

**CHEM 2111      Fundamentals of Organic Chemistry**  
(Spring Term, 1 February – 28 May 2021)

**1. Instructor**

Prof. Wei-Min DAI; Room CYT-6012, lifts 35/36  
Tel. 2358-7365; E-mail: [chdai@ust.hk](mailto:chdai@ust.hk)

**2. Teaching Assistants**

Mr. Peilin TIAN                      [ptianaa@connet.ust.hk](mailto:ptianaa@connet.ust.hk)  
Miss Eryu WANG                   [ewangab@connect.ust.hk](mailto:ewangab@connect.ust.hk)

**3. Lecture Time and Venue**

Date & Time:                      Tue & Thu 9:00–10:20 am  
    (3 lecture hours per week)  
Venue:                                Live online mode using Zoom

**4. Course Description & Objectives**

Credit Points:                      3  
Pre-requisite:                      CHEM 1010 or CHEM 1020  
Exclusion:                            CHEM 2110, CHEM 2112, and CHEM 2118

Brief Information/synopsis:

Various classes of organic compounds, emphasizing organic chemical reactions and mechanisms of major functionalities and their importance in the area of biological chemistry. For engineering students under the four-year degrees who prefer to learn organic chemistry in a single term.

The course will treat selected topics from a mechanistic viewpoint and illustrate their usefulness in the wider body of organic chemistry. Examples of concepts in organic synthesis will be given. The course does not aim to provide a comprehensive coverage of organic reactions, rather it will seek to encourage students to think about organic chemical reactions, and to apply key concepts to other reactions not covered in the course.

**5. Intended Learning Outcomes**

Upon successful completion of the course, students should be able to:

No.    ILOs

1. Recognize fundamentals of organic chemistry including structures, reaction mechanisms, and some transformations of carbon-derived compounds.
2. Explain the essential facts and principles of organic chemistry.
3. Demonstrate awareness of organic chemistry topics relevance to social and daily life.
4. Formulate and analyze mechanisms and products of some general organic transformations by applying organic chemistry principles.

**6. Requirement & Assessment Scheme**

i. Attendance at all lectures

ii. Assessment

Two Assignments (30% of 100 points)

Two Essays (70% of 100 points)

Assessing Course ILOs

1, 2, 3, 4

1, 2, 3, 4

- iii. The course grade is assigned based on students' performance in assessment tasks/activities.

## 7. Student Learning Resources

*Textbook:* "Organic Chemistry, A Brief Course", by Robert C. Atkins, Francis A. Carey, and Chi Wi Ong; McGraw-Hill Education (Asia), 2013.

or "Organic Chemistry, A Brief Course, 3rd Edition", by Robert C. Atkins and Francis A. Carey; McGraw-Hill; International Edition, 2007.

*Solutions Manual:* "Student Solutions Manual to accompany Organic Chemistry, A Brief Course, 3rd Edition" by Robert C. Atkins and Francis A. Carey; McGraw-Hill; International Edition 2007.

## 8. Teaching & Learning Activities

Scheduled activities: 3 lecture hours per week

## 9. Course Schedule

<i>Week 1</i>	2 & 4 Feb Chemical bonding
<i>Week 2</i>	9 & 11 Feb Alkanes and cycloalkanes
<i>Week 3</i>	16 & 18 Feb Acids, bases and alkyl halides
<i>Week 4</i>	23 & 25 Feb Alkenes and alkynes I: Structure and preparation
<i>Week 5</i>	2 & 4 Mar Alkenes and alkynes II: Reactions
<i>Week 6</i>	9 & 11 Mar Stereochemistry
<i>Week 7</i>	16 & 18 Mar Nucleophilic substitution
<i>Week 8</i>	23 & 25 Mar Free radicals
<i>Week 9</i>	30 Mar Spectroscopy
	<b>[31/3–6/4 Mid Term Break]</b>
	8 Apr Spectroscopy (continue)
<i>Week 10</i>	13 & 15 Apr Alcohols, ethers, and phenols Aromatic compounds

