<table>
<thead>
<tr>
<th>Module Code</th>
<th>ST7003</th>
</tr>
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<tbody>
<tr>
<td>Module Name</td>
<td>Design and Analysis of Experiments</td>
</tr>
<tr>
<td>ECTS Weighting¹</td>
<td>10 ECTS</td>
</tr>
<tr>
<td>Semester taught</td>
<td>Semester 2</td>
</tr>
<tr>
<td>Module Coordinator/s</td>
<td>TBA</td>
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### Module Learning Outcomes

On successful completion of this module, students will be able to:

- **LO1.** Compare and contrast observational and experimental studies
- **LO2.** Describe and explain the roles of control, blocking, randomisation and replication in experimentation
- **LO3.** Explain the advantages of statistical designs for multifactor experiments
- **LO4.** Describe and explain the genesis of a range of basic experimental design structures
- **LO5.** Implement and interpret the analysis of variance for a range of experimental designs
- **LO6.** Describe the models underlying the analysis of variance for a range of basic experimental designs
- **LO7.** Produce and interpret graphs for data summary and model diagnostics
- **LO8.** Provide outline descriptions of more elaborate designs and data analyses
- **LO9.** Outline strategic issues involved in the design and implementation of experiments

### Module Content

The need for experiments
- Experimental and observational studies
- Cause and effect
- Control

Basic design principles for experiments
- Control
- Blocking (pairing)
- Randomisation
- Replication
- Factorial structure

Standard designs
- Randomised blocks
- Two-level factors
- Multi-level factors
- Split units

Analysis of experimental data
- Exploratory data analysis
- Effect estimation and significance testing
- Analysis of variance
- Statistical models, fixed and random effects
- Model validation, diagnostics

Review topics
- Block structure and treatment structure
- Repeated measures

¹ **TEP Glossary**
Analysis of Covariance
Clinical trials
Response surface designs
Robust designs
Non-Normal errors
Strategies for Experimentation

Teaching and Learning Methods
Lecture hours: 20
Lab hours: 4

Assessment Details

<table>
<thead>
<tr>
<th>Assessment Component</th>
<th>Brief Description</th>
<th>Learning Outcomes Addressed</th>
<th>% of total</th>
<th>Week set</th>
<th>Week due</th>
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<tbody>
<tr>
<td>Examination</td>
<td>3 hour written examination</td>
<td></td>
<td>100%</td>
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Reassessment Details
Examination (3 hours, 100%)

Contact Hours and Indicative Student Workload

<table>
<thead>
<tr>
<th>Contact Hours (scheduled hours per student over full module), broken down by:</th>
<th>24 hours</th>
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<tbody>
<tr>
<td>Lecture</td>
<td>20 hours</td>
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<tr>
<td>Laboratory</td>
<td>4 hours</td>
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<tr>
<td>Tutorial or seminar</td>
<td>0 hours</td>
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<tr>
<td>Other</td>
<td>0 hours</td>
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<table>
<thead>
<tr>
<th>Independent study (outside scheduled contact hours), broken down by:</th>
<th>72 hours</th>
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</thead>
<tbody>
<tr>
<td>preparation for classes and review of material (including preparation for examination, if applicable)</td>
<td>72 hours</td>
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<tr>
<td>completion of assessments (including examination, if applicable)</td>
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<td>Total Hours</td>
<td>96 hours</td>
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Recommended Reading List

*Core material:*
Mullins, E., Statistics for the Quality Control Chemistry Laboratory, Royal Society of Chemistry, 2003, particularly Chapters 4-5, 7-8.

*Suggested Text:*

*Alternative Text:*

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2. TEP Guidelines on Workload and Assessment
Recommended Reading (not essential for examination purposes):

Supplemental lectures notes available on course website.

Module Pre-requisites

Prerequisite modules: Base module ST7001

Other/alternative non-module prerequisites:

Module Co-requisites

Module Website

Last Update

DD/MM/YYYY by Your Name