

<b>Academic Year</b>	20/21	<b>Semester</b>	2
<b>Course Coordinator</b>	Li Tianhu		
<b>Course Code</b>	CM9103		
<b>Course Title</b>	Food Processing and Preservation		
<b>Pre-requisites</b>	CM9101 and CM9102 (or by permission)		
<b>No of AUs</b>	3 AUs		
<b>Contact Hours</b>	Lectures: 39 hours		
<b>Proposal Date</b>	13 March 2020		

### Course Aims

This course aims to introduce the knowledge on 1) food quality, 2) food preservatives, 3) food additives, 4) food preservation methods as well as 5) food processing. Concepts and principles of food science and technology that are taught in lectures are closely link to the expertise of students' daily life. In addition, problem-based learning will be utilized as an instructional strategy of active learning.

### Intended Learning Outcomes (ILO)

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

1. Identify and discuss the scientific principles that underlines food preservation and food processing
2. Utilize these principles to evaluate the food preservation methods and food processing procedures currently used in food industry

### Course Content

#### Lectures

1. Introduction to food processing and preservation
  - Evaluation of Food Quality
  - Food Spoilage
  - Food Preservation
2. Food preservatives
  - Basic Information on Food preservatives
  - Examples of Antimicrobial food preservatives (microorganisms)
  - Examples of Antioxidants (chemical reactions)
  - Examples of Chelating agents (chemical reactions and physical interaction)
3. Food preservation methods
  - Low temperature methods
  - High temperature methods
  - Drying methods
  - Vacuum packing
  - Modified atmosphere
  - Variation of pH
  - Pulsed electric field processing

- Food irradiation
- Pascalization

4. Food additives

- Emulsifiers, foaming agents and antifoaming agents
- Gelling agents
- Thickening agents
- Firming agents
- Leavening agents
- Acidity regulators
- Humectants, anti-caking agents, glazing agents and stabilizers
- Sweeteners
- Colorants

5. Food processing

6. Nutrition Labeling

**Assessment (includes both continuous and summative assessment)**

This is a graded course. There is a checklist of ALL the components of the assessments, including both individual and team assessments.

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/ Individual	Assessment rubrics
Homework	All	Competence	10%	Individual	See Appendix 1
Midterm Assessments	All	Competence, communication	30%	Individual	Point-based marking (not rubrics based)
Final examination	All	Communication, Competence	60%	Individual	See Appendix 1
Total			100%		

**Formative feedback**

You will be given feedback in the following ways:

1. Through marking and discussion of homework
2. Through the marking of the midterm assessments
3. Feedback will be provided to the students following the final exam
4. Through consultation with the faculty member for the coursework section

**Learning and Teaching approach**

Approach	How does this approach support students in achieving the learning outcomes?

Lectures	Present the key ideas and important information, which will be used to solve different types of problems.
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### Reading and References

1. Food Processing and Preservation  
Author: B. Sivasankar  
Publisher: PHI Learning Private Limited  
ISBN 978-81-203-2086-4
2. Essentials of Food Science 3rd  
Author: Elizabeth W. Christian; PH.D. Vaclavik Vickie A  
Publisher: Springer  
ISBN 978-0-387-69939-4

### Course Policies and Student Responsibilities

#### *Absence Due to Medical or Other Reasons*

If you are sick and unable to attend your class, you have to:

1. Send an email to the instructor regarding the absence and the requests for a replacement class if necessary.
2. Submit the original Medical Certificate<sup>||</sup> to administrator.
3. Attend the assigned replacement class (*subject to availability*).

<sup>||</sup> The medical certificate mentioned above should be issued in Singapore by a medical practitioner registered with the Singapore Medical Association.

