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 1
Course Author * Faculty proposing/revising the course	Melanie Weingarten
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Course Title	FOOD CHEMISTRY & NUTRITION
Course Code	CM5101
Academic Units	3
Contact Hours	53
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	(CM1031 and CM1051) or (CM1051 and CM9001/CM5000) or (BS1003 and CM1051) or (BS1005 and CM1031) or (BS1003 and BS1005) or CM1002 or CY1101 or by permission
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This course aims to introduce the basic knowledge on the chemical composition of food ingredients and the chemical transformation of the three major components: 1) Fat and oil food products; (2) Proteins in food and (3) Carbohydrates in food. In addition, this course will introduce the basic science related to (4) Water content in food; (5) Food browning; (6) Natural food colorants and (7) Special topics related to recent food technologies. This course provides the basic laboratory skills related to food chemistry that are essential for food chemists working in industry and academia. Concepts and principles of food science and technology that are taught in lectures are closely link to the expertise of your daily life. In addition, problem-based learning will be utilized as an instructional strategy of active learning. Furthermore, you will be trained in the safe handling of chemicals and instruments, and in the assessment of risks associated with experimental procedures. We plan to do an excursion to the Food Tech Innovation Center, Singapore's 4000 sqm Food Hub in Biopolis.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Identify the major components of oil and oil products; explain the modification and deterioration of fats; consider other nutritional factors and deduce the correlations between lipids, vegetable oils and triglycerides.
ILO 2	Identify essential amino acids, limiting amino acids and protein-rich foods; explain the key steps in tofu and cheese production; deduce examples of proteins in food.
ILO 3	Identify mono-, di- and polysaccharides; deduce examples of carbohydrates in food.
ILO 4	Evaluate the chemical changes in food that occur during processing and storages.
ILO 5	Explain how various food components can be valorized and play additional roles in Singapore's Food Story.
ILO 6	Identify potential key challenges in Singapore's efforts towards agrifood, future food and sustainable food production.
ILO 7	Explain on the operation techniques commonly used in isolation and chemical analysis of food ingredients.
ILO 8	Work independently and, where required, in collaboration with other students to safely perform experiments from the laboratory manual.
ILO 9	Follow detailed instructions in the laboratory manual to obtain desired experimental results.
ILO 10	Operate state-of-the-art scientific laboratory equipment that is often used in industry.
ILO 11	Analyze the data from your experiments to fit a theoretical model.
ILO 12	Explain and discuss your experimental results using scientific literature.
ILO 13	Work independently to prepare a detailed written report of your experimental findings.
ILO 14	Keep an accurate laboratory notebook of your experimental results in a form that is understandable by a third party.
ILO 15	Assess the potential risks of an experimental procedure before the procedure is carried out.
ILO 16	Review the experimental procedures after the experiments to see if there are more potential risks and propose how these can be alleviated.

ILO 17	Connect the experiments conducted with the relevant theories.

Course Content

Lectures: 1) Introduction to food chemistry and nutrition 2) Water content in food 3) Fat and Oil Food Products 4) Carbohydrates in Food 5) Proteins in Food 6) Food Browning 7) Natural Food Colorants 8) Special Topics (related to recent technologies in food and nutrition)

Experiments: 8) Determination of Moisture Content in Food, 9) Fehling's Test for Reducing and Non-reducing Sugars, 10) Non-Enzymatic Browning, The Maillard Reaction, Browning in Reconstituted Milk, 11) Enzymatic Discolouration of Fruit and Vegetable and Blanching Effectiveness, 12) Ascorbic Acid in Cabbage

Reading and References (if applicable)

Food Science & Nutrition Author: Sunetra Roday Publisher: Oxford Higher Education ISBN 978-0-19-568911-2
Essentials of Food Science 3rd Author: Elizabeth W. Christian; PH.D. Vaclavik Vickie A Publisher: Springer ISBN 978-0-387-69939-4

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Course Introduction; Introduction to food chemistry and nutrition; Water Content in Food.	1-17		In-person	Lecture
2	Fat and Oil Food Products Lab: Determination of Moisture Content in Food - Group A	1, 7-17		In-person	Lecture Laboratory experiment; Proforma provided
3	Fat and Oil Food Products Lab: Determination of Moisture Content in Food - Group B	1-, 7-17		In-person	Lecture Laboratory experiment; Proforma provided
4	Proteins in Food Lab: Fehling's Test for Reducing and Non-reducing Sugars - Group A	2, 7-17		In-person	Lecture Laboratory experiment; Proforma provided
5	Carbohydrates in Food Lab: Fehling's Test for Reducing and Non-reducing Sugars - Group B	2, 7-17		In-person	Lecture Laboratory experiment; Proforma provided