<i>Week 11</i>	<i>20 &amp; 22 Apr</i> Aromatic compounds (continue) Aldehydes and ketones
<i>Week 12</i>	<i>27 &amp; 29 Apr</i> Carboxylic acids Carboxylic acid derivatives
<i>Week 13</i>	<i>4 &amp; 6 May</i> Amino acids, peptides, and proteins

**10–14 May, Study Break**

**No Final Examination**

#### 10. Reserve Items in Library

<http://ustlib.ust.hk/search/r?SEARCH=chem+2111>

Call Number	QD253.2 .A74 2002 c.1-3
AUTHOR	Atkins, Robert C. (Robert Charles)
TITLE	Organic chemistry, a brief course
EDITION	3rd ed.
IMPRINT	Boston : McGraw-Hill, c2002.
# Copies:	3 copies
Call Number	QD251.2 .A82 2002 c.1-2
AUTHOR	Atkins, Robert C. (Robert Charles)
TITLE	Organic chemistry, a brief course : student solutions manual
EDITION	3rd ed.
IMPRINT	Boston : McGraw-Hill, c2002.
# Copies:	2 copies

Revised on 10 March 2021 by Prof. Wei-Min Dai





**CHEM 2155 Fundamental Organic Chemistry Laboratory**  
**2021 Spring**  
**Course Outline**

**1. Instructor**

Dr. CHAN, Ho Wai Dennis (email: [chanhw@ust.hk](mailto:chanhw@ust.hk))  
Office Room 4528; Tel: 3469-2099

**2. Technical support staff / Teaching Assistant:**

*Technical support staff:*

TSE, Wai Pui Veronica (email: [chvaipui@ust.hk](mailto:chvaipui@ust.hk))

LAU, Chun Tak Disney (email: [disney@ust.hk](mailto:disney@ust.hk))

CHAN, Ka Lok Kelvin (email: [chkelvin@ust.hk](mailto:chkelvin@ust.hk))

WONG, Ka Man Joanne (email: [joannewong@ust.hk](mailto:joannewong@ust.hk))

Contact Details: CYT-1003 and CYT-1004; Tel: 3469-2611 & 3469-2612

*Teaching Assistant:*

Name: [to be provided in a separate file on Canvas]

**3. Meeting Time:**

Date/Time: Every Fri 10:30 – 13:20

**4. Course Description**

Credit Points: 1

Pre-requisites: (CHEM 1010 or CHEM 1020) & CHEM 1050

Co-requisites: CHEM 2110 or CHEM 2111

Exclusions: CHEM 2150

Brief Information/synopsis:

*This is the laboratory course designed for non-CHEM students who enrolled in CHEM 2110 or CHEM 2111. Students will perform a series of organic experiments related to the theories learnt in the related lecture courses. Students will be trained to practice a wide range of fundamental organic laboratory techniques, operate chemical instruments, relate the physical and chemical principles and theory in practice, and develop their data interpretation and analytical skills. For non-CHEM students in programs that designate this course as required course/specified elective.*

**5. Intended Learning Outcomes (ILOs)**

Upon completion of the course, students should be able to:

1	Conduct analysis and interpretation of experimental data related to organic experiments.
2	Assess and manage the risk of chemical substances and laboratory procedures, and to evaluate their potential impact on the environment.
3	Know how to conduct standard laboratory procedures involved in synthetic and instrumental work related to organic experiments.
4	Know how to operate chemical instruments.
5	Able to show self awareness, to interact with other people in team working, and to work independently.

## 6. Assessment Scheme

Grading type: letter grades.