### 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. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

### Course Instructors

Instructor	Office Location	Phone	Email
Li Tianhu	SPMS-CBC-04-21	65137364	thli@ntu.edu.sg

### Planned Weekly Schedule

<b>Week</b>	<b>Topic</b>	<b>Course LO</b>	<b>Readings/ Activities</b>
1	Introduction to food processing and preservation <ul style="list-style-type: none"> <li>• Evaluation of Food Quality</li> <li>• Food Spoilage</li> <li>• Food Preservation</li> </ul>	1, 2	Lecture
2	Food preservatives <ul style="list-style-type: none"> <li>• Basic Information on Food preservatives</li> <li>• Examples of Antimicrobial food preservatives (microorganisms)</li> </ul>	1, 2	Lecture
3	Food preservatives <ul style="list-style-type: none"> <li>• Examples of Antioxidants (chemical reactions)</li> <li>• Examples of Chelating agents (chemical reactions and physical interaction)</li> </ul>	1, 2	Lecture
4	Food preservation methods <ul style="list-style-type: none"> <li>• Low temperature methods</li> <li>• High temperature methods</li> <li>• Drying methods</li> </ul>	1, 2	Lecture
5	Food preservation methods <ul style="list-style-type: none"> <li>• Vacuum packing</li> <li>• Modified atmosphere</li> <li>• Variation of pH</li> </ul>	1, 2	Lecture
6	Food preservation methods <ul style="list-style-type: none"> <li>• Pulsed electric field processing</li> <li>• Food irradiation</li> <li>• Pascalization</li> </ul>	1, 2	Lecture
7	Midterm Assessment	-	Assessment
8	Food additives <ul style="list-style-type: none"> <li>• Emulsifiers, foaming agents and antifoaming agents</li> <li>• Gelling agents</li> <li>• Thickening agents</li> <li>• Firming agents</li> <li>• Leavening agents</li> <li>• Acidity regulators</li> <li>• Humectants, anti-caking agents, glazing agents and stabilizers</li> <li>• Sweeteners</li> <li>• Colorants</li> </ul>	1, 2	Lecture
9	Food additives <ul style="list-style-type: none"> <li>• Leavening agents</li> </ul>	1, 2	Lecture

	<ul style="list-style-type: none"> <li>• Acidity regulators</li> <li>• Humectants, anti-caking agents, glazing agents and stabilizers</li> <li>• Sweeteners</li> <li>• Colorants</li> </ul>		
10	Midterm Assessment	-	Assesment
11	Food processing	1, 2	Lecture
12	Nutrition Labeling	1, 2	Consultation
13	Review on course contents	1, 2	Consultation

Appendix 1:

**Grading Criteria for Homework**

<b>Performance Level</b>	<b>Criteria</b>
Fail standard	Answers to the questions are mostly incorrect.
Pass standard	Answers to the questions are mostly correct.
High standard	Answers to the questions are almost always correct.

## Grading Criteria for Final Examination – Short Answer Questions

Performance Level	Criteria
Fail standard	Answers demonstrate the ability to repeat factual knowledge but not to apply it outside of the lecture context. Answers do not have a strong logical underpinning or maybe attempts to answer both ways at the same time.
Pass standard	Answers to the standard level question are correct and show the ability to apply concepts from the course, but a high level of critical thinking is absent. Answers are reasonably logical, but with gaps.
High standard	Answers to all questions show a high and consistent level of critical analysis of the information presented and creative solutions to the problems. Answers are highly logical and demonstrate strong reasoning. Answers are concise and to the point.

### CBC Programme Learning Outcome

The Division of Chemistry and Biological Chemistry (CBC) offers an undergraduate degree major in Chemistry that satisfies the American Chemical Society (ACS) curricular guidelines and equips students with knowledge relevant to the industry. Graduates of the Division of Chemistry and Biological Chemistry should have the following key attributes:

#### **1. Competence**

Graduates should be well-versed in the foundational and advanced concepts of chemical science, be able to evaluate chemistry-related information critically and independently, and be able to use complex reasoning to solve emergent chemical problems.

#### **2. Creativity**

Graduates should be able to synthesize and integrate multiple ideas across the curriculum, and propose innovative solutions to emergent chemistry-related problems based on their training in chemistry.

### **3. Communication**

Graduates should be able to demonstrate clarity of thought, independent thinking, and sound scientific analysis and reasoning through written and oral reports to audiences with varying technical backgrounds. They should also be able to effectively engage other professional chemists in collaborative endeavours.

### **4. Character**

Graduates should be able to act in responsible ways and uphold the high ethical standards that the society expects of professional chemists.

### **5. Civic-mindedness**

Graduates should be aware of the impact of chemistry on society, and how chemistry can be applied to benefit mankind. They should also be aware of and uphold the best chemical safety practices.