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
6	Carbohydrates in Food Lab: Non-Enzymatic Browning, The Maillard Reaction, Browning in Reconstituted Milk – Group A	3, 7-17		In-person	Lecture Laboratory experiment; Proforma provided
7	Continuous Assessment 1 Lab: Non-Enzymatic Browning, The Maillard Reaction, Browning in Reconstituted Milk – Group B	1-3		In-person	Assessment
8	Continual Assessment 1 Lab: Enzymatic Discoloration and Blanching Effectiveness Group A	4, 7-17		In-person	Lecture Laboratory experiment; Proforma provided
9	Visit of Food Tech Innovation Center, Biopolis Lab: Enzymatic Discoloration and Blanching Effectiveness Group B	4, 7-17		In-person	Lecture Laboratory experiment; Proforma provided
10	Continuous Assessment 2 Lab: Ascorbic Acid in Cabbage Group A	5-6, 7-17		In-person	Assessment Laboratory experiment; Proforma provided

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
11	Food Browning Lab: Ascorbic Acid in Cabbage Group B	1-6		In-person	Lecture
12	Review on course contents	1-6		In-person	Lecture
13	Natural Food Colorants	1-6, 1-17		In-person	Lecture

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lectures	Present the key ideas and important information which will be used to solve different types of problems.
Oral Presentation	Group presentation of a research article on agrifood, future foods or sustainable food production, with an emphasis on efforts to realize Singapore's "30-by-30" goals. The presentation ends with a Q&A session, and the Course Instructor will evaluate the students' performances and ask related questions to probe students understanding on their selected topic.
Lab experiments	You will receive hands-on experience with necessary equipment during experiment sessions. The experiments will be conducted in a mixture of individually as well as part of a team. Proforma for the experiments are expected to be done individually so that you have complete knowledge of all theoretical aspects of the experiments. These experiments develop proficiency in problem solving skills and reinforce concepts that are covered in the lectures

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): Presentation(CA-1 - Presentation)	5-6	Competence, Communication	10		Individual	Holistic	Multistructural
2	Continuous Assessment (CA): Test/Quiz(CA-2 Mid Term Test)	1-3	Competence, Communication	10		Individual	Analytic	Multistructural
3	Continuous Assessment (CA): Others(Laboratory Experiments: Certain experiments maybe performed as a team (15%) but report must be prepared individually (15%).)	1-17	Competence, Communication, Creativity	30		Individual	Analytic	Multistructural
4	Summative Assessment (EXAM): Final exam(Final Examination)	1-17	Communication, Competence	50		Individual	Analytic	Multistructural

Description of Assessment Components (if applicable)

Formative Feedback

You will be given feedback in the following ways:

1. Through the marking of the midterm test and subsequent post-consultation.

2. Feedback will be provided to the students following the final exam.

3. Through consultation with the faculty member for the coursework section.

4. Through the graded lab reports.

5. Through consultation with the faculty member who designed the lab experiment.

NTU Graduate Attributes/Competency Mapping

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

Attributes/Competency	Level
Care for Environment	Basic
Communication	Intermediate
Creative Thinking	Intermediate
Curiosity	Intermediate
Learning Agility	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)

Good academic work depends on honesty and ethical behavior. 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. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Policy (Absenteeism)

Absence from assessments/laboratoty without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. LOA must be submitted to the school for approval. If you miss a lecture onus is on you to watch the recorded lecture and clarify any doubt you may have with the instructor.

Policy (Others, if applicable)

1) Laboratory safety and punctuality

The instructors and chief TA of this module take a very serious stance on laboratory safety, punctuality, and academic integrity.

Students who flaunt safety rules spelt out in the CM5101 laboratory manual will be barred from entering the laboratory.

The laboratory sessions begin promptly at 2.30pm. A significant number of marks (up to 50%) will be deducted for students who are late for any of the laboratory sessions without a valid excuse. Students who arrive 20 minutes after the start of the lab session will not be allowed to enter the lab and will receive a grade of zero for that day's

experiment.

Hand-in your lab reports/pro-formas in time.

2) 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:hi Ai HUa
- If something was said in the course (by anyone, including instructor/supervisor) that made you uncomfortable.

Please e-mail our 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, 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 has any other concerns, please speak to your instructors or a faculty member.

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