**TQF 3 Course Specification**

**Section 1 General Information**

|  |  |  |
| --- | --- | --- |
| **1.** | **Course Code and Course Title** | วทคม ๑๗๒ เคมีอินทรีย์ |
|  |  | SCCH 172 Organic Chemistry |
| **2.** | **Number of credits** | 3 (3-0-6) |
|  |  | (Theory 3 hour Practice 0 hours Self-study 6 hour/week) |
| **3.** | **Curriculum and Course Type** |  |
|  | 3.1 Name of curriculum | Undergraduate level (International Program) |
|  | 3.2 Type of course | Specific course |
| **4.** | **Course Coordinator and Instructor** |  |
|  | Course coordinator | Dr. Thanthapatra Bunchuay  Department of Chemistry, Faculty of Science |
|  |  | E-mail address: thanthapatra.bun@mahidol.ac.th |
|  |  | Asst. Prof. Dr. Arada Chaiyanurakkul |
|  |  | E-mail address: arada.cha@mahidol.ac.th |
| **5.** | **Semester/ Class Level** |  |
|  | 5.1 Semester | 2nd Semester / 1st year |
|  | 5.2 Number of students | Approximately 150 students |
|  |  |  |
| **6.** | **Pre-requisite** | SCCH 161 General Chemistry |
| **7.** | **Co-requisite** | None |
| **8.** | **Study Site Location** | Online via Zoom  Salaya Campus, Faculty of Science |
| **9.** | **Date of Preparation/Latest Revision of the course Specification** | 10 January 2021 |

**Section 2 Goals and Objectives**

**1. Course Goals**

Organic chemistry encompasses the chemistry of molecules built up primarily of carbon, hydrogen and other elements such as oxygen and nitrogen. Such molecules are abundant in nature and are essential for life, such as being the basis of proteins, genetic material, and enzymes. Additionally, organic compounds are the components of many products we use on a daily basis, such as medicines, cosmetics, soaps/detergents, and fuels. Therefore, these molecules exhibit much structural diversity, giving rise to different levels of reactivity and many different properties. The goal of this course is to provide students with an outline of the general classes of organic molecules, and discuss the nature of each in terms of how they react, how they can be prepared, their chemical/physical properties, and their applications in different areas of science.

**2. Objectives of Course**

* 1. **Course objectives**

Students will be able to

By the end of the course, students should be able to:

1. Identify the general types of organic molecules based on their functional groups
2. Understand the basic rules of stereochemistry and how these are applied in relation to organic molecules
3. Show an understanding of the reactivity of each class of organic compounds discussed
4. Understand the basic rules of nomenclature, and demonstrate this through providing names for each class of organic molecules discussed in the course
5. Gain an appreciation of the chemical/physical properties of different classes of organic compounds, and how these properties are related to functional groups (or stereochemistry)

**2.2 Course-Level Learning Outcomes: (CLO)**

After completion of this course, students are able to

CLO1 Identify organic molecules based on their functional groups and predict their chemical/physical properties

CLO2 Apply the basic rules of stereochemistry to identify differences in chemical structures, and understand the importance of stereochemistry in relation to physical/chemical properties

CLO3 Indicate how different types of organic molecules react, and how the functional groups in these molecules dictate their reactivity

CLO4 Be able to apply nomenclature rules to give correct names for organic compounds

CLO5 Indicate how different classes of organic compounds can be prepared through basic chemical transformations

**Section 3 Course Description and Implementation**

**1. Course description**

The first half of this class covers basic principles in organic chemistry. The class aims to use basic knowledge taught in the general chemistry (SCCH 161) class to understand organic reactions. The focus of this half includes the following topics: functional group identification; stereochemistry; basic principles of organic reactions; preparation and reactions of alkanes, alkenes, alkynes and aromatic compounds. The second half of this course discusses the nature, nomenclature, reactivity and preparation of organic compounds having various functional groups such as alkyl halides, alcohols, ethers, phenols, aldehydes and ketones, carboxylic acids and derivatives, and amines. The chemistry of biologically important molecules such as carbohydrates, proteins, lipids and nucleic acids will also be highlighted.

**2. Number of Hours per Semester**

|  |  |  |
| --- | --- | --- |
| **Lecture**  **(hours)** | **Laboratory**  **(hours)** | **Self-study**  **(hours)** |
| - | 45 hours  (3 hours / week) | 90 hours  (1 hour / week) |

**3. Number of Hours per week for Individual Advice**

- 3 hour/week (during office hours). To arrange counselling hour, student can contact instructor directly.

