CBMS760
Analytical Measurement Uncertainty and Method Validation
S1 Evening 2016
Dept of Chemistry & Biomolecular Sciences

Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Information</td>
<td>2</td>
</tr>
<tr>
<td>Learning Outcomes</td>
<td>2</td>
</tr>
<tr>
<td>Assessment Tasks</td>
<td>3</td>
</tr>
<tr>
<td>Delivery and Resources</td>
<td>5</td>
</tr>
<tr>
<td>Policies and Procedures</td>
<td>6</td>
</tr>
<tr>
<td>Graduate Capabilities</td>
<td>8</td>
</tr>
</tbody>
</table>

Disclaimer
Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.
## General Information

<table>
<thead>
<tr>
<th>Unit convenor and teaching staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danny Wong</td>
</tr>
<tr>
<td><a href="mailto:danny.wong@mq.edu.au">danny.wong@mq.edu.au</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission to MRes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corequisites</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Co-badged status</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Unit description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical measurements are required in forensic science, local and international trade, manufacture and production, government regulatory agencies, biotechnology, and nearly every field of science. However, there are always uncertainties associated with measurements owing to experimental errors. This unit systematically covers the estimation principles of measurement uncertainty of values deriving from analytical chemistry measurement procedures and a logical approach to the process of validating an analytical chemistry measurement method. These will then be applied to specific examples from common analytical chemistry.</td>
</tr>
</tbody>
</table>

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at [http://students.mq.edu.au/student_admin/enrolmentguide/academicdates/](http://students.mq.edu.au/student_admin/enrolmentguide/academicdates/)

## Learning Outcomes

1. To understand the concept of making valid analytical measurements
2. To understand the process of deconstructing a method so that factors that influence the final result can be identified
3. To familiarise with commonly applied statistical techniques for evaluation of chemical data
Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1</td>
<td>4%</td>
<td>24/03/2016</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>6%</td>
<td>15-04-2016</td>
</tr>
<tr>
<td>Assignment 3</td>
<td>10%</td>
<td>13-05-2016</td>
</tr>
<tr>
<td>Assignment 4</td>
<td>10%</td>
<td>03-06-2016</td>
</tr>
<tr>
<td>Project</td>
<td>15%</td>
<td>Week 13</td>
</tr>
<tr>
<td>Final Examination</td>
<td>55%</td>
<td>June 2016</td>
</tr>
</tbody>
</table>

Assignment 1
Due: **24/03/2016**
Weighting: 4%

Numerical calculation and short answer type.

This Assessment Task relates to the following Learning Outcomes:
- To understand the concept of making valid analytical measurements
- To understand the process of deconstructing a method so that factors that influence the final result can be identified
- To familiarise with commonly applied statistical techniques for evaluation of chemical data

Assignment 2
Due: **15-04-2016**
Weighting: 6%

Numerical calculation and short answer type.

This Assessment Task relates to the following Learning Outcomes:
- To understand the concept of making valid analytical measurements
- To understand the process of deconstructing a method so that factors that influence the final result can be identified
- To familiarise with commonly applied statistical techniques for evaluation of chemical data
Assignment 3
Due: 13-05-2016
Weighting: 10%

Numerical calculation and short answer type.

This Assessment Task relates to the following Learning Outcomes:
  • To understand the concept of making valid analytical measurements
  • To understand the process of deconstructing a method so that factors that influence the final result can be identified
  • To familiarise with commonly applied statistical techniques for evaluation of chemical data

Assignment 4
Due: 03-06-2016
Weighting: 10%

Numerical calculations and short answer type.

This Assessment Task relates to the following Learning Outcomes:
  • To understand the concept of making valid analytical measurements
  • To understand the process of deconstructing a method so that factors that influence the final result can be identified
  • To familiarise with commonly applied statistical techniques for evaluation of chemical data

Project
Due: Week 13
Weighting: 15%

A written report based on a research work that encompasses all theoretical concepts covered in the unit.

This Assessment Task relates to the following Learning Outcomes:
  • To understand the concept of making valid analytical measurements
  • To understand the process of deconstructing a method so that factors that influence the final result can be identified
• To familiarise with commonly applied statistical techniques for evaluation of chemical data

Final Examination
Due: June 2016
Weighting: 55%

A 3-hour written examination.

