Master of Science Chemical Science

Programme Requirements

Chemical Science - MSc
CH5822 (10 credits) **and** CH5831 (10 credits) **and** CH5832 (20 credits) **and** 70 credit from Module List: CH3621, CH3721, CH4514, CH4614, CH5461, CH5511, CH5517-CH5518, CH5612-CH5614, CH5711, CH5713-CH5717 **and** CH5841 (60 credits)

Compulsory modules:

CH5822 Research Skills in Chemistry				
SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Planned timetable:	To be arranged.			
This module involves gaining familiarity and expertise in specialised research techniques in the Chemical Sciences appropriate to the prospective Research Project. These will vary considerably according to the chosen area but may include running a computer modelling calculation, operation of spectrometers, diffractometers, and similar instruments, searching for data in the chemical literature, manipulation of air sensitive materials, conducting a high-pressure reaction etc.				
Programme module type:	Compulsory for MSc in Catalysis Compulsory for MSc in Chemical Science			
Learning and teaching methods and delivery:	**Weekly contact**: 14 hours practical classes (x 10 weeks), 1-hour one-to-one supervision (x 10 weeks)			
Assessment pattern:	Coursework (laboratory reports) = 100%			
Module coordinator:	Dr P Kilian			
Module teaching staff:	all staff			

CH5831 Literature Review for MSc				
SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	1
Planned timetable:	To be arranged.			
This module which forms part of the MSc programme in Chemical Science involves an in-depth survey of the published literature within a specified research area which is related to the prospective research project.				
Programme module type:	Compulsory for MSc in Catalysis Compulsory for MSc in Chemical Science			
Learning and teaching methods and delivery:	**Weekly contact**: 5 x 1-hour consultation and feedback sessions with supervisor over the semester.			
Assessment pattern:	Coursework (~4,000-word Literature Review)= 100%			
Module coordinator:	Dr P Kilian			
Module teaching staff:	all staff			

CH5832 Contemporary Research Awareness				
SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	Whole Year
Planned timetable:	To be arranged.			
This module which forms part of the MSc programme in Chemical Science is based on Research Colloquia and Seminars delivered by external speakers and covering the whole range of areas within current chemical science research. Assessment is by two essays to be based on selected lecture(s) and additional reading, one to be submitted at the end of each semester.				
Programme module type:	Compulsory for MSc in Catalysis Compulsory for MSc in Chemical Science			
Learning and teaching methods and delivery:	**Weekly contact**: 20 hours in total over the whole year.			
Assessment pattern:	Coursework (2 x 3,000-word essays) = 100%			
Module coordinator:	Dr P Kilian			
Module teaching staff:				

CH5841 Research Project for MSc				
SCOTCAT Credits:	60	SCQF Level 11	**Semester:**	Summer
Planned timetable:	To be arranged.			
The research project for MSc aims to develop the students' skills in the following areas: experimental design and problem-solving; abstraction, evaluation and interpretation of data in the chemical literature; practical skills and teamwork; communication of results orally and in a dissertation. The project is supervised by a member of the academic staff. The project topic and aims will be selected by both supervisor and student and a related literature survey will be carried out in module CH5831.				
Programme module type:	Compulsory for MSc in Catalysis Compulsory for MSc in Chemical Science			
Learning and teaching methods and delivery:	**Weekly contact**: 30 hours of practical classes (research work).			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Dr P Kilian			
Module teaching staff:	all staff			

Optional modules:

Either

CH3621 Organic Chemistry Laboratory				
SCOTCAT Credits:	10	SCQF Level 9	**Semester:**	1
Planned timetable:	9.00 am - 12.30 pm Mon to Fri (Weeks 1 - 5)			
Practical experiments involving synthesis, characterisation and measurements in organic chemistry.				
Programme module type:	Optional for MSc Chemical Science			
Learning and teaching methods and delivery:	**Weekly contact**: Daily 3.5-hour morning practical classes over 5 weeks (Weeks 1 - 5).			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Dr I A Smellie, Dr N S Keddie			
Module teaching staff:	Dr I A Smellie, Dr N S Keddie, Dr R J M Goss			

