1. **Title of the module**

CH743: Modern Molecular Synthesis

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

School of Physical Sciences

1. **The level of the module (e.g. 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)**

Term 1

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

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

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

MChem

1. **The intended subject specific learning outcomes.**

*On successfully completing the module students will have a knowledge and understanding of:*

* 1. The concepts, terminology, theory, and methods in relation to advanced molecular synthesis.
  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.
  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:*

* 1. 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.
  2. Analyse and solve problems strategically through the evaluation, interpretation and synthesis of scientific information.
  3. 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:*

* 1. Recognise the motivation and mentality behind total synthesis and appreciate approaches at the forefront of molecular chemistry.
  2. Perform retrosynthetic analysis on a molecule, taking into consideration chirality, functional group compatibility, efficiency, and feasibility of starting materials.
  3. Understand the concepts involved in a wide range of organic transformations, including carbon-carbon bond forming reactions, chiral reactions, templation, and protecting group strategies.
  4. Apply this knowledge in the chemistry of some simple multi-step targeted syntheses.
  5. 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:

* 1. Demonstrate self-direction and originality in tackling and solving problems using a variety or resources.
  2. Demonstrate qualities and transferable skills necessary for employment requiring the exercise of initiative and personal responsibility.
  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.
  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**

**Module Aim:** 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.

Lectures (24 lectures):

1. The aims and tools of total synthesis
2. Total synthesis of topical organic molecules
3. Template-directed synthesis and non-covalent assemblies
4. **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**

This module will be taught by 24 lectures.

Concentrated exposure to methodologies and approaches will benefit the students as they begin their 4th year research projects, and thus this module offered in first term will be of benefit.

Independent learning hours will include literature research, private study, assessment work.

The total number of study hours will be 150 hours.

1. **Assessment methods.**

This module will be assessed by 20% coursework and 80% exam

The course work will be comprised of a take-away notebook project. Students will be assigned a complex molecular target for which they will search the primary literature, and in a notebook, outline the mechanism of each and every transformation towards their target molecule.

The Final Exam will examine a variety of strategies, methodologies, and applied approaches to targets covered in lecture and unseen targets for which the acquired knowledge can be applied.

1. **Map of Module Learning Outcomes (sections 8 & 9) to Learning and Teaching Methods (section12) and methods of Assessment (section 13)**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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** | **Hours allocated** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Lectures** | **24** | **X** | **X** | **X** | **X** | **X** |  | **X** | **X** | **X** |  |  |  |  | **X** |  |
| **Private Study** | **126** | **X** | **X** | **X** | **X** | **X** | **x** | **X** | **x** | **x** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Workbook |  |  |  |  |  |  | **X** | **X** |  |  |  | **X** | **X** | **X** | **X** | **X** |
| Examination |  | **X** | **X** | **X** | **X** | **X** |  |  | **X** | **X** | **X** |  |  |  |  |  |

1. **The School/Collaborative Partner (delete as applicable) 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 student support service, and specialist support will be provided where needed.**
2. **Campus(es) or Centre(s) where module will be delivered:**

Canterbury Campus

**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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