# School of Chemistry

# Study Abroad Module Handbook 2024-2025

**Module Title:**LM Applications of Supramolecular Chemistry

**Module Code:**20493

**Semester:**1

**Credits:**10

**Level:**LM

**Module Description:**This module is composed of two components. The first considers systems where an external input changes a property of a supramolecular system in a reversible manner. The second component of the module relates to how concepts of supramolecular chemistry may be applied to the design of systems capable of executing function. Where possible, emphasis is placed on recent developments and potential applications. Both components build on lecture material delivered earlier in the programme.

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**Module Title:**LM Synthesis of Natural Products

**Module Code:**20494

**Semester:** 2

**Credits:**10

**Level:**LM

**Module Description:**The potential biological applications of many natural products provide one very important reason for tackling their synthesis, and rising to the challenge of developing an elegant and creative approach to the preparation of complex molecules is perhaps more of a driving force than synthetic chemists would dare admit! This course discusses some of the issues that arise when devising a total synthesis, and outlines some of the strategies which have been used to realise the total synthesis of complex natural products. The course builds on lecture material delivered earlier in the programme.

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**Module Title:**LM Modern Methods for Molecular Synthesis

**Module Code:**28080

**Semester:** 1

**Credits:**10

**Level:**LM

**Module Description** Modern methods for molecular synthesis looks at some of the more recent advances and advanced concepts therein that are used by organic chemists today. You will see how a wide range of catalysts and reaction protocols can be used to transform simple starting materials into higher value desirable products. Furthermore, and importantly, the reasons why these strategies work and shy they might be deployed is discussed.

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**Module Title:**LC Inorganic Chemistry I

**Module Code:**29216

**Semester:**1

**Credits:**20

**Level:**LC

**Module Description:**This module provides an introduction to inorganic chemistry. Material covered includes the fundamentals of chemical bonding, atomic structure, periodic trends in key atomic properties and VSEPR theory. This is then followed by introductory molecular orbital theory and consideration of metallic and ionic solids. The module covers the synthesis, properties, reactivity and bonding found for compounds of s- and p-block elements. The module also introduces the chemistry of the d-block, including bonding, stability, reactivity and crystal field theory.

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**Module Title:**LC Organic Chemistry 1a

**Module Code:**33065

**Semester:**1

**Credits:**10

**Level:**LC

**Module Description:**This module introduces some of the most conceptually and practically important reactions in Organic chemistry. A mechanistic approach is adopted; that is, the behaviour of organic molecules is explained by referring to simple molecular orbital descriptions of bonding and concepts such as electronegativity and polarisation. A relatively narrow range of principles can then be used to rationalise a diverse array of transformations. The module shows how organic molecules can be constructed from simple starting materials or building blocks and how functional groups can be added or manipulated accurately and with control.

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**Module Title:**LH Organic Chemistry IIIa

**Module Code:**33067

**Semester:** 1

**Credits:**10

**Level:**LH

**Module Description:**This level 3 module builds on the knowledge, principles and concepts developed through pre-requisite modules (LC Organic Chemistry Ia and Ib and LI Organic Chemistry IIa and IIb). The module covers more advanced aspects of organic chemistry , and seeks to rationalise the outcome of reactions and processes through the application of mechanistic theory and fundamental physical principles.

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**Module Title:**LI Organic Chemistry IIa

**Module Code:**33077

**Semester:**1

**Credits:**10

**Level:**LI

**Module Description:**This module builds upon the fundamental principles of structure, reactivity and bonding introduced in Year 1 to develop a deeper understanding of the reactivity of organic molecules and how to harness this in the selective synthesis of complex molecules. Students learn how to bring all of these ideas together in the design of synthetic routes to complex organic molecules such as pharmaceuticals, pesticides, dyestuffs and perfumes.

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**Module Title:**LI Year 2 Chemistry Options A

**Module Code:**33088

**Semester:** 1

**Credits:**10

**Level:**LI

**Module Description:**In this module students select from a range of courses reflecting modern, topical material aligned to the current research interests of the School. The breadth of courses offered allows students to specialise in those aspects of the discipline of particular interest to them.

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**Module Title:**LH Year 3 Chemistry Options A

**Module Code:**33090

**Semester:**1

**Credits:**10

**Level:**LH

**Module Description:**In this module students select from a range of courses reflecting modern, topical material aligned to the current research interests of the School. The breadth of courses offered allow students to specialise in those aspects of the discipline of particular interest to them.