Or

CH3721 Physical Chemistry Laboratory				
SCOTCAT Credits:	10	SCQF Level 9	**Semester:**	1
Planned timetable:	9.00 am - 1.00 pm Mon to Fri (Weeks 7-10)			
This module comprises practical experiments involving physical measurements and the use of computational programmes in Chemistry.				
Programme module type:	Compulsory for MSc in Geochemistry (unless BSc Chemistry is already held) Optional for Chemical Science MSc			
Learning and teaching methods and delivery:	**Weekly contact**: Daily 4-hour morning practical classes over 4 weeks (Weeks 7 - 10).			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Prof M Buck			
Module teaching staff:	Prof P A Wright, Prof M Buck, Dr R Schaub, Dr T van Mourik, Prof M Buehl			

Either

CH4514 Advanced Metal Chemistry				
SCOTCAT Credits:	10	SCQF Level 10	**Semester:**	1
Planned timetable:	To be arranged.			
This module covers the heavier d-block and f-block metals and also the theory behind bonding, magnetism and electronic spectroscopy in d-block metal complexes. At the end of the module students should be in a position to understand fully the nature of bonding in d- and f-block metal systems, to understand the electronic spectra of d-block complexes and to rationalise trends in chemical properties both down and across the periodic table. The module also aims to explore the role played by inorganic systems in biology and their growing importance in medicine. There will also be discussion of the mechanisms of action of some inorganic systems in biology.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science Optional for Chemistry MPhil Optional for MSc in Geochemistry			
Pre-requisite(s):	for MSc in Geochemistry require BSc in Chemistry			
Anti-requisite(s):	CH4455			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr B E Bode			
Module teaching staff:	Dr E Zysman-Colman, Dr B E Bode			

Or

CH4614 Heterocyclic and Pericyclic Chemistry

SCOTCAT Credits:	10	SCQF Level 10	**Semester:**	1
Planned timetable:	To be arranged.			
This module covers the important areas of heterocyclic and pericyclic chemistry in detail. In heterocyclic chemistry, the nomenclature and numbering of single and fused ring systems, and structure, reactivity, synthesis and applications of the main five and six-membered ring systems with one and two heteroatoms will be covered. Selected industrial syntheses of heterocyclic medicinal compounds are used to illustrate the basic principles as well as the factors to be considered in large scale synthesis. In pericyclic chemistry, a frontier molecular orbital approach based on the Woodward-Hoffmann rules will be applied to pericyclic reactions and used to provide an understanding of the energetics and stereochemistry of Diels-Alder and 1,3-dipolar cycloaddition reactions as well as electrocyclic processes and sigmatropic rearrangements. Synthetic applications of these processes will also be illustrated.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science Optional for Chemistry MPhil			
Anti-requisite(s):	CH4456			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total, plus a half-day site visit.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr R A Aitken			
Module teaching staff:	Dr R A Aitken, Dr E R Kay			

CH5461 Integrating Chemistry

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	1
Planned timetable:	To be arranged.			
This is a general chemistry module aimed at developing and consolidating fundamental aspects of basic understanding. Students will be encouraged to gain a deeper understanding of elementary core material by a combination of discussion, general reading, essay work and problem solving at a more advanced level than previously required. Students will be expected to read externally on related topics. In addition, each student will be required to submit an essay which will be on a topic relevant to the broader issues of chemical study and knowledge. The problems will apply the knowledge gained in Level 2000 Chemistry modules.				
Programme module type:	Optional for Chemical Science MSc (unless CH4461 has been previously passed).			
Anti-requisite(s):	CH4461			
Learning and teaching methods and delivery:	**Weekly contact**: 2 classes per week over 8 weeks (Weeks 3-11) and a total of 3 x 1-hour seminars.			
Assessment pattern:	2-hour Written Examination = 60%, Coursework = 40%			
Module coordinator:	Dr R Schaub			
Module teaching staff:	all staff			

