

## **Annexe A: New/Revised Course Content in OBTL+ Format**

### **Course Overview**

The sections shown on this interface are based on the templates [UG OBTL+](#) or [PG OBTL+](#)

If you are revising/duplicating an existing course and do not see the pre-filled contents you expect in the subsequent sections e.g. Course Aims, Intended Learning Outcomes etc. please refer to [Data Transformation Status](#) for more information.

|                                                            |                                  |
|------------------------------------------------------------|----------------------------------|
| Expected Implementation in Academic Year                   | AY2022-2023                      |
| Semester/Trimester/Others (specify approx. Start/End date) | Semester 2                       |
| Course Author<br>* Faculty proposing/revising the course   | Shingo Ito                       |
| Course Author Email                                        | sgito@ntu.edu.sg                 |
| Course Title                                               | Organic and Bioorganic Chemistry |
| Course Code                                                | CM2031                           |
| Academic Units                                             | 3                                |
| Contact Hours                                              | 44                               |
| Research Experience Components                             | Not Applicable                   |

## Course Requisites (if applicable)

|                       |                                                                                   |
|-----------------------|-----------------------------------------------------------------------------------|
| Pre-requisites        | CM1031 or CM9001/CM5000 or CY1101 or CM1002 or (BS1013 & BS1033 )or by permission |
| Co-requisites         |                                                                                   |
| Pre-requisite to      |                                                                                   |
| Mutually exclusive to |                                                                                   |
| Replacement course to |                                                                                   |
| Remarks (if any)      |                                                                                   |

## Course Aims

This course aims to introduce a series of fundamental organic reactions with their detailed reaction mechanisms and a concept of retrosynthetic analysis for students to be able to plan chemical synthesis of more complex organic molecules than previously discussed.

## Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

|       |                                                                                                                              |
|-------|------------------------------------------------------------------------------------------------------------------------------|
| ILO 1 | Explain the structure and reactivity of various organic/inorganic reagents that are used for synthesis of organic compounds. |
| ILO 2 | Explain the reasonable reaction mechanism of various organic reactions using curved arrows.                                  |
| ILO 3 | Predict the product structures of the organic reactions given.                                                               |
| ILO 4 | Propose and describe reasonable synthesis plans for complex organic molecules using a concept of retrosynthetic analysis.    |

## Course Content

1. Nucleophilic substitution reactions
2. Introduction to retrosynthesis
3. Aromatic compounds: nucleophilic aromatic substitution reactions
4. Chemistry of alkenes and epoxides
5. Reduction
6. Oxidation
7. Acid/base, nucleophile/electrophile
8. Chemistry of carbonyl compounds
9. Radical chemistry
10. Protecting groups

## Reading and References (if applicable)

Recommended textbook:

Organic Chemistry 8th Ed., John E. McMurry, CENGAGE, ISBN: 978-0-8400-5444-9

Organic Chemistry 2nd Ed., J. Clayden, N. Greeves, S. Warren, Oxford, ISBN: 978-0-19-927029-3

## Planned Schedule

| Week or Session | Topics or Themes                                                                                                               | ILO | Readings | Delivery Mode | Activities          |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------|-----|----------|---------------|---------------------|
| 1               | Nucleophilic substitution reactions                                                                                            | 1-3 |          |               | Lecture             |
| 2               | Introduction to retrosynthesis                                                                                                 | 4   |          |               | Lecture             |
| 3               | Aromatic compounds: nucleophilic aromatic substitution reactions                                                               | 1-3 |          |               | Lecture             |
| 4               | Chemistry of alkenes and epoxides                                                                                              | 1-3 |          |               | Lecture             |
| 5               | Reduction, and Midterm Test 1                                                                                                  | 1-4 |          |               | Lecture, assessment |
| 6               | Reduction, Oxidation                                                                                                           | 1-3 |          |               | Lecture             |
| 7               | Oxidation                                                                                                                      | 1-3 |          |               |                     |
| 8               | Acid/base, nucleophile/electrophile                                                                                            | 1-3 |          |               | Lecture             |
| 9               | Chemistry of carbonyl compounds: reactivity of carbonyl compounds, chemistry of enol/enolates<br>Group presentation (tutorial) | 1-3 |          |               | Lecture             |

| Week<br>or<br>Session | Topics or Themes                                                                        | ILO | Readings | Delivery Mode | Activities          |
|-----------------------|-----------------------------------------------------------------------------------------|-----|----------|---------------|---------------------|
| 10                    | Chemistry of carbonyl compounds: Michael addition<br>Group presentation (tutorial)      | 1-3 |          |               | Lecture             |
| 11                    | Chemistry of carbonyl compounds: Miscellaneous (but still important)<br>Carbonyl Topics | 1-3 |          |               | Lecture             |
| 12                    | Radical Chemistry, Protecting groups, and Midterm Test 2                                | 1-4 |          |               | Lecture, assessment |
| 13                    | Review                                                                                  | 1-4 |          |               | Lecture             |

