

Essential Organic Chemistry

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| Title | Essential Organic Chemistry |
| Semester | E2023 |
| Master programme in | Kemi / Chemical Biology |
| Type of activity | Course |
| Teaching language | English |
| Study regulation | Read about the Master Programme and find the Study Regulations at ruc.dk Læs mere om uddannelsen og find din studieordning på ruc.dk |

REGISTRATION AND STUDY ADMINISTRATIVE

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| Registration | <p>Sign up for study activities at stads selvbetjening within the announced registration period, as you can see on the Studyadministration homepage.</p> <p>When signing up for study activities, please be aware of potential conflicts between study activities or exam dates.</p> <p>The planning of activities at Roskilde University is based on the recommended study programs which do not overlap. However, if you choose optional courses and/or study plans that goes beyond the recommended study programs, an overlap of lectures or exam dates may occur depending on which courses you choose.</p> |
| Number of participants | |
| ECTS | 10 |
| Responsible for the activity | William Goldring (goldring@ruc.dk) Frederik Diness (diness@ruc.dk) |
| Head of study | Anders Malmendal (amalm@ruc.dk) |
| Teachers | |
| Study administration | INM Registration & Exams (inm-exams@ruc.dk) |
| Exam code(s) | U60042 |

ACADEMIC CONTENT

Overall
objective

Organic chemistry plays an important, central role in our everyday life. From the synthesis of new medicines for health, or the construction of new materials and catalysts for industrial processes and energy production, to developing an understanding of how chemical and biological processes work, each area requires a strong foundation in and knowledge of organic chemistry.

The course will describe and illustrate the structure, properties and chemical reactions and reactivity of organic molecules, using a number of relevant examples systematically organised around functional group structures. Furthermore, a number of fundamental reaction mechanisms, such as substitution, elimination, addition and rearrangement processes, will be discussed and illustrated to develop a deeper understanding of these processes, and to help the student to account for reaction outcomes, product formation and selectivity. Finally, the application of organic chemistry, including the reactivity of the products resulting from the reactions that appear in this course, will be described in the context of multistep synthesis, together with new concepts and issues that arise in the design and implementation of such efforts.

Laboratory experiments will introduce the principles of organic synthesis and the identification of reaction products from experimental data, such as IR and NMR. The experiments will complement as well as add to the content of the lectures.

Detailed
description of
content

Organic chemistry plays an important, central role in our everyday life.

From the synthesis of new medicines for health, or the construction of new materials and catalysts for industrial processes and energy production, to developing an understanding of how chemical and biological processes work, each area requires a strong foundation in and knowledge of organic chemistry.

The course will describe and illustrate organic chemistry reactions, using a number of relevant examples systematically organized around functional group structures.

Furthermore, a number of fundamental reaction mechanisms, such as substitution, elimination, addition and rearrangement processes, will be discussed to develop a deeper understanding of these processes, and the factors governing them.

Finally, the application of organic chemistry, including the reactivity of the products resulting from the reactions that appear in this course, will be described in the context of multistep synthesis, together with new concepts and issues that arise in the design and implementation of such efforts.

The course will describe and illustrate the structure, functional groups and reactivity of organic compounds, together with related reaction mechanisms. Laboratory experiments will introduce the principles of organic synthesis and complement and add to the content of the lectures. Part of the experimental work will include the identification of reaction products from experimental data, such as IR and NMR.

Detailed Teaching Objectives and Learning Outcomes

After successful completion of the course the student will be able to demonstrate and apply:

Knowledge of:

