1. **Title of the module**

CHEM7430 (CH743) - Modern Molecular Synthesis

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

Physical Sciences

1. **The level of the module (Level 4, Level 5, Level 6 or Level 7)**

Level 7

1. **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

1. **Prerequisite and co-requisite modules**

Prerequisite:

Successful completion of Stage 3 Chemistry and progression to Stage 4 MChem

1. **The programmes of study to which the module contributes**

Chemistry

1. **The intended subject specific learning outcomes.  
   On successfully completing the module students will be able to:**

Have a knowledge and understanding of:

8.1 The concepts, terminology, theory, and methods in relation to advanced molecular synthesis.

8.2 Areas of chemistry including properties of chemical elements, organic functional groups, identification of different forms of chirality, and an array of chemical transformations used in synthetic chemistry.

8.3 Developments at the forefront of some areas of organic chemistry, particularly compatibility between chemical reactions and functional groups present during synthetic route to challenging target molecules, including the use of templates.

On successfully completing the module students will have the intellectual skills to:

8.4 Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to the subject and to use it to solve qualitative and quantitative problems. In particular, the ability to link chemical structure to reaction compatibility and sequence.

8.5 Analyse and solve problems strategically through the evaluation, interpretation and synthesis of scientific information.

8.6 Use data-processing skills to search for, assess, and interpret chemical information and data, particularly through comprehensive literature searches.

On successfully completing the module students will have the subject-specific skills to:

8.7 Recognise the motivation and mentality behind total synthesis and appreciate approaches at the forefront of molecular chemistry.

8.8 Perform retrosynthetic analysis on a molecule, taking into consideration chirality, functional group compatibility, efficiency, and feasibility of starting materials.

8.9 Understand the concepts involved in a wide range of organic transformations, including carbon-carbon bond forming reactions, chiral reactions, templation, and protecting group strategies.

8.10 Apply this knowledge in the chemistry of some simple multi-step targeted syntheses.

8.11 Make use of appropriate texts, or other learning resources, to determine the optimal synthetic route.

1. **The intended generic learning outcomes.  
   On successfully completing the module students will be able to:**

9.1 Demonstrate self-direction and originality in tackling and solving problems using a variety or resources.

9.2 Demonstrate qualities and transferable skills necessary for employment requiring the exercise of initiative and personal responsibility.

9.3 Demonstrate problem-solving skills, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information.

9.4 Demonstrate time-management and organisational skills, as evidenced by the ability to plan and implement efficient and effective modes of working, together with self-management and organisational skills with the capacity to support life-long learning.

1. **A synopsis of the curriculum**

The ability to examine a molecule through the lens of retrosynthetic analysis, and subsequent delineation of a feasible series of reactions to generate the target molecule, is an essential tool in all areas of Synthetic Chemistry. The topic finds its fullest expression in the total synthesis of complex molecules such as natural products. Students will make use of the full repertoire of reactions they have compiled to date, but new reactions may also be delivered. The development of synthetic schemes will be taught. Exposure will be given to consideration of functional group compatibility, convergent and template-directed synthesis, protecting group strategies, strategies devoid of protecting groups, and non-covalent approaches. In-depth exposure to chirality and carbon-carbon bond forming reactions, and their application in small molecule synthesis will be covered. Much of the teaching will be delivered through use of important examples. Comprehensive literature searching as a means to problem solving will be emphasised. These are topics relevant to the cohorts completing UoK’s Chemistry programmes. The aim of this module is to deliver advanced concepts of modern synthetic chemistry and the introduction of these concepts in the synthesis of complex molecular targets.

1. **Reading list (Indicative list, current at time of publication. Reading lists will be published annually)**

As this is a Level 7 module, the reading list will be comprised of a selection of published reports from the primary literature (journals) representative of both historical triumphs in synthesis, and topics currently at forefront of molecular synthesis.

Readings will be made available prior to delivery.

1. **Learning and teaching methods**

Total contact hours: 24

Private study hours: 126

Total study hours: 150

1. **Assessment methods**
   1. Main assessment methods

Assignment (30 pages, 20%)

Examination (3hrs) (80%)

13.2 Reassessment methods

Like-for-like

1. **Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section12) and methods of assessment (section 13)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Module learning outcome** | *8.1* | *8.2* | *8.3* | *8.4* | *8.5* | *8.6* | *8.7* | *8.8* | *8.9* | *8.10* | *8.11* | *9.1* | *9.2* | *9.3* | *9.4* |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lectures | **X** | **X** | **X** | **X** | **X** |  | **X** | **X** | **X** |  |  |  |  | **X** |  |
| Private study | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Assignment |  |  |  |  |  | **X** | **X** |  |  |  | **X** | **X** | **X** | **X** | **X** |
| Examination (3 hrs) | **X** | **X** | **X** | **X** | **X** |  |  | **X** | **X** | **X** |  |  |  |  |  |

1. **Inclusive module design**

The School recognises and has embedded the expectations of current equality legislation, by ensuring that the module is as accessible as possible by design. Additional alternative arrangements for students with Inclusive Learning Plans (ILPs)/declared disabilities will be made on an individual basis, in consultation with the relevant policies and support services.

The inclusive practices in the guidance (see Annex B Appendix A) have been considered in order to support all students in the following areas:

a) Accessible resources and curriculum

b) Learning, teaching and assessment methods

1. **Campus(es) or centre(s) where module will be delivered**

Canterbury

1. **Internationalisation**

Chemical findings contained within this module have been discovered by residents of many diverse countries and recognised as internationally important by awards such as the Nobel Prize. All the students will be well versed in internationally recognised ‘language’ of structure and mechanism in organic chemistry.

**FACULTIES SUPPORT OFFICE USE ONLY**

**Revision record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.**

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| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
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Revised FSO Jan 2018