CH5511 Homogeneous Catalysis

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	1
Planned timetable:	To be arranged.			
This module discusses the use of metal based systems in organic transformations and a detailed treatment of homogeneous catalysis. Important processes in the petrochemicals industry will be used to exemplify the principles described.				
Programme module type:	Compulsory for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil. Optional for MSc in Geochemistry.			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	TBC			
Module teaching staff:	Prof R P Tooze, Prof D Cole-Hamilton			

CH5517 Advanced Physical Inorganic Chemistry

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	2
Planned timetable:	To be arranged.			
This module involves distinct sections on photophysics of coordination complexes including theory and applications, and inorganic 'open shell' compounds including synthesis, characterisation and applications of paramagnetic inorganic species.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil Optional for MSc in Geochemistry			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr E Zysman-Colman			
Module teaching staff:	Dr E Zysman-Colman, Dr B Bode			

CH5518 Blockbuster Solids

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	2
Planned timetable:	To be arranged.			
This module covers two major topics. The first deals with modern materials which have a major impact on our lives, focusing on how the material's structure influences its electrical, magnetic and thermal properties. In the second section, emphasis will be placed on metal organic frameworks and how they can be used for the storage and release of gases.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil Optional for MSc in Geochemistry			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof P Lightfoot			
Module teaching staff:	Prof P Lightfoot, Prof R E Morris			

CH5611 Asymmetric Synthesis

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	1
Planned timetable:	To be arranged.			
This module discusses the methods available for the synthesis of chiral compounds. After a detailed introduction to the specialised terminology and analytical methods used, the main methods using chiral auxiliaries, chiral reagents and chiral catalysts will be described. This will then be combined with a consideration of synthetic strategy and total syntheses of several complex chiral compounds will be discussed.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr M L Clarke			
Module teaching staff:	Dr M L Clarke, Prof A D Smith			

CH5612 Natural Products, Biosynthesis and Enzyme Co-factors

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	2
Planned timetable:	To be arranged.			
The module will investigate the biosynthesis of the main natural products groups (polyketides, terpenes, alkaloids). Unifying features of their structures and biosynthesis will be described and methods for studying the biosynthesis of natural products will be taught (isotope tracer methods). The common enzyme co-factors (PLP, TPP, NADH, co-enzyme B12) will be highlighted and their mechanistic role in mediating enzymatic transformations will be explored.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof D O'Hagan			
Module teaching staff:	Prof D O'Hagan, Prof T K Smith, Dr G J Florence			

CH5613 Reactive Intermediates

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	2
Planned timetable:	To be arranged.			
Aspects of the organic chemistry of the most important reactive intermediates viz.: carbo-cations, carbanions, free radicals, carbenes, nitrenes and arynes will be covered. Means of generating each type of reactive intermediate will be introduced. The key reactions of each intermediate will be reviewed and their characteristic reactions highlighted. An understanding of the use of each species in organic synthesis and of their significance in mechanistic analysis will be developed.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr R A Aitken			
Module teaching staff:	Dr R A Aitken, Dr I A Smellie			

CH5614 Chemical Biology

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	2
Planned timetable:	To be arranged.			
This module will examine new methodologies for drug discovery. An overview of the processes of target discovery, lead discovery and lead optimisation will be given. The use of structural biology (protein crystallography, NMR), computational chemistry and combinatorial chemistry in 'rational drug design' will be described. The module will look at the technologies behind combinatorial library design, synthesis and high throughput screening. Broad and focused libraries will be discussed. Several examples will be explored, such as the development of drugs against AIDS and influenza.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	TBC			
Module teaching staff:	Prof N J Westwood, TBC			

CH5616 Molecular Recognition

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	2
Planned timetable:	To be arranged.			
This module offers a systematic introductory treatment of molecular recognition, emphasising fundamental concepts of intermolecular interactions and molecular recognition in solution. The nature, strength and directionality of orbital, hydrogen-bonding and hydrophobic interactions will be explored. Spectroscopic and other techniques for studying these interactions will be outlined with examples.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof D Philp			
Module teaching staff:	Prof D Philp, Dr E R Kay			