<u>Assessment items</u>	<u>ILOs to be assessed</u>
10% Safety Assignment	2
30% Lab Quizzes	1, 2
35% Lab Reports	1, 2, 3, 4, 5
25% Oral Test	1, 2, 4

\* Passing mark: 50%

## 7. Student Learning Resources

### Reference books:

Kenneth L. Williamson, "*Macroscale and Microscale Organic Experiments 3<sup>rd</sup> edition*", Boston: Houghton Mifflin ©1999; or  
Kenneth L. Williamson, Kathrine M. Maters, "*Macroscale and Microscale Organic Experiments 6<sup>th</sup> edition*", Australia: Brooks/Cole ©2011; or  
Kenneth L. Williamson, Kathrine M. Maters, "*Macroscale and Microscale Organic Experiments 7<sup>th</sup> edition*", Australia: Cengage ©2017.

\* Other course materials can be downloaded from Canvas website by logging in using your ITSC username and password (<https://canvas.ust.hk>).

## 8. Teaching and Learning Activities

Scheduled activities: 2 hr 50 min (tutorial + laboratory demonstrations, etc.)

## 9. Keyword syllabus:

- Recrystallization of Organic Solids
- Distillation of Organic Liquids
- Liquid-liquid Extraction of Organic Components from a Mixture
- Organic Synthesis
- Nucleophilic Substitution
- Melting Point Measurement
- Infra-Red Spectroscopy of Organic Compounds

# CHEM 2311 Analytical Chemistry

## Course Outline - Spring 2021

### 1. Instructor

Dr. Simon W. Chan

Email [chanwan@ust.hk](mailto:chanwan@ust.hk), Rm 4520

**Office Hours:** by appointment

### 2. Teaching Assistant(s)

Claire Sun (*course content*) [zsunar@connect.ust.hk](mailto:zsunar@connect.ust.hk)

GUO, Wanlin (*Quiz*) [wguoag@connect.ust.hk](mailto:wguoag@connect.ust.hk)

PAN, Guanrui (*course content*) [gpanaa@connect.ust.hk](mailto:gpanaa@connect.ust.hk)

CHIN, Man Lung [mlchin@connect.ust.hk](mailto:mlchin@connect.ust.hk)

KWOK, Hong Ching [hckwokaa@connect.ust.hk](mailto:hckwokaa@connect.ust.hk)

CHEN, Junyi (h.w.) [jcheneb@connect.ust.hk](mailto:jcheneb@connect.ust.hk)

### 3. Lecture Time and Venue

**Date/Time:** Wed & Fri (4:30 – 5:50); **Venue:** at your desktop computer

### 4. Course Description

Credit Points: 3; Pre-requisite: CHEM 1010 or 1020; Exclusion: CHEM 2310

#### ***Brief Information/synopsis:***

Fundamental & practical aspects of chemical analysis, including titrimetric, electrical, optical & mass spectroscopic methods, analytical separations by chromatography.

### 5. Assessment Scheme

- Assignment (30% in total): 2 x 15%;
- <sup>a</sup> Quiz (70% in total): 7 x 10%; (*subject to changes in accordance to University regulation and for Fairness to the **whole class***)
  - <sup>a</sup> Quiz: online, in class; ***Camera must be turned on showing both your face and hands during the quizzes, or Zero mark will be award for that quiz***

\*\*\* 2 bonus (2 x 1) points for answering questions during the lecture\*\*\*



## 6. Intended Learning Outcomes

Upon successful completion of this course, students should be able to:

No.	ILOs
1	Able to recognize fundamentals of analytical chemistry including various concentration units, statistics for analytical chemistry, acid-base titrations, complexometric titrations, redox titrations, basics of optical spectroscopy, basics of chromatography and mass spectrometry.
2	Able to explain the essential facts, principles and theories for analytical chemistry.
3	Able to demonstrate awareness of topics of analytical chemistry relevant to social and daily life, such as environmental issues.
4	Formulate and analyze a wide range of analytical chemical problems by applying chemical principles.
5	Show appreciation of analytical chemistry and its interface with social and daily life such as environmental issues, and arouse audience's interest in chemistry.

