

## Programme Specification

**Programme title: Analytical Sciences**

|                                                                         |                                                                                                                                         |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Academic Year:                                                          | 2018/19                                                                                                                                 |
| Degree Awarding Body:                                                   | University of Bradford                                                                                                                  |
| Partner(s), delivery organisation or support provider (if appropriate): | NA                                                                                                                                      |
| Final and interim award(s):                                             | [Framework for Higher Education Qualifications (FHEQ) level 7]<br>Master of Science<br>Postgraduate Diploma<br>Postgraduate Certificate |
| Programme accredited by (if appropriate):                               | NA                                                                                                                                      |
| Programme duration:                                                     | 1 year full time, 2 years part time                                                                                                     |
| QAA Subject benchmark statement(s):                                     | Chemistry (2014)                                                                                                                        |
| Date of Senate Approval:                                                |                                                                                                                                         |
| Date last confirmed and/or minor modification approved by Faculty Board | February 2017                                                                                                                           |

### Introduction

This programme is designed to develop graduate students into experienced, independent practitioners of modern analytical science in tune with the needs of research and industry. The Analytical Sciences MSc is a research-focussed degree. It is designed to provide the necessary practical, interpretative analytical skills to apply a wide range of analytical techniques to key areas of application in advanced aspects of modern analytical chemistry. This will allow students to explore areas of specialist knowledge through optional modules, and to then give them a genuine research experience through an extended research project.

The instrumental science programmes are centred at Bradford's state-of-the-art University Analytical Centre, a £3m facility housing the major capital equipment of the University and the focus for its academic and commercial contract research in analysis.

The programme is designed to offer learning for both full time (1 year) and part-time (2 years) studies. MSc, Postgraduate diploma, Postgraduate certificate can be awarded.

### **Programme Aims**

The programme is intended to:

- A1 Develop a systematic knowledge and understanding of the core principles of instrumental analytical chemistry, to enable students to develop skills in a range of essential analytical techniques.
- A2 Allow students to identify appropriate contexts for application of instrumental analytical techniques.
- A3 Instruct students in methods of data analysis to assess the significance of experimental outcomes.
- A4 Allow students to assimilate, evaluate and present results of instrumental analysis objectively.
- A5 Instruct students in the safe operation of instrumentation in a modern analytical laboratory.
- A6 Critically understand quality control systems applicable in analytical sciences.
- A7 To provide students with a supportive and structured environment in which they are encouraged to develop the independent study skills required for lifelong learning.
- A8 Equip students with information and skills to facilitate transition to employment or further study.
- A9 Develop and enhance students' ability in a range of personal and key transferable skills such as group work, presentation skills and report writing
- A10 Enhance skills associated with the communication of scientific data
- A11 Develop an understanding of the processes and challenges involved in taking research ideas into the marketplace.
- A12 Provide students with experience of project management methods and experimental design for analytical chemistry.
- A13 Provide students with experience in research at the forefront of the field of their chosen specialism.
- A14 Adapt and apply analytical methods to problems in the chosen field of specialism.
- A15 Provide students with the opportunity to develop key skills in the dissemination of research outcomes through a thesis, journal communication and scientific presentation.

## Programme Learning Outcomes

To be eligible for the award of Postgraduate Certificate at FHEQ level 7, students will be able to:

- LO1 Evaluate, appraise and apply instrumental analytical techniques,
- LO2 Explain and critically evaluate experimental approaches and the operation of frequently-applied instrumental analytical techniques,
- LO3 Employ critical thinking and conceptual understanding and recognise, define and prioritise problems, analyse, interpret, objectively evaluate and prioritise information recognising its limitations,
- LO4 Examine their level of attainment in defined attributes and skills through the use of reflective practice,
- LO5 Critically examine and categorise an area of the scientific literature,
- LO6 Implement project planning techniques in designing a research project plan,
- LO7 Communicate analytical data,
- LO8 Manipulate samples for selection, preparation and analysis,
- LO9 Operate analytical instrumentation under supervision,
- LO10 Manipulate and interpret analytical data,
- LO11 Devise experimental strategies for analysis, project-plan experimentation and develop a written project proposal from concept,
- LO12 Employ effective time management and task prioritisation.

Additionally, to be eligible for the award of Postgraduate Diploma at FHEQ level 7, students will be able to:

- LO13 Manage a scientific research project,
- LO14 Manage health and safety for their own sample collection, preparation and analysis, including completion of relevant COSHH, ethical and other risk assessments,
- LO15 Operate selected analytical instrumentation independently,
- LO16 Write and interpret scientific reports.