This Assessment Task relates to the following Learning Outcomes:
• To understand the concept of making valid analytical measurements
• To understand the process of deconstructing a method so that factors that influence the final result can be identified
• To familiarise with commonly applied statistical techniques for evaluation of chemical data

Delivery and Resources

Technology Used
It is important that you have a scientific calculator as hand-held calculators will be used for assignments and in the final examination. Note that text retrieval calculators are not allowed in the final examination.

Use will be made of Excel and other data processing and display software. Computers carrying this software are available in the teaching laboratories. Items of interest, links to other on-line material will be placed on the unit website.

The University does provide computers for general use, but it would be advantageous to have your own computer and internet access.

Prescribed text

Recommended references
ISO/IEC International Standard 17025 General Requirements for the competence of testing and calibration laboratories, ISO, 2005

In House Method Validation: A guide for Chemical Laboratories, LGC Ltd, 2003

Eurachem Guide: the Fitness for purpose of analytical methods, LGC Ltd, 1988


L.Kirkup, Data Analysis with Excel: An introduction for physical scientists, Cambridge University Press, 2002

D.B.Hibbert, Quality Assurance for the Analytical Chemistry Laboratory, Oxford University Press, 2007

Useful websites

Eurachem -http://www.eurachem.org/


Valid Analytical Measurements http://www.vam.org.uk/home.asp

CITAC - http://www.citac.cc/

AOAC - http://www.aoac.org/


**Policies and Procedures**

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html


Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.

http://unitguides.mq.edu.au/unit_offerings/59278/unit_guide/print
In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

**Student Code of Conduct**

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: [https://students.mq.edu.au/support/student_conduct/](https://students.mq.edu.au/support/student_conduct/)

**Results**

Results shown in iLearn, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

**Student Support**

Macquarie University provides a range of support services for students. For details, visit [http://students.mq.edu.au/support/](http://students.mq.edu.au/support/)

**Learning Skills**

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

**Student Enquiry Service**

For all student enquiries, visit Student Connect at ask.mq.edu.au

**Equity Support**

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

**IT Help**

For help with University computer systems and technology, visit [http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.
Graduate Capabilities

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

**Learning outcomes**

- To understand the concept of making valid analytical measurements
- To understand the process of deconstructing a method so that factors that influence the final result can be identified
- To familiarise with commonly applied statistical techniques for evaluation of chemical data

**Assessment tasks**

- Assignment 1
- Assignment 2
- Assignment 3
- Assignment 4
- Project
- Final Examination

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

**Learning outcomes**

- To understand the concept of making valid analytical measurements
- To understand the process of deconstructing a method so that factors that influence the final result can be identified
- To familiarise with commonly applied statistical techniques for evaluation of chemical data
Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3
- Assignment 4
- Project
- Final Examination

PG - Discipline Knowledge and Skills
Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- To understand the concept of making valid analytical measurements
- To understand the process of deconstructing a method so that factors that influence the final result can be identified
- To familiarise with commonly applied statistical techniques for evaluation of chemical data

Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3
- Assignment 4
- Project
- Final Examination

PG - Critical, Analytical and Integrative Thinking
Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:
Learning outcomes

• To understand the concept of making valid analytical measurements
• To understand the process of deconstructing a method so that factors that influence the final result can be identified
• To familiarise with commonly applied statistical techniques for evaluation of chemical data

Assessment tasks

• Assignment 1
• Assignment 2
• Assignment 3
• Assignment 4
• Project
• Final Examination

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcomes

• To understand the concept of making valid analytical measurements
• To understand the process of deconstructing a method so that factors that influence the final result can be identified
• To familiarise with commonly applied statistical techniques for evaluation of chemical data

Assessment tasks

• Assignment 1
• Assignment 2
• Assignment 3
• Assignment 4
• Project
• Final Examination
PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues.

This graduate capability is supported by:

Learning outcomes

- To understand the concept of making valid analytical measurements
- To understand the process of deconstructing a method so that factors that influence the final result can be identified
- To familiarise with commonly applied statistical techniques for evaluation of chemical data

Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3
- Assignment 4
- Project
- Final Examination