

CH915-10 Techniques in Quantitative and Qualitative Analysis

22/23

Department

Chemistry

Level

Taught Postgraduate Level

Module leader

Mark Barrow

Credit value

10

Module duration

10 weeks

Assessment

100% coursework

Study location

University of Warwick main campus, Coventry

Description

Introductory description

This module will introduce practical fundamentals of qualitative and quantitative analysis. We will consider practical aspects of sampling and calibration techniques. The laboratory sessions will include quantitative analyses using volumetry, gravimetry, UV-visible, IR, Raman as well as NMR spectroscopy and state-of-the art inductively coupled plasma spectroscopy (ICP) techniques such as OES and MS.

[Module web page](#)

Module aims

To introduce students from a range of different backgrounds to the laboratory techniques in Analytical Science.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

This module will allow students to combine their advanced analytical techniques knowledge which they should obtain throughout the taught MSc programmes with hands-on experience in the laboratory and in practical workshops.

Topics covered might include:

- Applications of qualitative/quantitative analyses
- Performance characteristics of quantitative analytical methods
- Experimental error
- Sampling and how to deal with heterogeneous samples
- Measurement of mass and volume:
 - Volumetric and gravimetric methods
 - Optical spectroscopies
 - Infrared spectroscopy
 - Elemental Analysis
 - Chiro-optical spectroscopy
- Modern instrumental methods such as mass spectrometry and NMR spectroscopy
- Data analysis and interpretation

Learning outcomes

By the end of the module, students should be able to:

- To equip students from a range of different backgrounds with essential practical skills necessary for later modules.

Indicative reading list

D.A. Skoog, D.M. West, and F.J. Holler, Crouch, Fundamentals of Analytical Chemistry, 9th Edition

D.C. Harris, Quantitative Chemical Analysis, 7th edition.

Holler, Skoog, Crouch, Principles of Instrumental Analysis, 6th Edition.

Subject specific skills

Subject knowledge and understanding:

- Show an advanced understanding of the:
 - principles behind classical analytical and spectroscopic methods.
 - functions of various components in complex spectroscopic instrumentation.
- Discriminate between various analytical techniques, understanding the advantages, disadvantages and current applications of each.
- Demonstrate the ability to evaluate and interpret data from a variety of measurements.
- Display practical consideration for sources and treatment of experimental error.

Key Skills

- Communicate scientific material verbally and in writing
- Demonstrate numeracy
- Independently use information technology: data-fitting software and spreadsheets

- Locate and evaluate relevant information from outside sources/literature research
- Manage time effectively
- Cognitive Skills:
 - Critically analyse experimental data
 - Comprehensively assess errors in data
 - Test hypotheses using experimental data
 - Interpret results with aid of information from literature.
- Subject-Specific/Professional Skills:
 - Follow good and safe practice in the laboratory.
 - Demonstrate sound laboratory and measurement skills.
 - Produce clearly written and original scientific reports.
 - Research and reference relevant literature.

Transferable skills

1 Critical thinking

- Recognise patterns, themes and key messages from sometimes confused and incomplete data.
- Make informed decisions on the value of a range of sources allowing an evidence based conclusion based on this analysis.

2 Problem solving

- Use rational and logical reasoning to deduce appropriate and well-reasoned conclusions.
- Retain an open mind, optimistic of finding solutions, thinking laterally and creatively to look beyond the obvious.
- Knows how to learn from failure.

3 Self-awareness

- Actively seek opportunities for personal development in the context of employment and life.
- Aware of personal strengths and emotional intelligence
- Reflect on learning, seeking feedback on and evaluating personal practices, strengths and opportunities for personal growth.

4 Communication

- Communicate orally in a clear and sensitive manner which is appropriately varied according to different audiences.
- Written: Present arguments, knowledge and ideas, in a range of formats. Active listening: questioning, reflecting, summarising.

5 Teamwork and working effectively with others

- Operate within, and contribute to, a respectful, supportive and cooperative group climate.
- Sensitive to the impact of actions on others.

6 Information literacy (research skills)

- Critical awareness of how information is gathered, used, managed and synthesised.
- Understanding of the relative value of different sources and the importance of provenance.
- The systematic collection, analysis and evaluation of information in the investigation of a topic.

7 Digital literacy

- Has the capabilities that enable living, learning and working in a digital society.
- Comfortable with using digital media to communicate, solve problems, manage information,

collaborate, create and share content.

11 Professionalism

- Prepared to operate autonomously.
 - Aware of how to be efficient and resilient.
 - Manages priorities and time.
 - Self-motivated, setting and achieving goals, prioritising tasks.
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Study

Study time

Type	Required
Practical classes	9 sessions of 6 hours (54%)
Private study	46 hours (46%)
Total	100 hours

Private study description

Self study, preparation and writeups: 46 hours

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A3

	Weighting	Study time
Written Laboratory Reports	100%	
Lab reports following each lab session		

Feedback on assessment

Written work will be annotated and returned to students. Feedback on laboratory and workshop performance will be provided verbally.

Availability

Courses

This module is Core for:

- Year 1 of TCHA-F1PY Postgraduate Taught Analytical Science and Instrumentation
- Year 1 of TCHA-F1PX Postgraduate Taught Analytical and Polymer Science
- TCHA-F1PL Postgraduate Taught Molecular Analytical Science
 - Year 1 of F1PL Molecular Analytical Science
 - Year 1 of F1PL Molecular Analytical Science

This module is Optional for:

- Year 1 of TCHA-F1PB MSc in Chemistry with Scientific Writing
- Year 1 of TCHS-F1PK Postgraduate Taught Polymer Chemistry
- TCHA-F1PE Postgraduate Taught Scientific Research and Communication
 - Year 1 of F1PE Scientific Research and Communication
 - Year 1 of F1PE Scientific Research and Communication

This module is Core option list B for:

- Year 1 of TCHA-F1PY Postgraduate Taught Analytical Science and Instrumentation

This module is Option list A for:

- Year 1 of RCHA-F1P9 Postgraduate Research Analytical Science