CH5711 Advanced Spectroscopic Methods

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	1
Planned timetable:	To be arranged.			
This module describes the importance of more advanced spectroscopic methods for the elucidation of structure and properties of increasingly complex molecules and materials. Particular attention will be paid to those techniques which exploit synchrotron radiation.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil Optional for MSc in Geochemistry			
Pre-requisite(s):	for MSc in Geochemistry require BSc in Chemistry			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials per week.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof C J Baddeley			
Module teaching staff:	Prof C J Baddeley, Dr G Haehner			

CH5713 Surface Science and Heterogeneous Catalysis

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	2
Planned timetable:	To be arranged.			
The module describes the Chemistry of solid surfaces with particular reference to the structure of metal, oxide and semiconductor surfaces. The techniques available to characterise the uppermost atomic layers of a solid are presented and the novel reactivity of surfaces is linked to applications in sensors, electronic devices, heterogeneous catalysis as well as the processes of corrosion, friction and wear.				
Programme module type:	Compulsory for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil.			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof C J Baddeley			
Module teaching staff:	Prof C J Baddeley, Prof P A Wright			

CH5714 Chemical Applications of Electronic Structure Calculations

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	2
Planned timetable:	To be arranged.			
This module will build on the foundations laid in CH2701 and CH3712 and introduce further aspects and methods of modern computational chemistry related to the electronic structures of atoms and molecules. It will be shown how results of such calculations can be used to complement, interpret, and guide experiments in many areas of chemistry.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof M Buehl			
Module teaching staff:	Prof M Buehl, Dr J B O Mitchell			

CH5715 Energy Conversion and Storage

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	2
Planned timetable:	To be arranged.			
In our efforts to mitigate global warming it is essential to develop new and improved methods of generation and storage of energy. Foremost among these methods are the electrochemical technologies of batteries and fuel cells. In this module we will discuss the technical details and applications of such devices. Particular emphasis will be placed on the underlying electrochemistry and materials chemistry.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil Optional for MSc in Geochemistry			
Anti-requisite(s):	CH4712			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr R T Baker			
Module teaching staff:	Dr R T Baker, Prof J T S Irvine			

CH5716 Processing of Materials

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	1
Planned timetable:	To be arranged.			
This module focuses on the processing of materials. Fundamental materials properties such as crystallinity, composition, crystal phase, phase mixing, domain structure, grains and grain boundaries, porosity and pore structure will be covered and the main methods used to control these properties in order to develop and improve materials for specific applications will be addressed. Processes including casting, extrusion, physical and chemical vapour deposition, calcination, sintering, annealing, plasma treatments, mechanical working, crystallisation and dopant addition will be described and explained. Applications in high-value metals, ceramics and semiconductor materials will be emphasised.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil Optional for MSc in Geochemistry			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof J T S Irvine			
Module teaching staff:	Prof J T S Irvine, Dr M Cassidy			

CH5717 Nanostructured Materials

SCOTCAT Credits:	10	SCQF Level 11	**Semester:**	1
Planned timetable:	To be arranged.			
This module will introduce the concepts and science behind the design and synthesis of a wide range of nanostructures and the application of these structures in functional materials and devices. The relationship between nanoscale structure and composition and macroscale properties and behaviour will be emphasised. Structures will be classified and introduced in terms of their number of dimensions: clusters, nanoparticles and quantum dots (0-D); nanotubes, nanowires and nanorods (1-D); nanosheets and films (2-D); and porous crystals, mesoporous structures and metal-organic frameworks (3-D). Other specific topics will include the science of clusters, molecular assemblies and assemblies of nanostructures. Novel carbon based materials, including simple and functionalised fullerenes, carbon nanotubes and graphene and related materials will be described and their physical and chemical properties related to their structure and bonding. Advanced characterisation techniques and applications related to nanotechnology, MEMs, biomaterials, catalysis, and optical and magnetic devices will be addressed.				
Programme module type:	Optional for MSc in Catalysis Optional for MSc in Chemical Science and Chemistry MPhil			
Learning and teaching methods and delivery:	**Weekly contact**: 2 - 3 lectures per week over 9 - 10 weeks (within Weeks 1-11) and 2 - 3 tutorials in total.			
Assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof W Zhou			
Module teaching staff:	Prof W Zhou, Prof M Buck			