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	2024/2025
Semester/Trimester/Others (specify approx. Start/End date)	Semester 2
Course Author * Faculty proposing/revising the course	lin chen
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Course Title	Food Standard - Food Safety and Risk Assessment
Course Code	CH5220
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	NA
Co-requisites	NA
Pre-requisite to	NA
Mutually exclusive to	NA
Replacement course to	NA
Remarks (if any)	

Course Aims

This course will give an introduction into the principles behind food safety hazard and risk assessment as well as the different existing national and international systems for food safety, food control and food standard setting. It will provide background on the current approaches and systems in place and stimulate discussion on how these need to evolve to keep pace with new and novel food innovations whilst meeting the needs of industry and regulatory safety assessors. The increasing globalisation of the food trade, changing consumption patterns, the intensification of agriculture, increasing travel and tourism, and new types of production and manufacturing systems are just some of the trends that are having a serious impact on food production and food safety in many countries. At the same time, several existing and new food safety hazards are of increasing concern and new pathogens are frequently emerging and being transferred from animal to human populations, primarily through food. These new challenges need to be addressed are best dealt with in new safety and regulatory frameworks and approaches; these frameworks and their background will be explained and described.

Major theoretical topics of the course include:

New/novel ingredient/food assessment
Food hazard – chemical and microbiological hazards; food allergy
Food toxicity – food additives
Risk management – GMP and HACCP for food hygiene and safety regulation
Risk assessment, the science part of risk analysis

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Analyze food production chains and new/novel; products and processes. Understand the background for hazards and risks in food.
ILO 2	Use science-based risk principles (e.g. microbiology & toxicology) to understand food safety problems and solutions.
ILO 3	Design solutions utilizing major principles guiding food control systems and following safety and regulatory frameworks. Understand the principles of “safety by design” and how it can be implemented into food innovation.
ILO 4	Link food standards from regulatory authority and industry to foodborne disease prevention and safe consumption.
ILO 5	Explain scientific background and select solutions based on the set-up of the food control system in Singapore, regulatory frameworks (including Singapore Novel Food Framework and Singapore Food Act) and future food (SFS 30 by 30) goals.

Course Content

Introduction to food safety in the context of food systems and standards (as well as their evolution). Description of the risk concept (and the key underlying principles and core areas of toxicology, exposure assessment and risk communication) as well as international food policy based on the risk analysis framework. Understanding the application of food safety principles to new product innovation as well as new product production, including the application of HACCP (Hazard Analysis Critical Control Points) principles. Discussion around the need for integrated, holistic risk assessment strategies.

The increasing globalisation of the food trade, changing consumption patterns, the intensification of agriculture, increasing travel and tourism, and new types of production and manufacturing systems are just some of the trends that are having a serious impact on food production and food safety in many countries. At the same time, a number of existing and new food safety hazards are of increasing concern and new pathogens are frequently emerging and being transferred from animal to human populations, primarily through food. These new challenges are best dealt with in new regulatory frameworks; these frameworks and their background will be explained and described.

A large number of Engineers will be exposed to the use of regulatory systems based on scientific and engineering knowledge. This means that Engineers in a number of areas will be involved in regulatory developments as well as regulatory decisions. It is thus relevant for engineers to understand the set-up of regulatory systems, such as food safety regulatory systems – both in under to understand the risk assessment background as well as the risk management decisions relevant to mitigate such risks. The food safety regulatory system is relevant in international, regional and national setting and the understanding of such systems will enable a more coherent knowledge base not only related to food production but also to other related areas, including water technology, drug production, chemical engineering etc.

Reading and References (if applicable)

Reference reading (articles, websites etc) will be linked to key topics. These will provide background information on the topic and could be used to draw questions for the exam.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Course outline & Novel food	1, 2, 5	Slides provided	In-person	Lecture delivery
2	Introduction to Food Safety	1, 2, 5	Slides provided	In-person	Lecture delivery
3	Food Microbiology I	1, 2, 3, 4	Slides provided	In-person	Lecture delivery
4	Food Microbiology II	1, 2, 3, 4	Slides provided	In-person	Lecture delivery
5	Food Hypersensitivity	1, 2, 3, 4	Slides provided	In-person	Lecture delivery
6	Food Allergy	1, 2, 3, 4, 5	Slides provided	In-person	Lecture delivery
7	Food Toxicology I	1, 2, 3, 4, 5	Slides provided	In-person	Lecture delivery
8	Food Toxicology II	1, 2, 3, 4, 5	Slides provided	In-person	Lecture delivery
9	Food Additives	1, 2, 3, 4, 5	Slides provided	In-person	Lecture delivery
10	Genotoxic Carcinogens & Thresholds	1, 2, 3, 4, 5	Slides provided	In-person	Lecture delivery
11	Risk assessment	1, 2, 5	Slides provided	In-person	Lecture delivery
12	Risk management: GMP and HACCP	1, 2, 5	Slides provided	In-person	Lecture delivery
13	Risk Communication	1, 2, 5	Slides provided	In-person	Lecture delivery

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Interactive Lecture/Tutorial format	Demonstrate how to carry out a procedure such as working through a problem, use incomplete handouts which enabling students participating in class.

