Programme Specification

MSc Magnetic Resonance (2020-21)

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided.

Awarding Institution	University of Southampton
Teaching Institution	University of Southampton
Mode of Study	Full-time
Duration in years	1
Accreditation details	None
Final award	Master of Science (MSc)
Name of Award	Magnetic Resonance
Interim Exit awards	Postgraduate Certificate Postgraduate Diploma
FHEQ level of final award	Level 7
UCAS code	N/A
Programme Code	8301
QAA Subject Benchmark or other external reference	Master's Degree Characteristics 2016, QAA Framework for Higher Education Qualifications (FHEQ) 2008
Programme Lead	Jorn Werner (jmwe)
Pathway Lead	

Programme Overview

Brief outline of the programme

Magnetic Resonance exploits the interaction of spins with magnetic fields to produce detailed and unique information about a broad range of materials. Because of its unique properties, magnetic resonance draws on quantum physics and engineering and forms a central analytical technique in very diverse areas of research such as material sciences, organic chemistry, as well as the life sciences with applications in structure elucidation, metabolomics and imaging.

The programme will provide a solid foundation in the theory and application of magnetic resonance. You will be introduced to the quantum mechanical foundations of magnetic resonance and develop the technical and analytical skills to perform and interpret magnetic resonance experiments. You will learn how an NMR spectrometer works and gain hands-on experience in performing NMR experiments. You will be introduced to new developments of the technique itself and how NMR is used in material and life sciences. You will be introduced to advanced computational techniques that will enable you to calculate and simulate the results of NMR experiments.

An experienced team of world leading researchers with a broad scientific portfolio teaches the programme. The expertise ranges from the development of new concepts, building new instrumentation to application of magnetic resonance in material and biological sciences. This will provide you with a stimulating environment as well as diverse study and research opportunities. You will have access to world-class instrumentation and conduct an independent research project of your choice.

In addition to the subject specific modules you will have a choice modules that will enhance your transferable skills and academic capabilities.

Your contact hours will vary depending on your module/option choices. Full information about contact hours is provided in individual module profiles.

Learning and teaching
You will be helped to acquire these skills through aspects of the formal teaching programme as well has having ample opportunity to further develop and practise many of the individual skills during the modules and the research project.

Assessment
Your skills will be assessed as described in the section above, primarily through continuous assessment in a range of modules such as the transferable skills module and through your hands-on and in-depth research project.

Special Features of the programme

The aim is to integrate theoretical and practical knowledge of magnetic resonance and its equipment as to enable the student to become a competent spectroscopist in the field of magnetic resonance. Semester one will be dedicated to introducing fundamental concepts and practical understanding while semester two will take the students to an advanced level in terms of topics and research ability. The research thesis in semester 3 will draw on the basis built up in semesters one and two and will provide a real research opportunity requiring the acquisition of all the relevant theoretical and practical skills.

Programme Structure: Eight taught modular units are taken, four in semester one and four in semester two. Of these, 4 are core modules and 4 are optional modules that can be chosen from a pool of appropriate Chemistry and Biological Sciences modules. Some of the modules comprise of lectured units normally consists of two lectures a week plus a practical component (the nature of which differs depending on the module). Some of the compulsory modules have extended workshop formats supplemented by hands-on experimental elements involving interactions between small groups of students and academics. Additionally, some modules take the format of research seminars, dominated by the research project and guided study. The contribution of practicals and other components of in-course assessment to the final mark will vary from module to module. In semester 3, a lab-based research project, equivalent to 4 modules will be undertaken. This culminates in a manuscript-style written dissertation and oral/poster presentation.

A mixture of paper and e-learning environments will be used. (Blackboard, and NMR specific software environments for simulations and data analysis

Generally the purpose of lectures is to acquire new knowledge, in Workshops/Seminars/Practical's to purpose is to apply knowledge and demonstrate understanding, while independent study served to acquire knowledge, develop understanding, and acquire research skills. The independent research project ensures that the students gain first hand experience in conducting research, writing of scientific work, apply and implement knowledge.

Please note: As a research-led University, we undertake a continuous review of our programmes to ensure quality enhancement and to manage our resources. As a result, this programme may be revised during a student's period of registration; however, any revision will be balanced against the requirement that the student should receive the educational service expected. Please read our Disclaimer to see why, when and how changes may be made to a student's programme.

Programmes and major changes to programmes are approved through the University's programme validation process which is described in the University's Quality handbook.

Educational Aims of the Programme

The MSc in magnetic resonance aims to provide a sound and deep understanding of the concepts and application of magnetic resonance. It also aims to provide you with the practical skills to design implement and execute magnetic resonance experiments and will foster your ability to conduct independent scientific research. This entails researching and critically assessing current scientific literature as well as learning to conduct sound experimental work executing appropriate analyses and learning how to present and communicating your results in oral and written formats.

