Nanyang Technological University
Division of Chemistry and Biological Chemistry

Academic Year	AY20/21	**Semester**	1
Course Coordinator	Zhao Yanli		
Course Code	CM1031		
Course Title	Basic Organic Chemistry with Laboratory		
Pre-requisites	None		
Mutually Exclusive	BS1003 Organic Chemistry, CY1101 Principles of Modern Chemistry		
No of AUs	4		
Contact Hours	Lectures: 39, Tutorials: 5, Laboratory: 15		
Proposal Date	20 January 2020		

Course Aims

This course introduces you to basic organic chemistry in terms of the principles of organic molecular structures, stereochemistry, functional groups, basic organic reactions and their mechanisms. In addition to introducing some fundamental principles of structure and bonding, polar covalent bonds, as well as acids and bases, this introductory course covers the characteristic properties, synthesis, and reactivity of alkanes, alkenes, benzene and other aromatic compounds, halides, alcohols, aldehydes, ketones, carboxylic acids and their derivatives. This course will help you set up foundation for learning advanced organic chemistry.

Intended Learning Outcomes (ILO)

Upon successfully completing this course, you should be able to:

1. Describe some basic concepts in organic chemistry, such as molecular bonding, polar covalent bonds, acidity, basicity and stereochemistry
2. Explain major properties, synthesis, and reactivity of main organic compounds, such as alkanes, alkenes, benzene and other aromatic compounds, halides, alcohols, aldehydes, ketones, carboxylic acids and their derivatives
3. Draw correct organic structures with stereochemistry
4. Identify representative organic reactions
5. Predict simple organic transformations
6. Design some simple organic reactions
7. Perform basic organic lab experiments

Course Content

1. Structure and bonding

2. Polar covalent bonds, acids and bases

3. Organic compounds: alkanes and their stereochemistry

4. Organic compounds: cycloalkanes and their stereochemistry

5. Stereochemistry at tetrahedral centers

6. An overview of organic reactions

7. Alkenes: structure and reactivity as well as reactions and synthesis

8. Reactions of alkyl halides, aldehydes and ketones: nucleophilic substitutions and eliminations

9. Benzene, aromaticity, and electrophilic aromatic substitution

10. Carboxylic acids and derivatives

Assessment (includes both continuous and summative assessment)

Component	Course ILO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/Individual	Assessment rubrics
Midterm I	1, 2, 3	Competence, Creativity	15%	Individual	See Appendix 1
Midterm II	4, 5, 6	Competence, Creativity	15%	Individual	See Appendix 1
Lab component	7	Competence, Creativity	20%	Individual	See Appendix 1
Final Examination	1, 2, 3, 4, 5, 6	Competence, Creativity	50%	Individual	See Appendix 1
Total			*100%*		

Formative feedback

Formative feedback: Lecturers and TAs will be closely working with you to monitor your learning progress. They will provide you with timely feedback to improve your understanding and design. Furthermore, you can feel free to express your ideas and discuss them with lecturers and TAs as course progresses. This will help you achieve intended learning outcomes 1, 2, 3, 4, 5, and 6. You will have opportunities to practise the key learning aspects during lectures and tutorials.

Learning and Teaching Approach

Lectures (39 hours)	You will be spending time to learn detailed organic chemistry principles, structures and reactions. This will enable you to possess the ability for designing new organic chemistry experiments and addressing scientific problems in organic chemistry. Face to face lectures will be conducted, having active interactions between students and instructors. Students could also immediately clarify their doubts/questions during the lectures.
Tutorials (5 hours)	TAs will provide materials containing concepts taught in classes and cover related applications derived from corresponding lectures. You will be assigned to a small group for interactive discussions toward some representative questions, which will help you develop your own critical thinking capability and problem solving skills.
Laboratory (15 hours)	Assisted by TAs, you will be assigned to carry out organic chemistry laboratory experiments. Through laboratory exercise, you will be able to learn fundamental organic synthesis skills and techniques. The laboratory training will enable students to have critical thinking and independent research abilities.