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**Module Title:**LH Physical Chemistry IIIa

**Module Code:**33669

**Semester:** 1

**Credits:**10

**Level:**LH

**Module Description:**The module examines in depth the fundamental properties of molecules and how we observe them, building on the principles and concepts delivered in pre-requisite modules (LC Physical Chemistry I, LI Physical Chemistry IIa and LI Physical Chemistry IIb). Areas covered include experimental techniques and theory for probing and understanding atomic and molecular systems.

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**Module Title:**LC Fundamental Mathematics for Chemists

**Module Code:**34179

**Semester:** 1

**Credits:**10

**Level:**LC

**Module Description:**This module introduces Chemistry students to a number of important mathematical techniques and principles. The material presented is delivered within a chemistry context, i.e. with special emphasis placed on its relevance to students of Chemistry and its application to chemical sciences/chemistry problems.

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**Module Title:**LH Inorganic Chemistry IIIa

**Module Code:**33983

**Semester:** 1

**Credits:**10

**Level:**LH

**Module Description:**This module applies the principles and concepts delivered in pre-requisite modules (LC Inorganic Chemistry I, LI Inorganic Chemistry IIa and LI Inorganic Chemistry IIb) to a number of topical areas in inorganic chemistry. The topics covered in this module include: transition metal chemistry and homogeneous catalysis.

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**Module Title:**LI Inorganic Chemistry IIa

**Module Code:**33991

**Semester:**1

**Credits:**10

**Level:**LI

**Module Description:**This module builds upon the principles and concepts introduced in Year 1. The module begins with an introduction to Molecular Symmetry and Group Theory. This is followed by a more in-depth look at the chemistry of the d-block.

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**Module Title:**LI Physical Chemistry IIa

**Module Code:**33688

**Semester:**1

**Credits:**10

**Level:**LI

**Module Description:**This module builds upon the fundamental principles introduced in Year 1 to develop a deeper understanding of quantum mechanics and atomic spectroscopy. This module presents an introduction to quantum mechanics, starting from its development to explain the failures of classical mechanics, and its applications in spectroscopy.

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**Module Title:**LM Materials Chemistry

**Module Code:**24508

**Semester:** 2

**Credits:**10

**Level:**LM

**Module Description:**This module aims to explore the chemical concepts which underpin a range of energy storage technologies. There will be a particular focus on the application of solid state chemistry principles to understand and improve the function of the materials which are vital to the function of these technologies. The module is divided into two parts: Chemistry of the Hydrogen Economy and The Chemistry of Lithium-ion Batteries..

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**Module Title:**LI Physical Chemistry IIb

**Module Code:**33698

**Semester:** 2

**Credits:**10

**Level:**LI

**Module Description:**This module continues to builds upon the fundamental principles introduced in Year 1 and LI Physical Chemistry IIa to develop a deeper understanding of thermodynamics and intermolecular interactions and some of their applications in Chemistry..

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**Module Title:**LM Clusters, Surfaces and Interfaces

**Module Code:**28291

**Semester:** 2

**Credits:**10

**Level:**LM

**Module Description:**This module is composed of two research-led components. One part is concerned with processes occurring at the solid/liquid interface, including electrochemical interfaces, and electrochemical processes, including catalysis. The other part of the course covers tools used to characterise nanoscale objects and structures, using case studies to assess their relative advantages and limitations in different environments and applications..

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**Module Title:**LC Physical Chemistry I

**Module Code:**29223

**Semester:**2

**Credits:**20

**Level:**LC

**Module Description:**This module provides an introduction to thermodynamic considerations of reacting chemical systems. The laws of thermodynamics are presented, and the concept of chemical equilibrium discussed. The second part of the module is concerned with the kinetics of a reacting system *i.e*. the rate at which a reacting system proceeds and reaches equilibrium (as determined by thermodynamics). The third component is an introduction to optical spectroscopy. Mathematics underpins the whole module, and topics such as exponentials, logarithms, graphs, calculus and vectors are embedded within the chemistry content.

