulated delivery information to manage student expectations

Fully Online

Instruction that is solely delivered by web-based or internet-based technologies. This term is used to describe the previously used terms distance learning and e learning.

HybridC

Online with mandatory face-to-face learning on Campus

HybridO

Online with optional face-to-face learning on Campus

Work-based Learning

Learning activities where the main location for the learning experience is in the workplace.

Campus(es) for Module Delivery

The module will **normally** be offered on the following campuses / or by Distance/Online Learning: (Provided viable student numbers permit)

Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
✓					✓	

Term(s) for Module Delivery

(Provided viable student numbers permit).

Term 1	✓	Term 2	✓	Term 3	✓
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Learning Outcomes: (maximum of 5 statements)

On successful completion of this module the student will be able to:

L1. select, describe and critically use the main concepts and practices of statistics as the science of collecting analyzing and presenting data.

L2. create and implement suitable acceptance sampling schemes for given guarantees and evaluate the benefits gained from Single and Double sampling.

L3. select and employ the common tools found in statistical quality control and demonstrate a critical awareness in their use and limitations.

L4. examine, discuss and debate the importance of metrology and standards in quality issues.

L5. select and justify strategies for quality improvement and participate in the debate of benefits etc of chosen strategies.

Employability Skills and Personal Development Planning (PDP) Skills

SCQF Headings	During completion of this module, there will be an opportunity to achieve core skills in:
Knowledge and Understanding (K and U)	SCQF Level 11. The theory underpinning acceptance sampling, control charts and process capability indices.
Practice: Applied Knowledge and Understanding	SCQF Level 11. Application of acceptance sampling, control charts and assessment of process

	capability.
Generic Cognitive skills	SCQF Level 11. Selection with explanation of appropriate tools in a given situation.
Communication, ICT and Numeracy Skills	SCQF Level 11. Explanation. Calculation. Use of a spreadsheet.
Autonomy, Accountability and Working with others	SCQF Level 11. Participation in class debates.

Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code:	Module Title:
	Other:	appropriate knowledge and experience
Co-requisites	Module Code:	Module Title:

* Indicates that module descriptor is not published.

Learning and Teaching	
<p>The Learning & Teaching Strategy for this module is based on the general strategy for the MSc Quality Management.</p> <p>Classes are delivered on a weekly basis. Lectures will introduce and exemplify key theoretical and critical concepts. Tutorial sessions will be given to further develop students' understanding. Computer laboratory sessions will be used to develop data handling and analysis skills. Students will be given sufficient time and support to work on assignments.</p> <p>For On-line Learning students, full use will be made of the VLE. That is, all teaching material will be made available on-line and students will be guided through the material. Email and video-conferencing will be used extensively to support students. Group work will be organised and supported through facilities on the VLE such as forums and wikis. Group presentations will be made by video conference and scheduled according to time zones.</p> <p>Face-to-face students will use Microsoft Excel software for data analysis. On-line students may choose to use an equivalent package if they wish.</p>	
<p>Learning Activities</p> <p>During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:</p>	<p>Student Learning Hours (Normally totalling 200 hours): (Note: Learning hours include both contact hours and hours spent on other learning activities)</p>
Lecture/Core Content Delivery	18
Tutorial/Synchronous Support Activity	18
Independent Study	164
	200 Hours Total

****Indicative Resources: (eg. Core text, journals, internet access)**

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

Moodle Site*, Module Notes*.
Essential

Montgomery, D.C.(2009) Introduction to Statistical Quality Control, John Wiley and Sons, Sixth Edition,

Breyfogle, F.W.(2003) Implementing Six Sigma - Smarter Solutions using Statistical Methods, Second Edition, John Wiley and Sons

Martin J.W.(2006) Lean Six Sigma for Supply Chain Management, McGraw-Hill Professional

George M. L. (2003) Lean Six Sigma for Service: How to Use Lean Speed and Six Sigma to Improve Services and Transactions, McGraw-Hill Professional

The certified Six Sigma black belt handbook / T.M. Kubiak and Donald W. Benbow., Milwaukee, Wisconsin :, ASQ Quality Press., 2017, 9780873899413

Stapenhurst, T., 2013. Mastering statistical process control. Routledge.

Munro, R.A., Ramu, G. and Zrymiak, D.J., 2015. The certified Six Sigma green belt handbook. ASQ Quality Press.

(**N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Engagement Requirements

In line with the Academic Engagement Procedure, Students are defined as academically engaged if they are regularly engaged with timetabled teaching sessions, course-related learning resources including those in the Library and on the relevant learning platform, and complete assessments and submit these on time. Please refer to the Academic Engagement Procedure at the following link: [Academic engagement procedure](#)

Supplemental Information

Programme Board	Engineering
Assessment Results (Pass/Fail)	No
Subject Panel	Civil Engineering and Quality Management
Moderator	Dr James Findlay
External Examiner	A Garad
Accreditation Details	
Changes/Version Number	2.20 Add graduate attributes Update indicative resources. Update Module coordinator and moderator.

Assessment: (also refer to Assessment Outcomes Grids below)

One coursework assignment, worth 40% of the module

One class test, worth 60% of the module

(N.B. (i) **Assessment Outcomes Grids** for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed.

(ii) An **indicative schedule** listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Handbook.)

Assessment Outcome Grids (Footnote A.)

Component 1

Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Learning Outcome (5)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Clinical/ Fieldwork/ Practical skills assessment/	✓	✓	✓	✓	✓	40	20

Debate/ Interview/ Viva voce/ Oral							
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Component 2

Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Learning Outcome (5)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Class test (written)	✓	✓	✓	✓	✓	60	2
Combined Total For All Components						100%	22 hours

Footnotes

A. Referred to within Assessment Section above

B. Identified in the Learning Outcome Section above

Note(s):

1. More than one assessment method can be used to assess individual learning outcomes.
2. Schools are responsible for determining student contact hours. Please refer to University Policy on contact hours (extract contained within section 10 of the Module Descriptor guidance note).
This will normally be variable across Schools, dependent on Programmes &/or Professional requirements.

Equality and Diversity

This module is appropriate for all students.

[UWS Equality and Diversity Policy](#)

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)