Additionally, to be eligible for the award of Degree of Master at FHEQ level 7, students will be able to:

- LO17 Implement an original and self-directed research project,
- LO18 Demonstrate competence in presenting scientific data,
- LO19 Critically evaluate and present the results of research,
- LO20 Produce a dissertation and associated journal communication employing advanced level academic writing skills.

## Curriculum

The MSc Analytical Sciences programme is offered in full-time (1 year) and part-time (2 years) mode. The Masters qualification comprises 180 credits. 20 credits are equivalent to 200 student learning hours. The MSc consists of a core of compulsory modules to provide the appropriate framework and a range of option choices to develop specialist skills. A substantial 100 credit individual research theme runs throughout the whole MSc. All modules are at level 7. Details about modules, including specific learning outcomes, are available from the module descriptors.

The core modules are dedicated to developing generic analytical key skills, specialism practice for each pathway and project management experience. The specialist modules relating to the analytical instruments (60 credits) include lectures, workshops, hands-on laboratory and instrument sessions with relevant samples under the instruction of a team of interdisciplinary specialists in the area. The dissertation offers an opportunity for substantial research (20+60 credits).

### Postgraduate Certificate

| FHEQ Level | Module Title                                                        | Core/Option | Credits | Study Period | Module Code |
|------------|---------------------------------------------------------------------|-------------|---------|--------------|-------------|
| 7          | Advanced methods in analytical science                              | Core        | 20      | Semester 1   | CFS7029-B   |
| 7          | Research skills, professional development, and commercial awareness | Core        | 20      | Semester 1   | CFS7025-B   |
| 7          | Solid analysis                                                      | Option      | 20      | Semester 1   | CFS7026-B   |
| 7          | Spectroscopy                                                        | Option      | 20      | Semester 1   | CFS7030-B   |
| 7          | Separation science and mass spectrometry                            | Option      | 20      | Semester 2   | CFS7027-B   |
| 7          | Imaging                                                             | Option      | 20      | Semester 2   | CFS7028-B   |

Students will be eligible to exit with the award of Postgraduate Certificate if they have successfully completed 60 credits and achieved the award learning outcomes.

## Postgraduate Diploma

| FHEQ Level | Module Title                                                        | Core/Option | Credits | Study Period | Module Code |
|------------|---------------------------------------------------------------------|-------------|---------|--------------|-------------|
| 7          | Advanced methods in analytical science                              | Core        | 20      | Semester 1   | CFS7029-B   |
| 7          | Research skills, professional development, and commercial awareness | Core        | 20      | Semester 1   | CFS7025-B   |
| 7          | Solid analysis                                                      | Option      | 20      | Semester 1   | CFS7026-B   |
| 7          | Spectroscopy                                                        | Option      | 20      | Semester 1   | CFS7030-B   |
| 7          | Separation science and mass spectrometry                            | Option      | 20      | Semester 2   | CFS7027-B   |
| 7          | Imaging                                                             | Option      | 20      | Semester 2   | CFS7028-B   |
| 7          | Materials characterisation                                          | Option      | 20      | Semester 2   | CFS7018-B   |
| 7          | Archaeometry                                                        | Option      | 20      | Semester 2   | ARC7035-B   |
| 7          | Research Project – Preparatory Investigations                       | Core        | 20      | Semester 2   | CFS7022-B   |

Students will be eligible to exit with the award of Postgraduate Diploma if they have successfully completed at least 120 credits and achieved the award learning outcomes.

## Degree of Master

| FHEQ Level | Module Title                                                        | Core/Option | Credits | Study Period | Module Code |
|------------|---------------------------------------------------------------------|-------------|---------|--------------|-------------|
| 7          | Advanced methods in analytical science                              | Core        | 20      | Semester 1   | CFS7029-B   |
| 7          | Research skills, professional development, and commercial awareness | Core        | 20      | Semester 1   | CFS7025-B   |
| 7          | Solid analysis                                                      | Option      | 20      | Semester 1   | CFS7026-B   |
| 7          | Spectroscopy                                                        | Option      | 20      | Semester 1   | CFS7030-B   |
| 7          | Separation science and mass spectrometry                            | Option      | 20      | Semester 2   | CFS7027-B   |
| 7          | Imaging                                                             | Option      | 20      | Semester 2   | CFS7028-B   |
| 7          | Materials characterisation                                          | Option      | 20      | Semester 2   | CFS7018-B   |
| 7          | Archaeometry                                                        | Option      | 20      | Semester 2   | ARC7035-B   |
| 7          | Research Project – Preparatory Investigations                       | Core        | 20      | Semester 2   | CFS7022-B   |
| 7          | Research Project – Advanced Investigations                          | Core        | 60      | Summer       | CFS7023-E   |

Students will be eligible for the award of Degree of Master if they have successfully completed at least 180 credits and achieved the award learning outcomes.

