

STAT09010 Design and Analysis of Experiments using R

Full Title	Design and Analysis of Experiments using R		
Status	Uploaded to Banner	Start Term	2020
NFQ Level	09	ECTS Credits	05
Module Code	STAT09010	Duration	Semester - (13 Weeks)
Grading Mode	Numeric	Department	Physical & Life Sciences
Module Author	Olga Lyashevskaya		
Co Authors	Trish OConnell		

Module Description

This module provides the student with the design of experiments concepts, tools and techniques for optimising products and processes. The student will learn to build empirical models of a process and assess their validity. The R statistical software will be used extensively for data analysis and interpretation.

Learning Outcomes

On completion of this module the learner will/should be able to:

1. Conduct two and three level fractional factorial experiments and analyse the resulting data.
2. Plan, conduct and analyse experiments using Response Surface Methodology (RSM).
3. Analyse multiple response experiments and interpret the results.
4. Analyse and interpret data from experiments involving random effects models.
5. Use the expected means square rules to develop the appropriate statistical model.

Indicative Syllabus

Overview of Design Principles and Hypothesis Testing (1)
 Completely Randomized Design (2)
 Randomized Block Designs (3)
 Factorial Designs (1)
 Nested Designs, Split Plot, Repeated Measures (3)
 Fractional Factorial Designs (1)
 Response Surface Designs (1)
 Checking model assumptions (1)

The number of weeks is specified in the brackets.

Teaching and Learning Strategy

Teaching and learning methods will involve a combination of lectures and case-study with real world examples. Students will complete project work where they design and analyse their own experiments.

Assessment Strategy

Continuous assessment will involve the design and analysis of student's own experiments (worth 30%) and one R-based final exam (70%)

Repeat Assessment Strategies

Repeat assessment rules will comply with the academic policies and procedures of GMIT

Indicative Coursework and Continuous Assessment:		50 %		
Form	Title	Percent	Week (Indicative)	Learning Outcomes
Assignment	Use statapult teaching aid to design experiment	25 %	Week 8	1,2,3,4,5
Assignment	Project - design and analyse experiment	25 %	Week 12	1,2,3,4,5

End of Semester / Year Formal Exam:		50 %		
Form	Title	Percent	Week (Indicative)	Learning Outcomes
Practical Evaluation	Final exam	50 %	Week 14	1,2,3,4,5

Part Time Delivery Mode Average Weekly Workload:			3.00 Hours		
Type	Description	Location	Hours	Frequency	Weekly Avg
Lecture	Lecture	Online	2	Weekly	2.00
Practical	Practical	Online	1	Weekly	1.00

Blended Delivery Mode Average Weekly Workload:			3.00 Hours		
Type	Description	Location	Hours	Frequency	Weekly Avg
Lecture	Lecture	Online	2	Weekly	2.00
Practical	Practical	Online	1	Weekly	1.00

Required Reading Book List

Mathews, G., (2004). *Design of Experiments with MINITAB*. Amer Society for Quality.
ISBN 0873896378 ISBN-13 9780873896375

Lawson, J., (2014). *Design and Analysis of Experiments with R*. Chapman and Hall/CRC.
ISBN 1439868131 ISBN-13 9781439868133

Angela, D., (2017). *Design and Analysis of Experiments*. Springer.
ISBN 3319522485 ISBN-13 9783319522487

Recommended Reading Book List

Montgomery, C., (2012). *Design and Analysis of Experiments*. John Wiley & Sons.
ISBN 1118097939 ISBN-13 9781118097939

Hardwick, C., (2013). *Practical Design of Experiments: DoE Made Easy!* CreateSpace Independent Publishing Platform.
ISBN 1482760991 ISBN-13 9781482760996

Peralta, M., (2013). *Design Of Experiments*. CreateSpace Independent Publishing Platform.
ISBN 1494378582 ISBN-13 9781494378585

Online Resources

Statistical software can be installed from: <https://www.r-project.org/>

Programme Membership

GA_SADVG_O09 202000 Postgraduate Diploma in Science in Advanced Biopharmaceutical Science