Reading and References

Recommended textbook: Organic Chemistry, 9th Ed, John MaMurry; ISBN-13: 978-1305080485, ISBN-10: 1305080483

Course Policies and Student Responsibilities

You are expected to complete all assignments within defined time. You are also expected to read the lecture materials prior to the lecture session. This will help you learn much more efficiently as you will already have an impression on the topics to be covered, and clarify any question you may have during the lectures.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors

Instructor	Office Location	Phone	Email
Zhao Yanli	SPMS CBC 06-18	6316 8792	zhaoyanli@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course ILO	Readings/Activities
1	Introduction to the course	1	Lecture, Responseware, Assignment
2	Structure and bonding	1, 2	Lecture, Responseware, Assignment
3	Polar covalent bonds, acids and bases	1, 2	Lecture, Responseware, Assignment
4	Organic compounds: alkanes and their stereochemistry	1, 2, 3	Lecture, Responseware, Assignment
5	Organic compounds: cycloalkanes and their stereochemistry	1, 2, 3	Lecture, Responseware, Assignment
6	Stereochemistry at tetrahedral centers	1, 2, 3	Lecture, Responseware, Assignment
7	Midterm I	1, 2, 3	Assessment
8	An overview of organic reactions	1, 2, 3, 4, 5, 6	Lecture, Responseware, Assignment
9	Alkenes: structure and reactivity as well as reactions and synthesis	1, 2, 3, 4, 5, 6	Lecture, Responseware, Assignment
10	Reactions of alkyl halides, aldehydes and ketones: nucleophilic substitutions and eliminations	1, 2, 3, 4, 5, 6	Lecture, Responseware, Assignment
11	Benzene, aromaticity, and electrophilic aromatic substitution	1, 2, 3, 4, 5, 6	Lecture, Responseware, Assignment

12	Carboxylic acids and derivatives	1, 2, 3, 4, 5, 6	Lecture, Responseware, Assignment
13	Midterm II	1, 2, 3, 4, 5, 6	Assessment

Note: Midterm II may be arranged in week 12 depending on the teaching progress.

Appendix 1: Assessment Rubrics

Rubric for Midterm and Final Examination

For the questions in the exam, you will be expected to show your competency to understand organic chemistry principles, stereochemistry, major properties, synthesis, and reactivity of main organic compounds, having critical thinking and practical skills to solve scientific problems. Marks will be scaled to 10% of the course total.

0-3 marks	4-7 marks	8-10 marks
Shows little to no understanding of the theoretical and practical principles covered in the lectures	Shows moderate to good understanding of the theoretical and practical principles covered in the lectures	Shows a comprehensive or near comprehensive understanding of the theoretical and practical principles covered in the lectures

Rubric for Laboratory

Through laboratory exercise, students will be able to possess fundamental organic synthesis skills and techniques associated with the organic chemistry course. The laboratory training will enable students to have critical thinking and independent research abilities in solving scientific problems. Marks will be scaled to 10% of the laboratory component total.

0-3 marks	4-7 marks	8-10 marks
Shows little to no understanding of the theoretical and practical principles covered in the laboratory component	Shows moderate to good understanding of the theoretical and practical principles covered in the laboratory component	Shows a comprehensive or near comprehensive understanding of the theoretical and practical principles covered in the laboratory component

CBC Programme Learning Outcome

The Division of Chemistry and Biological Chemistry (CBC) offers an undergraduate degree major in Chemistry that satisfies the American Chemical Society (ACS) curricular guidelines and equips students with knowledge relevant to the industry. Graduates of the Division of Chemistry and Biological Chemistry should have the following key attributes:

1. Competence

Graduates should be well-versed in the foundational and advanced concepts of chemical science, be able to evaluate chemistry-related information critically and independently, and be able to use complex reasoning to solve emergent chemical problems.

2. Creativity

Graduates should be able to synthesize and integrate multiple ideas across the curriculum, and propose innovative solutions to emergent chemistry-related problems based on their training in chemistry.

3. Communication

Graduates should be able to demonstrate clarity of thought, independent thinking, and sound scientific analysis and reasoning through written and oral reports to audiences with varying technical backgrounds. They should also be able to effectively engage other professional chemists in collaborative endeavours.

4. Character

Graduates should be able to act in responsible ways and uphold the high ethical standards that the society expects of professional chemists.

5. Civic-mindedness

Graduates should be aware of the impact of chemistry on society, and how chemistry can be applied to benefit mankind. They should also be aware of and uphold the best chemical safety practices.