

ST4040: Modern Statistical Methods

Module Details					
Title Short:	Modern Statistical Methods APPROVED				
Language of Instruction:	English				
Module Code:	ST4040				
ECTS Credits:	5				
NFQ Level:	8	EQF Level:	6	EHEA Level:	First Cycle
Valid From:	2021-22 (01-09-21 – 31-08-22)				
Teaching Period:	Semester 2				
Module Delivered in	2 programme(s)				
Module Owner:	ANDREW SIMPKIN				
Module Discipline:	MA_ST_AM - School of Mathematics, Statistics and Applied Mathematics				
Module Data:	1 - 4 NON LAB				
Module Description:	An overview of modern approaches to statistical practice. Topics include: mixture models, nonparametric regression and smoothing, linear mixed models, penalised regression, classification and regression trees, prediction modelling, dealing with missing data, survival analysis				
Learning Outcomes					
<i>On successful completion of this module the learner will be able to:</i>					
LO1	Recognise how mixtures arise in an applied setting and construct a basic Gaussian mixture model				
LO2	Describe nonlinear relationships between variables using spline and kernel smoothers				
LO3	Extend linear regression to the case of clustered data, explain the concept of a random effect and its distinction from a fixed effect, calculate an intra-class correlation coefficient				
LO4	Apply penalised regression methods such as the LASSO for variable selection				
LO5	Construct a classification/regression tree; apply trees for prediction				
LO6	Calculate and interpret sensitivity, specificity, positive predictive value, negative predictive value; draw and interpret a ROC curve				
LO7	Derive and apply suitable methods for missing data				
LO8	Apply Cox proportional hazards models for time to event data				

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Module Content & Assessment

Indicative Content

Modern Statistical Methods

This course provides an overview of modern statistical methods and their application. Topics covered include: 1. Mixture models: how mixtures of distributions arise in data, how to construct suitable models for e.g. Gaussian mixtures 2. Nonparametric smoothing: modelling nonlinear relationships using spline and kernel smoothers 3. Linear mixed models: analysing clustered or repeated data through a mixed model framework to account for both within- and between-subject variability 4. Classification and regression trees: estimating and pruning trees to be used for prediction 5. Prediction modelling: measure and interpret the performance of statistical learning models 6. Missing data: an introduction to multiple imputation methods 7. Survival analysis: analysing time to event data using Cox proportional hazards models

No Written Assessment

No Continuous Assessment

No Oral, Audio Visual or Practical Assessment

Department-based Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Marks Out of	Pass Marks	Sitting	Assessment Period	Assessment Date	Duration	Mandatory
Departmental Assessment 1	Statistical Analysis Projects	1,2,3,4,5,6,7,8	100	100	0	First Sitting	Semester 2	n/a	0	False
Departmental Assessment 1	Statistical Analysis Reports	1,2,3,4,5,6,7,8	100	100	0	Second Sitting	Autumn	n/a	0	False

No Research

No Study Abroad

No Computer-based Assessment

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

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Module Workload

Workload: Full Time					
<i>Workload Type</i>	<i>WorkLoad Description</i>	<i>Learning Outcomes</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	1 hour duration	1,2,3,4,5,6,7,8	24	Per Semester	2.00
Tutorial	1 hour duration	1,2,3,4,5,6,7,8	12	Per Semester	1.00
Independent & Directed Learning (Non-contact)	No Description	1,2,3,4,5,6,7,8	89	Per Semester	7.42
Total Hours					125.00
Total Weekly Learner Workload					10.42
Total Weekly Contact Hours					3.00

This module has no Part Time workload.

Module Resources

This module does not have any book resources

This module does not have any article/paper resources

This module does not have any other resources

Module Full Time Equivalent**Module Full Time Equivalent**

<i>Discipline</i>	<i>%</i>
School of Mathematics, Statistics and Applied Mathematics	100

Module Delivered in

Course Stream Code	<i>Course Stream Title</i>
BMS2	BMS2 Bachelor of Science (Mathematical Science) Honours (Approved)
BS2	BS2 Bachelor of Science (Hons.) (Approved)

Module Instructors

Module Instructors	
<i>Staff Member</i>	<i>Staff Email</i>
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