The aims of the programme are to provide you with:
1. a stimulating, informed learning environment providing a range of expertise's related to magnetic resonance
2. a sound scientific knowledge base in magnetic resonance;
3. practical skills to conduct magnetic resonance experiments
4. the ability to describe and comment on specific aspects of current research in magnetic resonance;
5. an appreciation of the limits of our current understanding of magnetic resonance and how these may be advanced by further relevant research;
6. computational skills to simulate and analyze magnetic resonance experiments
7. an opportunity to develop a range of transferable skills (information and communication technology, team working, written and oral communication, time management, planning, data collection and presentation);
8. opportunities to develop your skills of critical thinking and to show that you can pursue independent study;
9. an opportunity to undertake independent projects on a magnetic resonance topic, including an in depth research project in an academic research laboratory;
10. an education and training suitable for a wide variety of careers and that will prepare you for higher degrees and careers in magnetic resonance research;
11. the capability of life-long learning, study and enquiry.

Programme Learning Outcomes

Knowledge and Understanding

On successful completion of this programme you will have knowledge and understanding of:

A1. Demonstrate deep understanding of key aspects of magnetic resonance
A2. Demonstrate familiarity with a quantum level description of magnetic resonance phenomena
A3. Demonstrate familiarity with advanced simulation techniques to describe magnetic resonance experiments
A4. Demonstrate practical knowledge to operate a magnetic resonance spectrometer
A5. Demonstrate understanding of central hardware components of a magnetic resonance spectrometer
A6. Acquire the ability to design and implement magnetic resonance experiments
A7. Acquire the ability to assess the suitability of magnetic resonance as a research tool for a given research question
A8. Critically analyse and evaluate published scientific articles and appreciate their contribution to current understanding in general and specific magnetic resonance research areas
A9. Synthesize and formulate scientific arguments and present them in recognized written scientific formats.
A10. Present scientific arguments and/or data orally in a logical and succinct manner to both scientific and lay audiences
A11. A detailed knowledge and critical understanding of a key research area within magnetic resonance gained through independent study
A12. Carry out, with supervision, an independent original scientific project in an area of magnetic resonance research
A13. Evaluate and present scientific data obtained demonstrating proficiency in use of advances computational analysis techniques
A14. Become proficient in carrying out searches in literature databases and be able to use appropriate referencing software
A15. Appreciate the importance of scientific method, enquiry and ethical responsibility when conducting scientific research
A16. Demonstrate an ability to conduct self-directed and self-motivated independent study

Subject Specific Intellectual and Research Skills

On successful completion of this programme you will be able to:

B1. Formulate and test hypotheses by planning, conducting and reporting a significant programme of magnetic resonance research
B2. Use a state of the art magnetic resonance equipment to conduct experiments
B3. Analyse and solve problems in magnetic resonance
B4. Use advanced software to simulate and analyse magnetic resonance experiments and determine their significance
B5. Relate your knowledge in magnetic resonance to applications in related disciplines such as chemistry, biochemistry and physics
B6. Independently integrate and critically evaluate experimental data, including primary source material in magnetic resonance journals and from experimentation
B7. Conduct risk assessments concerning the use of chemicals, animal material and laboratory procedures
B8. Demonstrate expertise in defined areas of magnetic resonance at the level of current research in the field
B9. Critically evaluate the data and methodology of current published research in magnetic resonance and present your conclusions

Transferable and Generic Skills

On successful completion of this programme you will be able to:

C1. Communicate/present effectively both verbally and in writing on a range of magnetic resonance topics to both specialised and non-specialised audiences
C2. Work with, and within, a group towards defined outcomes
C3. Use information technology and other resources to find, extract and synthesise information
C4. Solve problems relating to qualitative and quantitative information
C5. Learn independently through critical enquiry
C6. Demonstrate you have the ability to undertake appropriate further training
C7. Manage resources and time
C8. Demonstrate competency in using laboratory skills in a safe and responsible manner

Subject Specific Practical Skills

On successful completion of this programme you will be able to:

D1. Operate a modern NMR spectrometer
D2. Use advanced software packages for data analysis and simulation of spin systems
D3. Critically assess magnetic resonance data
D4. Ability to plan, design and carry out research projects in magnetic resonance
D5. Ability to assess the suitability of a research project for magnetic resonance

Learning Outcomes

LO01. Magnetic Resonance uses the quantum mechanically defined observable of spin for the interrogation of materials through the application of magnetic fields and using sophisticated electronics equipment. Accordingly understanding of basic quantum mechanics together with realising its practical potential in a wide range of applications is at the heart of the programme in magnetic resonance. This will entail a that the students will be equipped with the theoretical knowledge and technical understanding as well as practical skills to become competent spectroscopists in magnetic resonance as specified in the categories and outcomes above.