## Learning and Teaching Approach

| Approach | How does this approach support you in achieving the learning outcomes?                          |
|----------|-------------------------------------------------------------------------------------------------|
| Lectures | Face-to-face lectures will be employed to enable you to interact directly with the instructors. |

# Assessment Structure

Assessment Components (includes both continuous and summative assessment)

| No. | Component                                                    | ILO   | Related PLO or Accreditation          | Weightage | Team/Individual | Rubrics  | Level of Understanding |
|-----|--------------------------------------------------------------|-------|---------------------------------------|-----------|-----------------|----------|------------------------|
| 1   | Continuous Assessment (CA): Others(CA1 - Midterm Test 1)     | 1-4   | Competence, Creativity                | 20        | Individual      | Analytic | Relational             |
| 2   | Continuous Assessment (CA): Others(CA2 - Midterm Test 2)     | 1-4   | Competence, Creativity                | 20        | Individual      | Analytic | Relational             |
| 3   | Continuous Assessment (CA): Presentation(Group Presentation) | 1,2,4 | Competence, Creativity, Communication | 10        | Team            | Holistic | Multistructural        |
| 4   | Summative Assessment (EXAM): Final exam(Examination)         | 1-4   | Competence, Creativity                | 50        | Individual      | Analytic | Relational             |

Description of Assessment Components (if applicable)

## Formative Feedback

You will be given feedback in four ways:

By working through examples provided during lectures

By response to postings on the course discussion board

By attending consultation hours and tutorials

By studying the comments provided by the instructor after the grading of the midterms

By receiving comments to your Group Presentation from lectures and peers

# NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

| Attributes/Competency | Level        |
|-----------------------|--------------|
| Collaboration         | Basic        |
| Communication         | Basic        |
| Creative Thinking     | Intermediate |
| Curiosity             | Intermediate |
| Problem Solving       | Intermediate |

# Course Policy

## Policy (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. On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

## Policy (General)

You are expected to read the lecture materials prior to the lecture session in question. This will help you to learn much more efficiently as you will already have an impression on the topics to be covered. You should also read the textbook and to attempt the exercises provided in the problem sets. It is recommended to attend all seminar classes punctually and take all scheduled assignments and tests by due dates. You are expected to participate in all discussions and activities, especially in Group Presentation.

## Policy (Absenteeism)

If you miss a lecture, you are expected to make up for the lost learning activities. If you miss the mid-term test with approval, you will either be offered a make-up test or grading based upon the final exam score.

## Policy (Others, if applicable)

### Diversity and Inclusion Policy

Integrating a diverse set of experiences is important for a more comprehensive understanding of science and engineering.

It is our goal to create an inclusive and collaborative learning environment that supports a diversity of perspectives and learning experiences. That honours your identities; including ethnicity, gender, socioeconomic status, sexual orientation, religion or ability.

To help accomplish this:

- If you are neuroatypical or neurodiverse, have dyslexia or ADHD (for example), or have a social anxiety disorder or social phobia;
- If you feel your performance in the course is being impacted by your experiences outside of class;
- If something was said in the course (by anyone, including instructor/supervisor) that made you uncomfortable.

Please e-mail to your Associate Chair (Students & Continuing Education) at [ac-cceb-stud@ntu.edu.sg](mailto:ac-cceb-stud@ntu.edu.sg) about how

we can help facilitate your learning experience.

As a participant in course discussions you should also strive to honour the diversity of your classmates. You can do this by; using preferred pronouns and names; being respectful of others opinions and actively making sure all voices are being heard; and refraining from the use of derogatory or demeaning speech or actions.

All members of the course are expected to strictly adhere to the student code of conduct ( <https://www.ntu.edu.sg/life-at-ntu/student-life/student-conduct> ) . If you witness something that goes against this or have any other concerns, please speak to your instructors or a faculty member.

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Last Updated By: Pullarkat Appukuttan Sumod (Dr)