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

Course Overview

Expected Implementation in Academic Year	AY2025-2026
Semester/Trimester/Others (specify approx. Start/End date)	Semester 2
Course Author * Faculty proposing/revising the course	Mihaiela Stuparu
Course Author Email	mstuparu@ntu.edu.sg
Course Title	CHEMISTRY & BIOLOGICAL CHEMISTRY LABORATORY 3
Course Code	CM3061
Academic Units	3
Contact Hours	90
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	CM2061 or by permission
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This core Chemistry course aims to develop your skills and understanding of fundamentals of synthetic chemistry concepts that are essential for future career chemical industries. This course is also great preparation for a PhD and a career in chemistry research.

On completing this course, you will be able to carry out laboratory operations in synthetic chemistry associated with the synthesis of organic and inorganic compounds.
These may include reactions requiring heating, inert atmosphere, use of bio-reagents and handling reactive intermediates.
You will be able to work in a safe and responsible fashion, showing consideration for others in the laboratory.
You will be able to evaluate the risks inherent in the procedures and formulate appropriate precautions.
You will be able to purify the products of the reactions using techniques that may include recrystallisation, column chromatography and distillation under reduced pressure.
You will be able to obtain and interpret characterisation data that may include 1H NMR spectroscopy, infra-red spectroscopy, polarimetry and magnetic susceptibility measurement.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Evaluate risks in a synthetic procedure and devise appropriate precautions
ILO 2	Carry out the procedures contained in the course in order to synthesise both organic and inorganic compounds and understand the circumstances in which their use is appropriate
ILO 3	Carry out the purification procedures contained in the course and understand the circumstances in which their use is appropriate
ILO 4	Explain the reasons behind the use of the procedures and be able to identify circumstances when they are used improperly
ILO 5	Characterise synthesised compounds by the methods contained in the course
ILO 6	Suggest the appropriate technique or techniques to characterise a synthetic compound
ILO 7	Interpret the data arising from the characterisation techniques contained in the course
ILO 8	Keep an appropriate lab notebook reporting and tracking all the experimental steps
ILO 9	Communicate the results of scientific work in written and electronic formats to both scientists and the public at large.

Course Content

- The synthesis, qualitative and quantitative analysis of organic and inorganic compounds.
- Techniques for the synthesis of both organic and inorganic compounds.
- Methods of purification of organic and inorganic reaction products, preparation.
- Systematic characterisation of synthetic compounds by spectroscopic and other methods, and interpretation of the data obtained.
- Evaluation of laboratory risks.
- The content builds upon techniques and concepts from the year 1-3 courses.

Reading and References (if applicable)

The lab manual is provided.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Online pre-lab activities	1			Reading and quizzes
2	Laboratory	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing
3	Laboratory	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing
4	Laboratory	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing
5	Laboratory	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
6	Laboratory	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing
7	Laboratory	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing
8	Laboratory	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing
9	Laboratory	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing
10	Laboratory	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
11	Laboratory	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing
12	Laboratory	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing
13	Make-up lab when appropriate	1-8			Reading, online interactive content laboratory experiments, lab notebook recoding, and report writing

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Laboratory experience supported by online methods	This is a practical course for you to gain hands on experience. You will carry out experiments yourself to gain experience in handling equipment, chemicals and instruments in a safe, efficient and capable way. Your learning will be supported by pre-lab content, so that you will be prepared before starting practical work.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Description of Assessment Component	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Others()	1-9	Competence, Communication, Civic mindedness	20	Proformas and Lab Notebook	Individual	Analytic	Multistructural
2	Continuous Assessment (CA): Report/Case study()	1-9	Competence, Communication, Civic mindedness	30	Paper Style Report	Individual and Team	Holistic	Multistructural
3	Summative Assessment (EXAM): Final exam()	1-7, 9	Competence, Creativity, Communication	50		Individual	Analytic	Multistructural

Description of Assessment Components (if applicable)

Formative Feedback

You will be given feedback in two ways:

1. Through marking of the proformas, lab notebooks, and paper reports.

2. By the teaching assistants and faculty members during the laboratory session.

NTU Graduate Attributes/Competency Mapping

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

Attributes/Competency	Level
Adaptability	Advanced
Learning Agility	Advanced
Self-Management	Advanced
Project Management	Advanced
Critical Thinking	Advanced

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)

TO COMPLETE THE LAB COURSE, ALL THE EXPERIMENTS HAVE TO BE COMPLETED.

You are expected to work safely and efficiently in the laboratory with consideration for other students and the various university staff who support your laboratory work. This includes leaving a clean working space at the end of the day.

You will submit well prepared work in good time. In the lab, you will plan the use of your time carefully so that you complete all laboratory operations in good time.

There will be PRE-LAB ASSESSMENT for all experiments you will be doing that day. THE TA RESERVES THE RIGHT TO DISMISS YOU FROM THE LAB IF YOU ARE NOT PREPARED FOR EXPERIMENT.

Marks can be deducted during the lab session for improper experiment handling.

GAI is becoming a tool in the workplace and it is important that you understand how it can be effectively used. You are permitted to use GAI in completion of your lab reports but with some restrictions. However, the final draft MUST be your own work and you must take full responsibility for it. You MUST complete and submit the GAI declaration on each pro-forma/report

Policy (Absenteeism)

Students who miss a laboratory session with a valid reason only will be permitted to join the make up session.

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 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: Natasha Bhatia (Dr)