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): Presentation(Food safety topics with peer evaluation)	1, 2, 3, 4, 5	a, d, e, f, h, i, j, k	30	Team	Holistic	Not Applicable
2	Summative Assessment (EXAM): Test/Quiz(Closed book midterm exam)	1, 2, 3, 4, 5	a, b, c, d, f, h	20	Individual	Analytic	Not Applicable
3	Summative Assessment (EXAM): Final exam(Closed book)	1, 2, 3, 4, 5	a, b, c, d, f, g, h, i, k	50	Individual	Analytic	Not Applicable

Description of Assessment Components (if applicable)

The Continuous Assessment (CA) component consists of a group presentation on food safety topics, designed to evaluate students' understanding, communication skills, and teamwork. Each presentation is assessed based on five criteria: delivery, content/organization, enthusiasm/audience awareness, conclusion, Q&A. Each presentation is allocated a maximum score of 30 points.

Peer evaluation ensures accountability and fairness by requiring group members to rate each other's contributions confidentially. Ratings range from 0 to 10, and the average score determines the percentage of the group grade each member receives. For example, an average score of 9 or higher grants 100% of the group grade, while lower scores scale down the grade proportionally. This system encourages active participation and fair work distribution.

This assessment approach develops critical skills such as teamwork, public speaking, and analytical thinking, while promoting an in-depth exploration of food safety challenges.

Formative Feedback

You will receive feedback on your Continuous Assessment (CA) and Midterm Exam through in-class discussions during lecture sessions.

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
Creative Thinking	Intermediate
Curiosity	Basic
Systems Thinking	Basic

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 complete all scheduled assignments and tests by due dates. You are expected to take responsibility to follow up with course notes, assignments and course related announcements. You are expected to participate in all tutorial discussions and activities.

Policy (Absenteeism)

Continuous assessments make up a significant portion of your course grade. Absence from continuous assessments without officially approved leave will result in no marks and affect your overall course grade.

Policy (Others, if applicable)

Last Updated Date: 21-11-2024 15:07:13

Last Updated By: Dr Lin CHEN (Asst Prof)

Appendix 1

Assessment Criteria for Group Presentation with Peer Evaluation

Criteria	**Scores (30 points)**	**Exemplary**	**Proficient**	**Apprentice**	**Novice**
Delivery	4	• Holds attention of entire audience with the use of direct eye contact, seldom looking at notes	• Consistent use of direct eye contact with audience, but still returns to notes	• Displays minimal eye contact with audience, while reading mostly from the notes	• Holds no eye contact with audience, as entire report is read from notes
Content/ Organization	12	• Demonstrates full Knowledge with elaboration • Provides clear learning objective and contents	• Demonstrates full Knowledge without elaboration • Has somewhat clear objective and contents	• Demonstrates lack of knowledge • Attempts to define learning objective and contents	• Does not have grasp of information • Does not have clear learning objective and contents
Enthusiasm/ Audience Awareness	3	• Demonstrates strong enthusiasm about topic during entire presentation • Significantly increases audience understanding and knowledge of topic;	• Shows some enthusiastic feelings about topic • Raises understanding and awareness of most points	• Shows little or mixed feelings about the topic being presented • Raises audience understanding and knowledge of some points	• Shows no interest in topic presented • Fails to increase audience understanding of knowledge of topic
Conclusion	3	• Presentation highlights key ideas and concludes with a strong statement	• The presentation was summed up clearly	• An attempt was made to conclude the presentation	• No attempt was made to conclude the presentation
Q&A	6	• Provide clear answers with explanations and elaboration	• Provide clear answers without elaboration	• Is able to answer only rudimentary questions	• cannot answer questions
Length of Presentation	2	Within three minutes of allotted time +/-.	Within five minutes of allotted time +/-.	Within eight minutes of allotted time +/-	Ten or more minutes of allotted time +/-

Assessment Criteria for Peer Evaluation:
If you are working as a group with other students for the homework submission, then, each student in the group is required to rate the contribution of other group members. All evaluations are held in confidence so no student will know how other group members rate his/her contribution. You are to evaluate other group members fairly and objectively, bearing in mind the implications for the other members' grades (explained below). It is absolutely essential for you to submit your peer evaluation form to get marks. To factor peer evaluations into the marks for your homework assignment, the following computation will be used:

- If, on average, a student receives a rating of 9 or more, that student receives 100% of the group's grade.
- If, on average, a student receives a rating of less than 9, that student receives a specific percentage of the group's grade to be determined by the formulae below:

An average rating of 8 to < 9 = 90% + (average rating obtained - 8)*10
An average rating of 7 to < 8 = 80% + (average rating obtained - 7)*10
An average rating of 6 to < 7 = 70% + (average rating obtained - 6)*10
An average rating of 5 to < 6 = 60% + (average rating obtained - 5)*10
An average rating of 4 to < 5 = 50% + (average rating obtained - 4)*10
An average rating of 3 to < 4 = 40% + (average rating obtained - 3)*10
An average rating of < 3 will be investigated by your instructor and the student may receive 0% of group grades.