Programme Structure

The programme structure table is below:

Information about pre and co-requisites is included in individual module profiles.

Pathway

Part I
The programme structure table is below.

We cannot guarantee to offer every option each year; in the Year Handbooks, http://www.southampton.ac.uk/studentservices/academic-life/faculty-handbooks.page and are briefly summarised below.

The programme is offered as a full-time course and normally lasts for one year.

Study is divided into three semesters with semester 1 and 2 having 12 weeks for teaching and learning and 2-3 weeks for examinations. Semester 3 will be dedicated to the carrying of an independent research project and writing up the resultant dissertation.

The programme is divided into individual study modules. Each study module is accredited as being worth a certain number of credit points to you on successful completion. Modules are normally worth 7.5 ECTS which is equivalent to 150 hours of study. Modules are generally assessed by coursework throughout the duration of the module but some optional modules are assessed at the end of each semester.

Part I Core
The student must take 120CATS/ 60 ECTS from the modules in Core.

Code	Module Title	ECTS	Type
CHEM6156	Advanced Topics in Magnetic Resonance	7.5	Core
CHEM6142	Chemistry MSc Advanced Research Project	30	Core
CHEM6157	Introduction into Practical Aspects of NMR	7.5	Core
CHEM6133	Scientific writing and presentation skills for Chemistry MSc	7.5	Core
CHEM6155	Spin Dynamics	7.5	Core

Part I Optional
Optional modules can be chosen to a total of 60 CATS/ 30 ECTS.
The student will take at least 30 CATs (two full modules) from the list below.

In addition, a student may choose appropriate option modules relevant to the masters programme from a wider range of subject elective modules available at the University. These choices must be discussed and approved by the Programme Lead.

The University Regulations allow students to take 30 CATS at NQF Level 6 (i.e. modules with a 3xxx code).

Code	Module Title	ECTS	Type
CHEM6147	Advanced Spectroscopy and Applications	7.5	Optional
CHEM6141	Advanced Topics in Inorganic Chemistry	7.5	Optional
NATS6008	Biomedical Spectroscopy and Imaging	7.5	Optional
CHEM6144	Chemistry through the Computational Microscope	7.5	Optional
NATS3006	Drugs of the future: designing a magic bullet	7.5	Optional
UOSM6001	Ethics in Science, Engineering and Technology: Jekyll and Hyde	7.5	Optional
CHEM3002	Medicinal Chemistry	7.5	Optional
BIOL6032	Molecular Recognition	7.5	Optional
CHEM6124	NMR Spectroscopy: Theory and Application	7.5	Optional
CHEM3041	Synthetic Methods in Organic Chemistry	7.5	Optional
CHEM6146	X-Ray Crystallographic Techniques, Advanced Main Group Chemistry and Applications	7.5	Optional

Progression Requirements

The programme follows the University's regulations for ***Progression, Determination and Classification of Results : Undergraduate and Integrated Masters Programmes*** and ***Progression, Determination***

and Classification of Results: Postgraduate Master's Programmes as set out in the University Calendar: http://www.calendar.soton.ac.uk/sectionIV/sectIV-index.html

Support for student learning

There are facilities and services to support your learning some of which are accessible to students across the University and some of which will be geared more particularly to students in your particular Faculty or discipline area.

The University provides:

- library resources, including e-books, on-line journals and databases, which are comprehensive and up-to-date; together with assistance from Library staff to enable you to make the best use of these resources
- high speed access to online electronic learning resources on the Internet from dedicated PC Workstations onsite and from your own devices; laptops, smartphones and tablet PCs via the Eduroam wireless network. There is a wide range of application software available from the Student Public Workstations.
- computer accounts which will connect you to a number of learning technologies for example, the Blackboard virtual learning environment (which facilitates online learning and access to specific learning resources)
- standard ICT tools such as Email, secure filestore and calendars.
- access to key information through the MySouthampton Student Mobile Portal which delivers timetables, Module information, Locations, Tutor details, Library account, bus timetables etc. while you are on the move.
- IT support through a comprehensive website, telephone and online ticketed support and a dedicated helpdesk in the Hartley Library.
- Enabling Services offering support services and resources via a triage model to access crisis management, mental health support and counselling. Support includes daily Drop In at Highfield campus at 13.00 – 15.00 (Monday, Wednesday and Friday out of term-time) or via on-line chat on weekdays from 14.00 – 16.00. Arrangements can also be made for meetings via Skype.
- assessment and support (including specialist IT support) facilities if you have a disability, long term health problem or Specific Learning Difficulty (e.g. dyslexia)
- the Student Services Centre (SSC) to assist you with a range of general enquiries including financial matters, accommodation, exams, graduation, student visas, ID cards
- Career and Employability services, advising on job search, applications, interviews, paid work, volunteering and internship opportunities and getting the most out of your extra-curricular activities alongside your degree programme when writing your CV.
- Other support that includes health services (GPs), chaplaincy (for all faiths) and 'out of hours' support for students in Halls and in the local community (18.00-08.00).
- A Centre for Language Study, providing assistance in the development of English language and study skills for non-native speakers.