## 7. Student Learning Resources

Textbook: Exploring Chemical Analysis (5th Edition), Daniel Harris, Freeman, 2013

Reference: Quantity Chemical Analysis, Daniel C. Harris, Freeman

## 8. Teaching and Learning Activities

Scheduled activities: 3 hrs (lecture)

## 9. Course Schedule (Keyword Syllabus):

Measurements and the tools of an analytical chemist	Polyprotic Acids and Bases
Math Tool-kit, Significant Figures and Errors	EDTA Titrations
Statistics	Introduction to Electrochemistry
Least Squares and Quality Assurance	Potentials and Potentiometry: Electrode Measurements
Gravimetry, Titrations	Redox Titrations
Acids and Bases, Buffers and Indicators	Instrumental Electrochemistry
Acid-Base Titrations & N-Analysis	Optical Spectroscopy and Applications
Mass Spectrometry	Chromatography



**CHEM 2355 Fundamental Analytical Chemistry Laboratory**  
Course Outline – Spring 2021

**1. Instructor**

Instructor: Dr Joanne W T Tung  
Office: Rm 4541 (Lift 25/26)  
Tel: 2358 7395  
E-mail: jwttung@ust.hk

**2. Teaching Assistant**

Name (Surname first)	Email (@connect.ust.hk)
TEWARI, Neha	ntewari
JIN, Long	ljinac
ZHANG, Jiayin	jzhangem
XU, Xin	xxube
PAN, Guanrui	gpanaa
ZHU, Hongni	hzhuaup

**3. Meeting Time and Venue**

**Venue:** Online mode of delivery

**Time of Tutorials/Laboratory:**

LA1: Friday 10.30 - 13.20

**4. Course Description**

**Credit Points:** 1

**Pre-requisites:** CHEM1010 General Chemistry IA or CHEM1020 General Chemistry IB, or  
CHEM1050 Laboratory for General Chemistry I

**Co-requisites:** CHEM2311 Analytical Chemistry or  
CHEM2310 Fundamentals of Analytical Chemistry

**Course Description:** Practical aspects of fundamental chemical analysis.

**Course Objective:** With the use of analytical instruments and lab equipment, the course applies what the students learned in lectures in practical term.

**Design of the Laboratory Course:**

This course is delivered online through canvas and Zoom communication software.

**5. Intended Learning Outcomes (ILOs)**

On completion, students should be able to:

- Apply chemical principle for analytical determinations.
- Apply the instrumental techniques to quantitative and qualitative chemical analyses.
- Calculate and interpret the result based on the experimental data.

## 6. Assessment Scheme

The ILO points (a) to (c) are assessed by lab reports, lab quizzes and oral quiz.

Expt No.	Title of Experiment	ILOs
1	Calibration of Volumetric Glassware	(a)-(c)
2	Quantitative Analysis of Xylene Isomer (para-Xylene) Using Fourier Transform- Infrared Spectrometer (FT-IR)	(a)-(c)
3	Determination of n-Heptane, n-Octane and n-Decane in unknown sample using Gas Chromatograph - Flame Ionization Detector (GC-FID)	(a)-(c)

## Course Grading

Weight	Assessment	Course ILOs
60%	Reports	(a)-(c)
20%	Lab Quizzes	(a)-(c)
20%	Oral Quiz	(a)-(b)

## 7. Student Learning Resources

- Harris D. C., *Quantitative Chemical Analysis*, 9<sup>th</sup> Ed., W. H. Freeman and Company, New York, 2016.
- Skoog D A, West D M, Holler F J, *Fundamentals of Analytical Chemistry*, 7<sup>th</sup> Ed, Chapter 22B, Saunders College Publishing, 1996.

(A few copies of each of the above textbooks have been reserved at the Course Reserve in HKUST library.)

## 8. Teaching and Learning Activities

### *Prelab Practice*

Before each lab session, students are strongly advised to read the lab manual, relevant academic websites, textbooks and/or journal papers.

### *Videos on Canvas*

The videos of experiments and videos of background theory will be placed on the canvas website for students to watch.

### *Lab Briefing*

There will be tutorials for the experiments held by the Instructor during the lab session interactively on Zoom.

### *Students' Enquiry Session*

There will be time allowed for students to raise any questions regarding the experiment before the report submission deadline.

(End)