

## Solid Analysis

|                |                                              |
|----------------|----------------------------------------------|
| Module Code:   | CFS7026-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 7 (Masters)                       |

Pre-requisites:

Co-requisites:

## Contact Hours

| Type                  | Hours |
|-----------------------|-------|
| Lectures              | 18    |
| Practical classes and | 18    |
| Directed Study        | 164   |

## Availability Periods

| Occurrence | Location/Period                                 |
|------------|-------------------------------------------------|
| BDA        | University of Bradford / Semester 1 (Sep - Jan) |

## Module Aims

This module will provide you with specialist knowledge in the principles and application of XRD and thermal analysis. This covers: sample preparation, instrumental fundamentals and design, including case studies related to applications in specialist areas and recent advances.

The specialist knowledge is reinforced by the 'hands on' practical component and will include use of the analytical centre instruments, collecting and analysing data, troubleshooting and method development/enhancement. The practical sessions will also

involve following written experimental protocols, working in a small group, and working to deadlines.

## Outline Syllabus

### X-Ray Diffraction:

Module introduction. X-Ray Health and Safety. X-Ray crystallography: powder and single crystal, techniques in data collection; revision of basic crystallography and symmetry; systematic absences and space group determination; structure factors; the phase problem; direct methods for structure solution; techniques in refinement; disorder; molecular symmetry; analysis of molecular dimensions; crystal packing and non-bonded interactions. X-Ray and electron diffraction techniques, reciprocal lattice, crystal chemistry, crystal structure-property relationships. Phase identification with databases; X-Ray fluorimetry.

### Thermal Analysis:

Module introduction. Thermal methods: overview of techniques: TGA, DTA/DSC, DVS and DMA (and other thermal methods in use). Principles and detailed theory for TGA and DSC including instrumentation, experimental considerations/method development (eg heating rates and their effect on data), calibration and sample preparation.

Advanced thermal techniques: (1) Modulated Temperature DSC (MTDSC) and (2) Simultaneous thermal analysis and hyphenation of additional analytical probes (i) STA, (ii) TGA-Evolved Gas Analysis (mass spectrometry and FTIR) (iii) DSC-FTIR, DSC-Raman, DSC-XRD (iv) Hot-stage microscopy.

Applications of thermal analysis exemplifying all of the above in areas of pharmaceutical and materials analysis.

## Module Learning Outcomes

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

- 1 Evaluate and apply knowledge and understanding of the theories of instrumental analysis, including sample preparation and analysis.
- 2 Describe recent advances in the subject area.
- 3 Manipulate samples for selection, preparation and analysis.
- 4 Analyse, interpret and critically review experimental data generated with the selected techniques.
- 5 Identify poor quality analytical results and suggest/apply remedial action.
- 6 Apply skills in problem solving and written communication.

## Learning, Teaching and Assessment Strategy

This module will be presented as a series of lectures and workshops/laboratory sessions. The lectures will describe sample preparation and instrumental techniques covering the fundamentals to recent developments. The lectures will include case studies enabling you to think across your own discipline and explore other fields. The lectures will be supported

by practical workshops and 'hands-on' sessions with relevant samples. Formative progress tests will be used to revise previous content with feedback and questions from students. The assessment will be used to assess your learning and to enable you to demonstrate your problem-solving and interpretation skills.

### Mode of Assessment

| Type      | Method                    | Description                                                                                                      | Length      | Weighting | Final Assess' |
|-----------|---------------------------|------------------------------------------------------------------------------------------------------------------|-------------|-----------|---------------|
| Summative | Laboratory Report         | Student will submit a laboratory report detailing analysis of sample(s) and interpretation of experimental data. | -2000 words | 50%       | No            |
| Summative | Examination - closed book | A formal exam covering the taught syllabus. Short questions followed by longer essay type questions.             | 2 hours     | 50%       | Yes           |

### Legacy Code (if applicable)

### Reading List

To view Reading List, please go to [rebus:list](#).