## **Learning and Teaching Strategy**

A variety of teaching methods appropriate to the learning outcomes of the individual modules are employed throughout the programmes. Learning is developed through use of lectures, laboratories, workshops and directed study. Hands-on laboratory work (wet chemistry, instrumental use, instrument demonstration, software use) is core to this programme. Directed study involves a variety of activities, including directed reading of specified literature, web-based materials (e.g. videos, problem solving) and report writing. These learning and teaching strategies progressively focus on student-centred approaches to learning and will reflect increasing reliance on independent responsibility for learning. In this way students will develop the attributes needed for life-long learning and continued professional development.

## **Assessment Strategy**

A range of assessments are used in these programmes: Formative assessments are used throughout the programme (e.g. extensive use of E-learning, on-line, diagnostic testing and pre-module preparation materials). These are used to inform staff of the student background knowledge in advance of course and direct students towards relevant based information to help prepare for study.

Summative assessments include formal examinations, coursework (short and long problem solving questions, laboratory reports, research design), oral and poster presentations, and the MSc dissertation includes the preparation of a scientific paper thus increasing research output and aiding careers in research.

Learning outcomes LO 3, 7, 10 and 12 will be developed through a series of lectures, laboratories, workshops and directed study in 'Advanced methods in Analytical Science' and will be assessed through course work and formal exams.

Learning outcomes LO 1, 2, 3, 7, 8, 9 and 12 will be developed through a series of specialist instrumental modules (including; Imaging, Spectroscopy, Separation science and mass spectrometry, Solid analysis) run as lectures and workshops/laboratory sessions. These module outcomes will be assessed by a laboratory report based on data obtained during a supervised instrumental session and formal exam. Learning outcomes LO 4-7, 11-12 will be developed through the module 'Research skills, professional development, and commercial awareness' and assessed by course work involving preparation of a project plan, training plan, and evidence of reflective practice.

Learning outcomes LO 13-16 and 17-20 will be developed through supervised research and assessed through the Research Project – Preparatory Investigations (20 credits) and Research Project – Advanced Investigations (60 credits). These will be assessed through the preparation of a dissertation, a journal publication and an oral presentation covering the research project.

More detailed description of the way that learning is related to assessment in the modules that make up this programme can be found in the module descriptors.

## **Assessment Regulations**

This Programme conforms to the standard University Regulations which are available at the following link:

<http://www.bradford.ac.uk/aqpo/ordinances-and-regulations/>

## **Admission Requirements**

The University welcomes applications from all potential students and most important in the decision to offer a place is our assessment of a candidate's potential to benefit from their studies and of their ability to succeed on this particular programme. Consideration of applications will be based on a combination of formal academic qualifications and other relevant experience.

The standard entry requirements for the programme are as follows:

Applicants for the MSc or Postgraduate Diploma in Analytical Sciences will be expected to have completed (or be due to complete) a degree in chemistry, a closely related discipline or have substantive equivalent experience. The first degree should be a BSc in a science subject (e.g. Biosciences, Pharmaceutical Science, Chemistry, Forensic Science, Geology, Environmental Science, Archaeological Science) at the level of 1st, 2i or 2ii (2ii for subjects with significant analytical chemistry content, or recent equivalent experience). Admission onto the programmes will be on an individual basis for overseas students, at an equivalent level to UK entry requirements, on the advice of Student Registry. For students whose first language is not English a minimum International English Language Testing System (IELTS) score at 6.0, with no sub-test less than 5.0, or the equivalent is required. If applicants do not meet the IELTS requirement, they can take a University of Bradford pre-session English course. See the Language Centre for more details.

Admissions are made on the basis of a completed application form, references, official transcripts, or a list of courses/modules and grades/marks stamped by the applicant's undergraduate department or student registry. These documents are therefore required of all applicants.

Applications are welcome from students with non-standard qualifications or mature students (those over 21 years of age on entry) with significant relevant experience.

## **Recognition of Prior Learning**

If applicants have prior certificated learning or professional experience which may be equivalent to parts of this programme, the University has procedures to evaluate and recognise this learning in order to provide applicants with exemptions from specified modules or parts of the programme.

## Minor Modification Schedule

| Version Number | Brief description of Modification | Date of Approval (Faculty Board) |
|----------------|-----------------------------------|----------------------------------|
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