

Hokkaido University Syllabus					
■■ Course Title Organic Chemistry III					
■■ Subtitle					
■■ Instructor (Institution) Takeshi OHKUMA ( Faculty of Engineering )					
■■ Other Instructors (Institution) Takeshi OHKUMA ( Faculty of Engineering ) Taiga YURINO ( Faculty of Engineering )					
■■ Course Type				■■ Open To Other Faculties / Schools	OK
■■ Year	2020	■■ Semester	1st Semester	■■ Course Number	016187
■■ Type of Class	Lecture	■■ Number of Credits	2	■■ Year of Eligible Students	3~
■■ Eligible Department / Class				■■ Other Information	
■■ Numbering Code	ENG_ASE 3660				
■■ Major Category Code	■■ Major Category Title				
ENG_ASE	Engineering_Applied Science and Engineering				
■■ Level Code	■■ Level				
3	General Education Courses offered in upper years; Specialized Subjects (advanced)				
■■ Middle Category Code	■■ Middle Category Title				
6					
■■ Small Category Code	■■ Small Category Title				
6					
■■ Language Type					
Classes are in Japanese.					
■■ Course list by the instructor with practical experiences					
N/A					

## ■■ Key Words

Carbonyl Compounds; Nucleophilic Addition Reactions;  $\alpha$ -Substitution Reactions; Condensation Reactions

## ■■ Course Objectives

Students will acquire fundamental knowledge of organic chemistry, which is necessary for learning synthetic organic chemistry, polymer chemistry, and biochemistry, and then they will be able to understand the nature and transformation methods of organic molecules. The lecture of organic chemistry consists of Organic Chemistry I, II, III, IV, and in Organic Chemistry III students will learn basic idea on the properties and reactions including mechanisms of carbonyl compounds.

#### ■ ■ Course Goals

Students understand the structure and properties of aldehydes, ketones, carboxylic acids, and carboxylic acid derivatives. They also understand nucleophilic addition reactions, carbonyl condensation reactions, and the related reactions including reaction mechanism comprehensively. Moreover, they can use the reactions as molecular transformation methods.

#### ■ ■ Course Schedule

##### 1. Introduction of carbonyl compounds (1)

Electronic structures, chemical properties, and general reactions of carbonyl compounds are introduced.

##### 2. Nucleophilic addition reactions of carbonyl compounds (3)

After learning the nomenclature, preparation methods, oxidation and nucleophilic addition reactions of aldehydes and ketones, their applications to organic synthesis are discussed.

##### 3. Carboxylic acids (2)

Nomenclature of carboxylic acids and their structural and chemical properties are introduced. Substituent effects on acidity and typical reactions of carboxylic acids are examined.

##### 4. Carboxylic acid derivatives (2)

Typical reactions of acid halides, esters, amides, acid anhydrides, and nitriles are introduced.

##### 5. $\alpha$ -Substitution reactions of carbonyl compounds (3)

Acidity of hydrogen at the  $\alpha$ -position of carbonyl compounds and formation of enolates are discussed. Typical reactions of enolates are also introduced.

##### 6. Condensation reactions of carbonyl compounds (4)

Aldol condensation, Claisen condensation, Michael reaction, Robinson annulation, and the related condensation reactions are introduced.

#### ■ ■ Homework

Preparation for the next lecture: It will be preferable to read the relevant contents in the textbook.

Review: Students review the contents based on the textbook and the lecture note. Students are sometimes required to submit assignments. It will be preferable to solve some exercises on the textbook before the examination.

#### ■ ■ Grading System

The final grade will be determined students who attended above a certain number by depth of understanding and proficiency of the lecture contents on syllabus. Students must earn at least 60 points out of 100 to pass at the regular assignments (20%) as well as examinations (80%).

#### ■ ■ Practical experience and utilization for classes

#### ■ ■ Condition of tasking the subject

#### ■ ■ Textbooks

[有機化学 \(中\) 第9版 / John McMurry : 東京化学同人, 2017, ISBN:9784807909131](#)

#### ■ ■ Reading List

#### ■ ■ Websites

#### ■ ■ Website of Laboratory

<http://labs.eng.hokudai.ac.jp/labo/orgsynth/en/>

#### ■ ■ Additional Information

It is preferable that students have already earned credits of Organic Chemistry I and Organic Chemistry II.

■ ■ Update

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