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**Module Title:**LM Advanced Sustainable Polymeric and Advanced Molecular Materials

**Module Code:**32177

**Semester:**2

**Credits:**10

**Level:**LM

**Module Description: This module covers the broad themes of sustainable polymeric materials and nanomaterials. The first part of this module explores degradable polymeric materials. The ability of polymers to entangle bestows them with properties that provide their strength, flexibility and durability The way in which the leading degradable materials in this class are accessed as well as the considerations that need to be taken into account to modify these for a wider range of applications will be addressed. The module will develop fundamental understanding of the chemistry that underpins these advances as well to consider more application-focussed research at the state-of-the-art. The second part of the module explores the use of polymers, metals and other materials in the human body. These biomaterials need to have a range of functionalities, lifetimes and biodegradability. Specific parts of the human body, and the biomaterials that are used clinically, will be explored over the course of the lectures.**

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**Module Title:**LC Organic Chemistry 1b

**Module Code:**33066

**Semester:** 2

**Credits:**10

**Level:**LC

**Module Description:**This module further discusses some of the most conceptually and practically important reactions in Organic chemistry. A mechanistic approach is adopted; that is, the behaviour of organic molecules is explained by referring to simple molecular orbital descriptions of bonding and concepts such as electronegativity and polarisation. A relatively narrow range of principles can then be used to rationalise a diverse array of transformations. The module shows how organic molecules can be constructed from simple starting materials or building blocks and how functional groups can be added or manipulated accurately and with control.

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**Module Title:**LH Organic Chemistry IIIb

**Module Code:**33068

**Semester:**2

**Credits:**10

**Level:**LH

**Module Description:**This level 3 module continues to build on the knowledge, principles and concepts developed through pre-requisite modules (LC Organic Chemistry Ia and Ib, LI Organic Chemistry IIa and IIb and LH Organic Chemistry IIIa). The module covers further advanced aspects of organic chemistry and seeks to rationalise the outcome of reactions and processes through the application of mechanistic theory and fundamental physical principles.

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**Module Title:**LI Organic Chemistry IIb

**Module Code:**33078

**Semester:** 2

**Credits:**10

**Level:**LI

**Module Description:**This module continues to builds upon the fundamental principles of structure, reactivity and bonding introduced in Year 1 and in module LI Organic Chemistry IIa to further develop a deeper understanding of the reactivity of organic molecules and how to harness this in the selective synthesis of complex targets Students continue to learn how to bring all of these ideas together in the design of synthetic routes to complex organic molecules such as pharmaceuticals, pesticides, dyestuffs and perfumes.

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**Module Title:**LI Year 2 Chemistry Options B

**Module Code:**33089

**Semester:**2

**Credits:**10

**Level:**LI

**Module Description:**In this module students select from a range of courses reflecting modern, topical material aligned to the current research interests of the School. The breadth of courses offered allow students to specialise in those aspects of the discipline of particular interest to them.

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**Module Title:**LH Year 3 Chemistry Options B

**Module Code:**33091

**Semester:** 2

**Credits:**10

**Level:**LH

**Module Description:**In this module students select from a range of courses reflecting modern, topical material aligned to the current research interests of the School. The breadth of courses offered allow students to specialise in those aspects of the discipline of particular interest to them.

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**Module Title:**LH Physical Chemistry IIIb

**Module Code:**33681

**Semester:**2

**Credits:**10

**Level:**LH

**Module Description:**The module continues to examine in depth the fundamental properties of molecules and how we observe them, building on the principles and concepts delivered in pre-requisite modules (LC Physical Chemistry I, LI Physical Chemistry IIa, LI Physical Chemistry IIb and LH Physical Chemistry IIIa). Areas covered include experimental techniques and theory for probing and understanding atomic and molecular systems.

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**Module Title:**LH Inorganic Chemistry IIIb

**Module Code:**33987

**Semester:**2

**Credits:**10

**Level:**LH

**Module Description:**This module continues to apply the principles and concepts delivered in pre-requisite modules (LC Inorganic Chemistry I, LI Inorganic Chemistry IIa, LI Inorganic Chemistry IIb and LH Inorganic Chemistry IIIa) to a number of topical areas in inorganic chemistry

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**Module Title:**LI Inorganic Chemistry IIb

**Module Code:**34000

**Semester:** 2

**Credits:**10

**Level:**LI

**Module Description:**This module continues to builds upon the principles and concepts introduced in Year 1 and in module LI Inorganic Chemistry IIa. This module begins with an introduction to organometallic chemistry and metal-metal bonding. The second part covers trends in both physical and chemical properties of transition metal elements and ions across and down the d-block, and discusses synthesis and characterisation of solid-state materials, including an introduction to defects.

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