Example 1: Assume the overall group assignment is 30 marks, and out of 30 your group got 30 marks. A student with an average rating of 9.10 gets 100% of 30 marks, i.e., 30 marks. An average rating of 6.29 means that a student gets 72.9% (or 70%+(6.29-6)*10) of 30 marks, i.e., 21.87 marks.

Example 2: Assume the overall group assignment is 30 marks, and out of 30 your group got 20 marks. A student with an average rating of 9.10 gets 100% of 20 marks, i.e., 20 marks. An average rating of 6.29 means that a student gets 72.9% (or 70%+(6.29-6)*10) of 20 marks, i.e., 14.58 marks.

Your instructor reserves the right to review the student ratings for questionable circumstances, which include, but are not limited to, acts of discrimination or malice.

Criteria	Yourself	Member 1	Member 2	Member 3	Member 4	Member 5
Contributed the fair share of work (Score: 0 to 10)						
TOTAL						
Comments, if any						

Mapping of Course ILOs to EAB Graduate Attributes

Course Code & Title	CH5220 Food Standard - Food Safety and Risk Assessment
Course Type	NTU_UG

Overview										
(a)	●	(b)	●	(c)	●	(d)	●	(e)	◐	(f)	○
(g)	○	(h)	◐	(i)	○	(j)		(k)	○		

Legend:

●	Fully consistent (contributes to more than 75% of Student Learning Outcome)
◐	Partially consistent (contributes to about 50% of Student Learning Outcome)
○	Weakly consistent (contributes to about 25% of Student Learning Outcome)
Blank	Not related to Student Learning Outcome

Course ILOs		**EAB Graduate Attributes**
1)	Analyze Food Production Chains And New/Novel; Products And Processes. Understand The Background For Hazards And Risks In Food.	a, b, d
2)	Use Science-Based Risk Principles (E.G. Microbiology & Toxicology) To Understand Food Safety Problems And Solutions.	a, b, c, e
3)	Design Solutions Utilizing Major Principles Guiding Food Control Systems And Following Safety And Regulatory Frameworks. Understand The Principles Of “Safety By Design” And How It Can Be Implemented Into Food Innovation.	c, d, f, e, j
4)	Link Food Standards From Regulatory Authority And Industry To Foodborne Disease Prevention And Safe Consumption.	c, f, g, h, i
5)	Explain Scientific Background And Select Solutions Based On The Set-Up Of The Food Control System In Singapore, Regulatory Frameworks (Including Singapore Novel Food Framework And Singapore Food Act) And Future Food (SFS 30 By 30) Goals.	f, g
6)		
7)		
8)		

9)		
10)		

EAB Graduate Attributes

a) **Engineering Knowledge**: Apply the knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems.

b) **Problem Analysis**: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences with holistic considerations for sustainable development. (WK1 to WK4)

c) **Design / Development of Solutions**: Design creative solutions for complex engineering problems and design systems, components or processes that meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required. (WK5)

d) **Investigation**: Conduct investigations of complex problems using research-based knowledge (WK8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e) **Modern Tool Usage**: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering problems, with an understanding of the limitations. (WK2 and WK6)

f) **The Engineer and the World**: When solving complex engineering problems, analyse and evaluate sustainable development impacts to: society, the economy, sustainability, health and safety, legal frameworks and the environment (WK1, WK5, and WK7).

g) **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (WK9).

h) **Individual and Collaborative Team Work**: Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multidisciplinary, face-to-face, remote and distributed settings (WK9).

i) **Communication**: Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions, taking into account cultural, language, and learning differences.

j) **Project Management and Finance**: Demonstrate knowledge and understanding of engineering management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

k) **Life-long Learning**: Recognise the need for, and have the preparation and ability to (i) engage in independent and life-long learning, and (ii) adapt to new and emerging technologies, and (iii) think critically, in the broadest context of technological change (WK8).

No	Knowledge Profile
WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences
WK2	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
WK5	Knowledge including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts that supports engineering design and operations in a practice area
WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
WK7	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline such as the professional responsibility of an engineer to public safety and sustainable development.
WK8	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues
WK9	Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc with mutual understanding and respect, and of inclusive attitudes

Reference: EAB Accreditation Manual