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| | <ul style="list-style-type: none"> • nomenclature in organic chemistry. • structure of organic compounds. • reactivity and reactions of organic compounds. • organic reaction mechanisms. • factors governing organic chemistry reactions. • phenomena such as geometric isomerism, stereoisomerism, and tautomerism. <p>Skills in:</p> <ul style="list-style-type: none"> • problem-solving, independent learning and the application of methods to solve unfamiliar problems. • safe handling of organic compounds. • performing a chemical synthesis experiment according to a written procedure. <p>Learning outcomes:</p> <ul style="list-style-type: none"> • describe and illustrate organic chemistry reaction mechanisms. • determine the outcome of a reaction and account for the product formed. • develop a synthetic plan to construct a structure type, or to interconvert between structure types. • interpret measurements of organic compounds, and the results and outcome of experiments involving organic compounds. |
| Course material and Reading list | <p>Textbook:</p> <p>J. McMurry, Organic Chemistry with Biological Applications, 3rd Ed., Cengage Learning, 2015. Chapters 6-9 and 12-18.</p> <p>Other materials:</p> <ul style="list-style-type: none"> • Powerpoint slides will be posted on moodle during the course, prior to each lecture. • Problem sets will be posted on moodle during the course, prior to each workshop. • A laboratory manual will be posted on moodle in late september and detailed pre- and post-laboratory assignments will be posted on moodle before and after each session. |
| Overall plan and expected work effort | <p>10 ECTS corresponds to 270 hours of work</p> <p>The work load for the student:</p> <p>Preparation time Contact time</p> <ul style="list-style-type: none"> • lectures and workshops 60 hours • laboratory sessions 16 hours • examination 4 hours <p>Study and preparation time:</p> <ul style="list-style-type: none"> • reading and self-revision problems 60 hours, • theoretical problem preparation 45 hours, • laboratory and assignments 40 hours, • revision and exam preparation 45 hours. <p>Total 270 hours</p> |
| Format | |

Evaluation
and feedback

The course includes formative evaluation based on dialogue between the students and the teacher(s).

Students are expected to provide constructive critique, feedback and viewpoints during the course if it is needed for the course to have better quality. Every other year at the end of the course, there will also be an evaluation through a questionnaire in SurveyXact. The Study Board will handle all evaluations along with any comments from the course responsible teacher.

Furthermore, students can, in accordance with RUCs 'feel free to state your views' strategy through their representatives at the study board, send evaluations, comments or insights from the course to the study board during or after the course.

Programme

The course is organized around a combination of lectures (powerpoint, boardwork, and discussion, 36 hrs), problem solving workshops (22 hrs) and laboratory experiment sessions (16 hrs). See study.ruc.dk for a detailed course schedule, and the course page on Moodle for a schedule, course description, laboratory manual and other documents, together with lecture notes, problem solving questions and laboratory report assignments.

Each lecture section is followed by a problem solving workshop, organized according to the course schedule on Moodle. Students will find questions associated with a particular lecture section in separate files uploaded to the course Moodle page.

Students are expected to complete or attempt the problem solving questions associated with a particular workshop, before it takes place, and be prepared to present their solutions, in whole or in part, during the workshop.

Two reports must be completed for each laboratory experiment. One is a short pre-lab report due before the experiment session, and the other post-lab report must be completed before the following session.

ASSESSMENT

Overall
learning
outcomes

After successful completion of the course the student will be able to:

- translate between nomenclature and structure of organic compounds
- use a reaction mechanism to account for the reaction of an organic compound based on its structure and the reagents involved
- solve unfamiliar problems through the application of skills and strategies in problem-solving and independent learning
- safely handle organic compounds
- perform a chemical synthesis experiment according to a written procedure
- describe and illustrate organic chemistry reaction mechanisms
- compare and contrast the structure, reactivity and properties of a group of organic molecules
- determine the outcome of a reaction and account for the product formed
- develop a synthetic plan to construct a structure type, or to interconvert between structure types
- interpret measurements of organic compounds
- interpret the results and outcome of experiments involving organic compounds.

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| Form of examination | <p>Individual written invigilated exam</p> <p>The duration of the exam is 4 hours.</p> <p>Permitted support and preparation materials for the exam: Computer without internet access during the exam, pocket calculator, course material and own notes.</p> <p>Assessment: 7-point grading scale. Moderation: External examiner.</p> |
| Form of Re-examination | Samme som ordinær eksamen / same form as ordinary exam |
| Type of examination in special cases | |
| Examination and assessment criteria | <p>Individual written invigilated exam based on a set of problem solving questions.</p> <p>Assessment criteria/the student will be assessed on their ability to:</p> <ul style="list-style-type: none"> • translate between the name and the structure of an organic compound. • compare and contrast the structure, reactivity and properties of a group of organic molecules. • use a reaction mechanism to account for the reaction of an organic compound based on its structure and the reagents involved. • determine the outcome of a reaction and account for the product formed. • determine the reagents required to achieve a specific reaction outcome. • develop a synthetic plan to construct a target structure, a structure type, or to interconvert between structure types. <p>-apply problem based skills, methods and strategies to solve unfamiliar problems</p> |
| Exam code(s) | Exam code(s) : U60042 |

