MODULE SPECIFICATION TEMPLATE

**SECTION 1: MODULE SPECIFICATIONS**

1. Title of the module

**Magnetic resonance in biosciences and medicine**

1. School or partner institution which will be responsible for management of the module

**Biosciences**

1. Start date of the module

**September 2013**

1. The number of students expected to take the module

**50-100 students**

1. Modules to be withdrawn on the introduction of this proposed module and consultation with other relevant Schools and Faculties regarding the withdrawal

**N/A**

1. The level of the module: **Honours [H]**
2. The number of credits and the ECTS value which the module represents

**15 credits (7.5 ECTS)**

1. Which term(s) the module is to be taught in (or other teaching pattern)

**Autumn term and/or Spring term (timetabling as appropriate)**

1. Prerequisite and co-requisite modules

**BI300, (one of: BI321 or BI3210 or BI322 or BI3220), BI301 and BI532**

1. The programmes of study to which the module contributes

**Biology and associated programmes**

**Biomedical Science and associated programmes**

**Biochemistry and associated programmes**

1. The intended subject specific learning outcomes

This module will explore the theoretical and practical aspects of applying magnetic resonance across the biosciences and medicine using published research exemplars. This approach will utilise basic biological, metabolic and biochemical knowledge (prerequisites in 9) but applied at an advanced level of understanding. Magnetic resonance will be taught from a multidisciplinary viewpoint at Honours level and its application will be demonstrated using reviews, research papers and case studies taken from the literature that demonstrate bioscience and medical applications. This module also includes the critical analysis of data and researching the subject through a variety of sources (*e.g.* library, journals, databases). We will also utilise local health professionals to provide overviews of these methods in true clinical settings.

The overall approach will allow the students to appreciate the role of magnetic resonance in life sciences and medicine. The module can be considered as broken into the following areas:

11A: Theory of magnetic resonance (MR). Fundamentals of MR relevant to both bioscience and medical applications. This introduction will provide an advanced multidisciplinary understanding of these methods including their advantages and limitations.

11B: Magnetic resonance in biology. MR applications toward biological molecules and cell metabolites with specific reference and use of case studies.

11C: Magnetic resonance in medicine. MR specifically applied to medical diagnosis (metabolomics) and imaging (MRI) with specific examples from case studies.

Program Outcomes relevant to specific points above:

**Biology**: **A.1-A.3, A.9, B.13-B.14, C.19, C.23**

**Biomedical Science: A.1-A.3, A.6, A.11, B.19-B.22, C.28, C.30**

**Biochemistry: A.1-A.2, A.4-A.6, A.10, B.14-B.17, C.23, C.25**

1. The intended generic learning outcomes:

All above items will involve

12A: Receiving/responding to different sources of information.

12B: Use of the internet and electronic sources.

12C: Self-management and organisation.

As covered in the following generic outcomes for each program:

**Biology: D.27, D.30-D.31, D.33, D.35, D.37**

**Biomedical Science: D.32, D.34-D.35, D.37**

**Biochemistry: D.27, D.29-D.30**

1. A synopsis of the curriculum

22 lectures to be delivered on the following topics and to include case studies

Lectures 1-4 Fundamentals of magnetic resonance

Lectures 5-6 Making things simple: multidimensional NMR

Lectures 7-8 Obtaining structures and dynamics of biological molecules

Lectures 9-11 Studying proteins, nucleic acids, carbohydrates and lipids

Lectures 12-13 NMR and metabolism: cells and tissues

Lectures 14-15 NMR of solid samples: Applications in biology

Lectures 16-18 MRI equipment, theory and techniques

Lectures 19-20 Vascular and cardiac imaging using MRI

Lectures 21 fMRI: following tissue and organ activity

Lectures 22 MRS and metabolism in animals and humans

1. Indicative Reading List

(Chary and Govil, 2008): NMR in Biological Systems: From Molecules to Human, Springer, 2008.

(Westbrook, Kaut Roth and Talbot, 2011): MRI in Practice, Wiley-Blackwell.

1. Learning and Teaching Methods, including the nature and number of contact hours and the total study hours which will be expected of students, and how these relate to achievement of the intended module learning outcomes

*Learning and Teaching Methods:*

Teaching and case study discussion will take place in lectures.

This is broken down in section13.

Lectures (direct contact hours) 22 hour

Visits to see magnetic resonance equipment 2 hours

Assessment feedback 4 hours

Revision Lectures 2 hours

Self Study 120 hours

**TOTAL STUDY HOURS** **150 hours**

Self study breakdown: Recommended reading 26 hours

Coursework Assessments 47 hours

Exam revision 47 hours

**Total Self-Study 120 hours**

*Achievement of module learning outcomes:*

All specific and generic learning outcomes in 11 and 12 are addressed across all lectures.

1. Assessment methods and how these relate to testing achievement of the intended module learning outcomes

All specific and generic learning outcomes are assessed through all coursework and examination and with relevance to the following areas listed in section 11:

Coursework Assessment 1 to test 11A, 11B, 12A, 12B and 12C (20%)

Coursework Assessment 2 to test 11A, 11C, 12A, 12B and 12C (20%)

Examination to test 11A, 11B, 12A and 12C (60%)

Each coursework assessment will be a problem based extended case study that compliments the lecture series. Assessment 1 will concentrate on general magnetic resonance methods and assessment 2 will concentrate on MRI.

1. Implications for learning resources, including staff, library, IT and space

There are no negative implications regarding this module and it will be delivered using the research strengths of staff in Biosciences; it is a good example of research-led teaching. Main lectures will be delivered by existing staff with additional lectures from clinicians and/or MRI technicians as appropriate to underpin the MRI component of the module.

1. The School recognises and has embedded the expectations of current disability equality legislation, and supports students with a declared disability or special educational need in its teaching. Within this module we will make reasonable adjustments wherever necessary, including additional or substitute materials, teaching modes or assessment methods for students who have declared and discussed their learning support needs. Arrangements for students with declared disabilities will be made on an individual basis, in consultation with the University’s disability/dyslexia support service, and specialist support will be provided where needed.
2. Campus(es) where module will be delivered: Canterbury

***If the module is part of a programme in a Partner College or Validated Institution, please complete the following:***

1. Partner College/Validated Institution: N/A
2. University School responsible for the programme: N/A

**SECTION 2: MODULE IS PART OF A PROGRAMME OF STUDY IN A UNIVERSITY SCHOOL**

**Statement by the School Director of Learning and Teaching/School Director of Graduate Studies (as appropriate):** "I confirm I have been consulted on the above module proposal and have given advice on the correct procedures and required content of module proposals"

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| ................................................................  Director of Learning and Teaching/Director of Graduate Studies (delete as applicable)  …………………………………………………  Print Name | ..............................................  Date |

**Statement by the Head of School:** "I confirm that the School has approved the introduction of the module and, where the module is proposed by School staff, will be responsible for its resourcing"

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| .................................................................  Head of School  …………………………………………………….  Print Name | ..............................................  Date |

**SECTION 3: MODULE IS PART OF A PROGRAMME IN A PARTNER COLLEGE OR VALIDATED INSTITUTION**

(Where the module is proposed by a Partner College/Validated Institution)

**Statement by the Nominated Officer of the College/Validated Institution** *(delete as applicable)***:** "I confirm that the College/Validated Institution*(delete as applicable)* has approved the introduction of the module and will be responsible for its resourcing"

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| .................................................................  Nominated Responsible Officer of Partner College/Validated Institution  ………………………………………………….  Print Name  …………………………………………………..  Post | ..............................................  Date |

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Partner College/Validated Institution

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Last updated January 2013