**Section 4 Development of Students’ Learning Outcomes**

**1. A brief summary of the knowledge or skills expected to develop in students; the course-level expected learning outcomes (CLOs).**

By the end of the course, students who successfully complete the course will be able to

CLO1 Identify organic molecules based on their functional groups and predict their chemical/physical properties

CLO2 Apply the basic rules of stereochemistry to identify differences in chemical structures, and understand the importance of stereochemistry in relation to physical/chemical properties

CLO3 Indicate how different types of organic molecules react, and how the functional groups in these molecules dictate their reactivity

CLO4 Be able to apply nomenclature rules to give correct names for organic compounds

CLO5 Indicate how different classes of organic compounds can be prepared through basic chemical transformations

**2. How to organize learning experiences to develop the knowledge or skills state in number 1 and how to measure the learning outcomes**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course-Level Learning Outcomes (CLOs) | Teaching method | | | | Evaluation method | | | |
| Lecture | Group discussion | Student participation | Highlight real life examples | Written exam | In class quiz | Review questions | Homework exercise |
| CLO1 Identify organic molecules based on their functional groups and predict their chemical/physical properties | ✓ |  | ✓ |  | 🗶 |  | 🗶 | 🗶 |
| CLO2 Apply the basic rules of stereochemistry to identify differences in chemical structures, and understand the importance of stereochemistry in relation to physical/chemical properties | ✓ | ✓ | ✓ | ✓ | 🗶 |  |  | 🗶 |
| CLO3 Indicate how different types of organic molecules react, and how the functional groups in these molecules dictate their reactivity | ✓ |  | ✓ | ✓ | 🗶 |  | 🗶 | 🗶 |
| CLO4 Be able to apply nomenclature rules to give correct names for organic compounds | ✓ |  | ✓ |  | 🗶 | 🗶 |  |  |
| CLO5 Indicate how different classes of organic compounds can be prepared through basic chemical transformations | ✓ | ✓ | ✓ | ✓ | 🗶 | 🗶 | 🗶 | 🗶 |

**Section 5 Lesson Plan and Evaluation**

Students are divided into 2 sections in this academic semester (2nd 2020/2021).

Section 1 EGBI, SCEN, SCIN, ENNM Dr. Thanthapatra Bunchuay (TVB)

Section 2 SCBM Asst. Prof. Dr. Arada Chaiyanurakkul (AC)

**1. Lesson plan**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Week | Topic | Hours | | | Teaching methods/ multimedia | Instructors |
| In-class  activity | Lab | |
| 1. | Introduction to Organic Chemistry  Bonding and Molecular Geometry | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 2. | Isomerism and Chirality I | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 3. | Isomerism and Chirality II | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 4. | Alcohols and Alkyl Halides I: Introduction to Reaction Mechanism | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 5. | Alcohols and Alkyl Halides II: Nucleophilic Substitution | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 6. | Elimination Reaction | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 7. | Addition Reactions of Alkene and Alkyne | **-** | 3 | | Teaching methods  - Group discussion  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 8. | Revision | **-** | 3 | | Teaching methods  - Group discussion  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 9. | Midterm Exam | | | | | |
| 10. | Aromatic and Heterocyclic Compounds I | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 11. | Aromatic and Heterocyclic Compounds I | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 12. | Aldehyde and Ketones | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 13. | Enolate and Enolate Anions | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 13. | Carboxylic Acid Derivatives | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 14. | Revision I | **-** | 3 | | Teaching methods  - Lecture  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 15. | Revision II | **-** | 3 | | Teaching methods  - Group discussion  Teaching materials  - Lecture handouts | Section 1 TVB  Section 2 AC |
| 16. | Final Exam (no written exam) | | | | | |
|  | Total | - | 45 |  | |  |

**2. Evaluation of CLOs**

**2.1 Measurement and Evaluation of Learning Achievement**

**A. Formative assessment**

The aim of formative assessment is to monitor student learning and to improve their learning, so it will not be included with the course score. Methods of formative assessment are as follows:

- Question-Answer in order to check student’s understanding during the laboratory hours.

**B. Summative assessment**

(1) Tool and weight for measurement and evaluation

| **Course- Level Learning Outcomes** | Assessment methods | | | | **Weight (%)** |
| --- | --- | --- | --- | --- | --- |
| Written exam | In class quiz | Review questions | Homework exercise |
| CLO1 Identify organic molecules based on their functional groups and predict their chemical/physical properties | 10 | - | 5 | 5 | 20 |
| CLO2 Apply the basic rules of stereochemistry to identify differences in chemical structures, and understand the importance of stereochemistry in relation to physical/chemical properties | 5 | - | - | 5 | 10 |
| CLO3 Indicate how different types of organic molecules react, and how the functional groups in these molecules dictate their reactivity | 15 | - | 10 | 5 | 30 |
| CLO4 Be able to apply nomenclature rules to give correct names for organic compounds | 5 | 5 | - | - | 10 |
| CLO5 Indicate how different classes of organic compounds can be prepared through basic chemical transformations | 15 | 5 | 5 | 5 | 30 |
| Total | 50 | 10 | 20 | 20 | 100 |