The Students' Union provides

- an academic student representation system, consisting of Course Representatives, Academic Presidents, Faculty Officers and the Vice-President Education; SUSU provides training and support for all these representatives, whose role is to represent students' views to the University.
- opportunities for extracurricular activities and volunteering
- an Advice Centre offering free and confidential advice including support if you need to make an academic appeal
- Support for student peer-to-peer groups, such as Nightline.

Methods for evaluating the quality of teaching and learning

You will have the opportunity to have your say on the quality of the programme in the following ways:

- Completing student evaluation questionnaires for each module of the programme
- Acting as a student representative on various committees, e.g. Staff: Student Liaison Committees, Faculty Programmes Committee OR providing comments to your student representative to feed back on your behalf.
- Serving as a student representative on Faculty Scrutiny Groups for programme validation
- Taking part in programme validation meetings by joining a panel of students to meet with the Faculty Scrutiny Group

Further details on the University's quality assurance processes are given in the *Quality handbook*.

Career Opportunities

Employability is about more than just getting a job. We believe in helping our students gain the necessary experience for a future career, along with the skills to identify opportunities and make the most of them. It is reassuring to know that Chemistry degrees are third only behind Medicine and Dentistry as the degree which offers the highest financial return over the term of the graduate's career, but the rewards of a Masters degree lie at a deeper personal level and not just in terms of financial return. During your year at the University of Southampton you will have the opportunity to broaden your options by meeting employers, getting involved in volunteering activities, work placements and much more. A significant proportion of our graduates decide to go into research by taking a PhD qualification, most of them staying in Southampton. But careers in industry and commerce are available even in the toughest economic times. There are also research and teaching opportunities and the options to branch out into other fields such as material and life sciences, medicine, pharmaceuticals, the law and science journalism.

- Career opportunities in a wide range of subject that involve magnetic resonance in: analytical chemistry, life science, physical and material sciences and medical imaging.
- Industries developing medical and analytical equipment
- Analytical science/ chemical industry R&D
- Pharmaceutical industry
- Scientific officer in chemical and physical science laboratories
- Teaching
- Scientific publishing
- Business management
- Research administration

External Examiner(s) for the programme

Students must not contact External Examiner(s) directly, and external examiners have been advised to refer any such communications back to the University. Students should raise any general queries about the assessment and examination process for the programme with their Course Representative, for consideration through Staff: Student Liaison Committee in the first instance, and Student representatives on Staff: Student Liaison Committees will have the opportunity to consider external examiners' reports as part of the University's quality assurance process.

External examiners do not have a direct role in determining results for individual students, and students wishing to discuss their own performance in assessment should contact their Personal Academic Tutor in the first instance.

Please note: This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided. More detailed information can be found in the programme handbook.

Appendix 1:

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. In addition to this, students registered for this programme also have to pay for:

Additional Costs

Type	Details
Stationery	You will be expected to provide your own day- to-day stationary items, e.g. pens, pencils, notebooks, etc). Any specialist stationery items will be specified under the Additional Costs tab of the relevant module profile.
Textbooks	Where a module specifies core texts these should generally be available on the reserve list in the library. However due to demand, students may prefer to buy their own copies. These can be purchased from any source. Some modules suggest reading texts as optional background reading. The library may hold copies of such texts, or alternatively you may wish to purchase your own copies. Although not essential reading, you may benefit from the additional reading materials for the module.
Approved Calculators	Candidates may use calculators in the examination room only as specified by the University and as permitted by the rubric of individual examination papers. The University approved models are Casio FX-570 and Casio FX-85GT Plus. These may be purchased from any source and no longer need to carry the University logo.
Printing and Photocopying Costs	In the majority of cases, coursework such as essays; projects; dissertations is likely to be submitted on line. However, there are some items where it is not possible to submit online and students will be asked to provide a printed copy.

In some cases you'll be able to choose modules (which may have different costs associated with that module) which will change the overall cost of a programme to you. Details of such costs will be listed in the Module Profile. Please also ensure you read the section on additional costs in the University's Fees, Charges and Expenses Regulations in the University Calendar available at www.calendar.soton.ac.uk.