MODULE SPECIFICATION

Part 1: Information			
Module Title	Statistical Research Methods		
Module Code	UFMFK7-30-3	Level	Level 6
For implementation from	2020-21		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Faculty of Environment & Technology	Field	Engineering, Design and Mathematics
Department	FET Dept of Engin Design & Mathematics		
Module type:	Standard		
Pre-requisites	Statistical Modelling 2020-21		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description

Overview: This module is concerned with the careful use of quantitative research methodology and the application of statistical techniques in empirical research.

Educational Aims: See Learning Outcomes.

Outline Syllabus: The syllabus includes:

Advanced modelling techniques:
Binary, ordinal and nominal logistic regression models: application, theoretical underpinning, model diagnostics.
Discriminant Analysis: applications and interpretation, theoretical underpinning, model diagnostics.
Multivariate Analysis of Variance.
Survival Analysis.

Biomedical research techniques:
Principles of experimental designs relating to medical studies including the clinical control randomised trial (randomisation, replication, blinding, use of controls, trial protocol, and the conduct of CRT); prospective cohort studies, case control studies, cross-sectional studies, longitudinal studies, cross-over trials, and their conduct.
Determination of sample size for a given study.
The analysis of category data arising in a medical context including (odds ratios within and

across strata, relative risk, log-linear modelling, sensitivity, specificity, negative predictive value, positive predictive value, evaluating predictive value of a test using Bayes Theorem, ROC curves).
Measures of reliability including Intra Class Correlations, Bland-Altman plots, Cohen's kappa.
Analysis of survival data including the proportional hazards survival model, estimation of survival probabilities, Kaplan-Meier survival curves, log rank tests.

Industrial Studies:
Two-level full and fractional factorial designs, central composite and rotatable designs and process optimisation.
Taguchi methods and their role in product design and quality improvement.

Time Series Analysis:
ARIMA modelling.

Missing data:
Concepts of missingness (MCAR, CAR, NMAR); effects of missing data; methods for handling missing data (e.g. imputation, multiple imputation, mean imputation, last one carried forward, listwise deletion, pairwise deletion); limitations and consequences of missing data.

Meta-analysis:
Introduction to meta-analysis. Systematic reviews, publication bias, effect sizes, random and fixed effects models; examples taken from the empirical literature.

Familwise error rate:
Multiple comparisons in ANOVA (e.g. Tukey's test, Student-Newman-Keuls test, Ryan-Einot-Gabriel-Welch tests, least significant difference), Tamhane's test, Games-Howell test, Hsu's test) and techniques to control Type I error rates (e.g. Bonferroni-Dunn, Hochberg step down, Hochberg step up) and the False Discovery Rate. When to use these tests.

Teaching and Learning Methods: The module is delivered by means of lectures, tutorials/practicals or workshops. To prepare for assessment, students are expected to undertake self-directed learning in addition to the directed learning which supports taught classes:

Contact time: 75 hours
Assimilation and development of knowledge: 150 hours
Assessment: 75 hours
TOTAL: 300 HOURS

Scheduled teaching hours takes the form of two concurrent streams:

Stream 1:
Whole group lectures, used to deliver new material and to consolidate previous material.
Weekly computer practical, with activities following on directly from the lecture to develop analytical skills and gain practical experience.

Stream 2:
A fortnightly lecture/workshop session used to introduce major themes and use case studies, published research papers and research examples.
A fortnightly tutorial/practical session used to discuss the themes introduced in the lecture/workshop in Stream 2.

Part 3: Assessment
Component A consists of an examination which assesses students' understanding of concepts and techniques as well as their ability to interpret results within different contexts. Component B consists of two short assignments worth 25% each. One assessment will focus on the statistical modelling of data and the second assessment will be on design concepts and the analysis of data to answer a defined research question.

First Sit Components	Final Assessment	Element weighting	Description
Examination (Online) - Component A	✓	50 %	Online Written examination
Written Assignment - Component B		25 %	Coursework 1 (max 10 pages)
Written Assignment - Component B		25 %	Coursework 2 (max 10 pages)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Examination (Online) - Component A	✓	50 %	Online Written examination
Written Assignment - Component B		50 %	Coursework (max 20 pages)

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will achieve the following learning outcomes:

Module Learning Outcomes	Reference
Appropriately apply advanced statistical techniques in empirical research using modern day software	MO1
Assess model diagnostics to inform empirical model building	MO2
Interpret and explain a wide variety of empirical statistical models in different context (own analyses or research papers)	MO3
Examine limitations of inference from statistical models based on model evaluation techniques and the way the data have been generated	MO4
Show detailed knowledge of the role played by statistical design in medicine and industry	MO5
Conduct literature searches to support empirical investigations and to correctly cite sources of information	MO6

Contact Hours

Independent Study Hours:	
Independent study/self-guided study	225
Total Independent Study Hours:	225
Scheduled Learning and Teaching Hours:	
Face-to-face learning	75
Total Scheduled Learning and Teaching Hours:	75

	Hours to be allocated	300
	Allocated Hours	300
Reading List	*The reading list for this module can be accessed via the following link:* https://uwe.rl.talis.com/modules/ufmfk7-30-3.html	

Part 5: Contributes Towards
This module contributes towards the following programmes of study: Mathematics and Statistics [Sep][FT][Frenchay][3yrs] BSc (Hons) 2018-19 Statistics [Sep][FT][Frenchay][3yrs] BSc (Hons) 2018-19 Mathematics [Sep][FT][Frenchay][4yrs] MMath 2018-19 Mathematics [Sep][FT][Frenchay][3yrs] BSc (Hons) 2018-19