(2) Grading policy

Evaluation of this course is performed according to Mahidol University regulations and Faculty of Science announcement related to bachelor's degree education. The following grade symbols, A, B+, B, C+, C, D+, D, and F, with criteria are given in the below Table:

| Score (percentage) | Symbols |
| --- | --- |
| 80-100 | A |
| 75-79 | B+ |
| 70-74 | B |
| 62-69 | C+ |
| 55-61 | C |
| 50-54 | D+ |
| 45-49 | D |
| 0-44 | F |

To pass this course, student must earn a grade of at least D.

(3) Re-examination (if any)

none

**3. Student Academic Appeals**

Students may submit formal complaint or academic appeal directly to

**International Education and Administration Unit, Division of Salaya Campus**

Room SC1-116, SC1-Building, Faculty of Science (Salaya Campus), Mahidol University

999 Phuttamonthon 4 Road, A. Phuttamonthon, Nakhon Pathom 73170, Thailand

E-mail: scsim@mahidol.ac.th; Phone: +66 2 4419820 ext. 1199

If it considered that a case exists, the matter will be investigated in accordance with the procedures, and the complainant informed of the outcome.

**Section 6 Teaching Resources**

**1. Required texts and main documents**

1. Course handouts (lecture material)
2. Information summary handouts
3. Revision questions

**2. Suggested materials**

1) Solomons, T. W. G., Fryhle C. B., Snyder S. A. Organic Chemistry, Wiley, Singapore, 2017.

2) Wade, L. G. Jr. Organic Chemistry, Pearson Prentice Hall, USA, 2006.

3) Clayden, J.; Greeves, N.; Warren, S.; Wothers, P. Organic Chemistry, Oxford, UK, 2005.

**3. Other resources (if any)**

- none

**Section 7 Evaluation and Improvement of Course Management**

**1. Strategy for Course Effectiveness Evaluation by Students**

There is an on-line evaluation form of course effectiveness. Students can evaluate each instructor and an overall course. Topics of evaluation include contents of the course, course management, teaching and assessment methods, overall satisfaction.

**2. Strategy for Teaching Evaluation**

Skill, knowledge, teaching strategy and learning media are evaluated by students and also co-course instructors.

**3. Teaching improvement**

Instructors get together to review grading results, student’s evaluation, teaching method, student learning, and student performance for self-improvement and course-improvement which will be applied for the next academic year.

**4. Verification of Standards of Learning Outcome for the Course**

The verification processes will be conducted by instructors based on student score, grading system and course evaluation results to review and verify standard LOs of the course.

**5. Revision Process and Improvement Plan for Course Effectiveness**

At the end of each academic year, instructors will collect the course’s evaluation and information from TQF5 to propose to the program administrative committee for consideration to improve the course.

**Appendix**

**Concordance between Specific Course and Program**

**Table 1.** Relationship between course and Program Learning Outcomes (PLOs)

*The PL examples shown in the table correspond to Sub Learning Outcomes (Sub LOs)*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course title  General Chemistry Laboratory | Program Learning Outcomes (PLOs) | | | | | | | |
| PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 |
| Course code  SCCH172 |  |  |  |  |  |  |  |  |

**Remark:** Please specify level of the learning management by following letters (I = Introduced, R = Reinforced, P = Practiced, M = Mastered), and curriculum mapping shown in TQF 2.

**Table 2.** Relationship between Course-Learning Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs)

| Course code  SCCH 169 | Program Learning Outcomes (PLOs) | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 |
| CLO1 Identify organic molecules based on their functional groups and predict their chemical/physical properties | 1.1  1.2 |  |  |  |  |  |  |  |
| CLO2 Apply the basic rules of stereochemistry to identify differences in chemical structures, and understand the importance of stereochemistry in relation to physical/chemical properties | 1.1 |  |  |  |  |  |  |  |
| CLO3 Indicate how different types of organic molecules react, and how the functional groups in these molecules dictate their reactivity | 1.1  1.2  1.3  1.5 |  |  |  |  |  |  |  |
| CLO4 Be able to apply nomenclature rules to give correct names for organic compounds | 1.1 |  |  |  |  |  |  |  |
| CLO5 Indicate how different classes of organic compounds can be prepared through basic chemical transformations | 1.1  1.2  1.3  1.5 |  |  |  |  |  |  |  |

**Remark:** A: Please define concordance between the Course-Level Learning Outcomes (CLOs) and Program Learning Outcomes (PLOs) in sub-PLO level.

B: Please give the information on Program Learning Outcomes (PLOs) specified in Table 3.