UNIVERSITY of BRADFORD

# Module Descriptor

## Molecular Analysis

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| Module Code: | CFS6016-B |
| Academic Year: | 2018-19 |
| Credit Rating: | 20 |
| School: | School of Chemistry and Biosciences |
| Subject Area: | Chemistry and Forensic Science (ceases 2016) |
| FHEQ Level: | FHEQ Level 6 |
| Module Leader: | Dr Philip Drake |

Additional Tutors:

Pre-requisites:

Co-requisites:

### Contact Hours

| Type | Hours |
|---|---|
| Lectures | 28 |
| Tutorials | 6 |
| Directed Study | 164 |
| Examinations DO NOT USE | 2 |

### Availability Periods

| Occurrence | Location/Period |
|---|---|
| BDA | University of Bradford / Semester 2 (Feb - May) |

### Module Aims

This module will introduce you to the different methods used in modern analytical sciences. The course aims to provide an understanding of the theory of common techniques, data analysis methods and will prepare you for more in-depth studies at stage-4 as well as providing a strong foundation in analytical techniques and methods for further studies in materials or medicinal chemistry. Many chemists work as analytical scientists in industry or

government laboratories and the course will provide a general background for applied work in these areas.

## Outline Syllabus

1. Statistics and data analysis
2. Theory and applications of NMR spectroscopy
3. Symmetry and group theory
4. Infrared, Microwave and Raman spectroscopy and applications of symmetry
5. Mass spectrometry: Theory, instrumentation and interpretation
6. UV/visible and atomic absorption spectroscopy: The Russell Saunders coupling; Term symbols; Microstates; Selection rules; Correlation diagrams; Beer Lambert Law
7. Photo electron spectroscopy - Jablonski diagrams, intersystem crossing, florescence and phosphorescence
8. Chromatography and separation
9. X-ray diffraction: Theory, instrumentation, single crystal structure determination, qualitative phase analysis by powder diffraction, indexing.
10. Case studies in combining analytical techniques to solve selected problems in inorganic and organic chemistry.

## Module Learning Outcomes

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

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|---|---|
| 1 | 1.1 - Apply statistical techniques to the analysis of data<br>1.2 - Demonstrate how nuclear magnetic resonance provides structural information<br>1.3 - Rationalise the use of different techniques in mass spectroscopy<br>1.4 - Use symmetry and group theory to interpret vibrational and rotational molecular spectra<br>1.5 - Explain the theories behind electronic spectroscopy<br>1.6 - Contrast the techniques of liquid and gas chromatography<br>1.7 - Explain the use of X-ray diffraction for solid form identification and molecular structure analysis.<br>(cont./ under LO 2) |
| 2 | 1.8 - Combine information from different analytical techniques to solve selected problems in inorganic and organic chemistry.<br>1.9 - Discuss the precision of the various techniques and their limitations<br><br>2.1- Converse using the language of the analytical sciences.<br>2.2 - Use specialist software packages and spread sheets to analyse data |
| 3 | 3.1 - Be competent at self-study and be able to quickly assimilate information.<br>3.2 - Be able to think across your own discipline and explore other fields |

## Learning, Teaching and Assessment Strategy

Lectures will deliver core content; providing you with the opportunity to acquire the information to enhance your knowledge and understanding of the various techniques used for chemical or materials analyses. This will be complemented by seminars, group discussions and tutorials to allow you to apply this learning to specific exemplar problems. At the start of this module you will become aware of data analysis methods using statistical techniques. You will learn how to analyse errors in your measurements, different types of

data and how to choose the right data analysis techniques for different kinds of data sets and problems. Next, we will move onto study nuclear magnetic resonance (NMR) techniques, mass spectrometry (MS), vibrational spectroscopies, ultraviolet (UV)/visible and atomic absorption techniques, and X-ray diffraction.
Directed study provides you with the opportunity to undertake guided reading and to develop their own portfolio of learning to enhance transferable skills and knowledge relating to evaluation of own role and subject provision.
The VLE will be used to provide access to online resources, lecture notes and external links to websites of interest.
Assessment 1: An assessed proactive Team Based Learning workshop to work on given set of problems
Assessment 2: Summative examination to cover the whole module.

## Mode of Assessment

| Type | Method | Description | Length | Weighting | Final Assess' |
|---|---|---|---|---|---|
| Summative | Examination - closed book | Summative assessment - closed book exam | 2 hours | 60% | No |
| Summative | Classroom test | Problem based exercise - group work | 2 hours | 40% | No |

## Legacy Code (if applicable)

CT-3513D

## Reading List

To view Reading List, please go to **rebus:list**.