Course days:

Hold: 1

Essential Organic Chemistry (CB)

time 05-09-2023 10:15 til
05-09-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 07-09-2023 12:15 til
07-09-2023 14:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 12-09-2023 10:15 til
12-09-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 14-09-2023 10:15 til
14-09-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 19-09-2023 10:15 til
19-09-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry - Flexible laboratory hours (CB)

time 19-09-2023 13:00 til
19-09-2023 18:00

Teacher Frederik Diness (diness@ruc.dk)

Essential Organic Chemistry (CB)

time 21-09-2023 10:15 til
21-09-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 26-09-2023 10:15 til
26-09-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 28-09-2023 10:15 til
28-09-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 03-10-2023 10:15 til
03-10-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry - Flexible laboratory hours (CB)

time 03-10-2023 13:00 til
03-10-2023 18:00

Teacher Frederik Diness (diness@ruc.dk)

Essential Organic Chemistry (CB)

time 05-10-2023 10:15 til
05-10-2023 12:00

location 28b.0-01 - store teorirum (30)
Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 10-10-2023 10:15 til
10-10-2023 12:00
location 28b.0-01 - store teorirum (30)
Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 12-10-2023 10:15 til
12-10-2023 12:00
location 28b.0-01 - store teorirum (30)
Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 24-10-2023 10:15 til
24-10-2023 12:00
location 28b.0-01 - store teorirum (30)
Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 26-10-2023 10:15 til
26-10-2023 12:00
location 28b.0-01 - store teorirum (30)
Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 31-10-2023 10:15 til
31-10-2023 12:00
location 28b.0-01 - store teorirum (30)
Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry - Flexible laboratory hours (CB)

time 31-10-2023 13:00 til
31-10-2023 18:00

Teacher Frederik Diness (diness@ruc.dk)

Essential Organic Chemistry (CB)

time 02-11-2023 10:15 til
02-11-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 07-11-2023 10:15 til
07-11-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 09-11-2023 10:15 til
09-11-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 14-11-2023 10:15 til
14-11-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry - Flexible laboratory hours (CB)

time 14-11-2023 13:00 til
14-11-2023 18:00

Teacher Frederik Diness (diness@ruc.dk)

Essential Organic Chemistry (CB)

time 16-11-2023 10:15 til
16-11-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 21-11-2023 10:15 til
21-11-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 23-11-2023 10:15 til
23-11-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 28-11-2023 10:15 til
28-11-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher Frederik Diness (diness@ruc.dk)

Essential Organic Chemistry (CB)

time 30-11-2023 10:15 til
30-11-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher Frederik Diness (diness@ruc.dk)

Essential Organic Chemistry (CB)

time 05-12-2023 10:15 til
05-12-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher Frederik Diness (diness@ruc.dk)

Essential Organic Chemistry (CB)

time 07-12-2023 10:15 til
07-12-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher Frederik Diness (diness@ruc.dk)

Essential Organic Chemistry (CB)

time 12-12-2023 10:15 til
12-12-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher William Goldring (goldring@ruc.dk)

Essential Organic Chemistry (CB)

time 14-12-2023 10:15 til
14-12-2023 12:00

location 28b.0-01 - store teorirum (30)

Teacher Frederik Diness (diness@ruc.dk)

Essential Organic Chemistry - Exam (CB)

time 09-01-2024 10:00 til
09-01-2024 14:00

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

location 44.3-40 - teorilokale (50)

Essential Organic Chemistry - Reexam (CB)

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| time | 23-02-2024 12:30 til 23-02-2024 16:30 |
| forberedelsesnorm | ikke valgt |
| forberedelsesnorm D-VIP | ikke valgt |
| location | 27.2-054 - lokale 3 (40) |