1. KentVision Code and title of the module

CHEM7430 – Modern Molecular Synthesis

## Division and School/Department or partner institution which will be responsible for management of the module

Division of Natural Sciences (Chemistry and Forensic Science)

## The level of the module (Level 4, Level 5, Level 6 or Level 7)

Level 7

## The number of credits and the ECTS value which the module represents

15 Credits (7.5 ECTS)

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

Autumn

## Prerequisite and co-requisite modules and/or any module restrictions

None

## The course(s) of study to which the module contributes

Compulsory for the following courses:

MChem Chemistry

Not available as an elective module

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

8.1 Demonstrate comprehensive knowledge and understanding of the concepts, terminology, theory, and methods in relation to advanced molecular synthesis.

8.2 Demonstrate full knowledge and understanding of 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 Demonstrate broad knowledge and understanding of 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.

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.

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.

## 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.

## 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. 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.

## Reading list

## The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices.

## The most up to date reading list for each module can be found on the university's [reading list pages](https://kent.rl.talis.com/index.html).

## Contact Hours

Private Study: 124

Contact Hours: 26

Total: 150

## Assessment methods

13.1 Main assessment methods

* Project Outline – 8%
* Synthetic and Mechanistic Analysis – 12%
* Examination (2 hours) – 80%

The examination must be passed in order to complete the module.

13.2 Reassessment methods

* Like-for-like

## Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section 12) and methods of assessment (section 13)

**Module learning outcomes against learning and teaching methods:**

| **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 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Private Study | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** | **x** |  |  |  |  | **x** |  |
| Lectures | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |

**Module learning outcomes against assessment methods:**

| **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 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Project Outline |  |  |  |  |  | **x** | **x** |  |  |  | **x** | **x** | **x** | **x** | **x** |
| Synthetic and Mechanistic Analysis |  |  |  |  |  | **x** | **x** |  |  |  | **x** | **x** | **x** | **x** | **x** |
| Examination | **x** | **x** | **x** | **x** | **x** |  |  | **x** | **x** | **x** |  |  |  | **x** | **x** |

## Inclusive module design

The Division 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

## Campus(es) or centre(s) where module will be delivered

Canterbury

## Internationalisation

Chemistry is an international discipline with widely applicable international resonance. This module presents subject-specific knowledge generated, developed, and refined by scientists around the world. Mastery of the learning outcomes will equip students to apply the knowledge in a wide range of international contexts and these will be addressed in making the content relevant to current global issues. The Division of Natural Sciences is an international community of students and staff and group activities and teaching will provide a platform for internationally-focussed discussion.

**DIVISIONAL USE ONLY**

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

| Date approved | New/Major/minor revision | Start date of delivery of (revised) version | Section revised  (if applicable) | Impacts PLOs (Q6&7 cover sheet) |
| --- | --- | --- | --- | --- |
| 9 Dec 2021 | Minor | Sept 2022 | 6, 12-13 | No |
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| Revised FSO Jan 2018 |