

# MODULE 2: Food Safety and Food Quality Analysis

## COURSE TITLE: 2.1 FOOD QUALITY MANAGEMENT SYSTEM

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## CREDITS: 4 (3-1-4)

1 credit: 1 h/week (15 h)

(Lecture-Practice-Self learning)

Class (contact hours): 45 H (15 weeks)

Practical work: 45 H (15 weeks)

Self-learning (Assignment, Presentation, Case study, Self study): 60 H (15 Weeks)

TOTAL: 150 H/SEMESTER (15 Weeks)

## LANGUAGE OF COURSE DELIVERY:

ENGLISH or FRENCH, and national languages (THAI, VIETNAMESE, KHMER)

## WORKLOAD: 150 H

(/25h=6 ECTS): 45 contact hours + 45h practical work + 60h self-learning (1 credit=15h)

Semester:

## PREREQUISITES: MICROBIOLOGY, CHEMISTRY, FOOD TECHNOLOGY

## COURSE OBJECTIVES

To provide the students with knowledge on the essential requirements for laboratory activities including management, standard practices, knowledge of international standards and legislation.

## LEARNING OUTCOMES

Upon completion of this course, students will be able:

LO1: to understand legislation and standards specific to food safety and food quality.

LO2: to understand and identify food hazards, adulteration and traceability

LO3: to understand quality management system for laboratories

LO4: to understand how to validate a method to monitor microbiological and/or chemical hazards in food (according to international guidelines and legislation)

LO5: to implement, in testing laboratories, a quality management system according to ISO 17025.

LO6: to keep the confidentiality of analytical results

LO7: to synthesis current information and communicate related to food safety and food quality and food safety management

Benchmark LOs	Knowledge	Skills	Competence	Suggested EQF levels
LO1	X			6
LO2	X			6
LO3	X			6
LO4	X			6
LO5		X		7
LO6			X	7
LO7		X	X	7

## COURSE OUTLINE

The course includes:

1. Food legislation (national and international):, Codex, FSMA, EU Food Laws, regulation-related to GMO, food-labelling, allergy
  - Means to access the legal/scientific document how to find and how to read and obtain the relevant information
  - Intellectual property/ethic of work (with private industries)/confidentiality
2. Laboratory quality management system
  - Protocol validation in the laboratory (chemical and microbiological hazards)
  - Reliability of techniques, International sample for validation test, metrology and calibration
  - Follow the guideline of the manufacturers
  - Recovery test
  - Laboratory management (ISO17025)
3. Laboratory safety
  - Safety and Health Laboratory regulations
  - Safety and Health Laboratory Standards (as OSHA)
  - Biological Safety
  - Chemical Safety
  - Radiation Safety

## **1. Food legislation (national and international): Codex, FSMA, EU Food Laws, regulation-related to GMO, food-labelling, allergy**

### **1.1. Overview of global legislation/regulation**

#### **1.2. Leading international standards organizations:**

WHO, FAO, Codex, ISO, EFSA, ASEAN

#### **1.3. Leading national governmental organization:**

Food Standards Agency, FDA, EPA

#### **1.4. Leading industry organizations:**

GFSI, ILSI, ICMSF, EUFIC, IOCU, GMA, NSF, EHEDG, 3-A SSI, BISSC, AIB

#### **1.5. Intellectual property/ethic of work (with private industries)/confidentiality**

#### **1.6. Legal requirements for food authenticity**

## **2. Laboratory quality management system /**

### **2.1. Protocol validation in the laboratory (chemical and microbiological hazards) (15-10-10 hours)**

- Reliability of techniques, International sample for validation test,
- Comment on selected International or National protocols
- Management of testing equipment including reference standards
- Metrology and calibration
  - Laboratory Internal Calibration, National calibration and International calibration
  - ISO 5725 - Accuracy (Trueness and Precision) of Measurement Methods and Results (6 parts)
  - LIMS and issues of the use of automated system regarding requirement for validity, authenticity, correctness, integrity, security and availability of data
- Follow the equipment guideline or manual of the manufacturers
- Recovery test / proficiency test

### **2.2. Laboratory management (ISO17025) (10 -5-5 hours)**

- ISO 17025 Standard presentation
- Management
- Quality manual example
- Accreditation process / Audit

### 3. Laboratory Safety

#### 3.1. Safety and Health Laboratory regulations

#### 3.2. Safety and Health Laboratory Standards (as OSHA)

#### 3.3. Biological Safety

- Biological Safety Manuals
- Research with Microbes and Cell Lines
- Animal Biosafety
- Plant biosafety
- Bloodborne Pathogens
- Case studies : Biological safety for some Agents and Toxins

#### 3.4. Chemical Safety

- Lab Safety Signs and Labels
- Laboratory Safety Manual and Chemical Hygiene Plan
- Use of Controlled Substances
- Safe Handling of Pyrophoric Chemicals
- Material Safety Data Sheets (Chemwatch software)

#### 3.5. Radiation Safety

- Radiation Safety Manual
- Dosimetry
- Laser safety
- Magnet safety
- RF/Microwave safety

#### 3.6. Hazardous Materials and Waste

- Chemical and biological (Hazardous) Waste
- Hazardous Waste Manual
- Mercury Exchange Program
- Radioactive Waste
- Hazardous Material transportation outside the lab

Practical class:

- Laboratory hazard inspections and assessment
- Action plan for laboratory hazard management

### LABORATORY SESSION: 45 HOURS

Course 1 :0 hours Course 2 : 25 hours Course 3 : 20 hours

#### Learning Outcomes (LOs)- Course Content Matrix

	1	2	3
LO1	X	X	X
LO2	X		
LO3		X	
LO4		X	X

LO5		X	X
LO6		X	
LO7		X	X

### Skills Development Matrix

Skills (Discipline specific)	
Food-related legislation and standards	IP
Lab-related legislation and standards	IPA
Lab management	PA
Food-related hazards identification	IP
Conventional food Lab analysis	IPA
Advanced food Lab analysis	IPA
Statistical analysis	IPA
Transferable Skills	
Independent learning	P
Time management	P
Oral communication	PA
Written Communication	PA
Co-operative learning	P
Project management	IP
Leadership	P
Ethics/Code of conduct	I

I :Introduce , P:Practice, A: Assess

### Outcome-Method Table

#### Intellectual Outcomes

Intellectual outcomes	Teaching methods or activities
Students will be better able to:	
understand legislation and standards specific to food safety and food quality	Classroom lecture, case studies, webinar, on-line tutorial
understand quality management system for laboratories	Classroom lecture, case studies, webinar, laboratory visits, on-line tutorial

#### Skills Outcome

Skills outcome	Teaching methods or activities
Students will demonstrate the ability to:	
implement in testing laboratories, a quality management system according to ISO 17025.	Classroom lecture, case studies, webinar, laboratory visits, on-line tutorial
implement in testing laboratories safety and health procedures according to a selected standard.	Classroom lecture, case studies, webinar, laboratory visits, on-line tutorial
perform safely laboratory analyses for routine microbiological and/or chemical testing, in the framework of an accredited laboratory	Classroom lecture, practical work, case studies, webinar, laboratory visits, on-line tutorial

#### Attitudinal Outcome

Attitudinal outcomes	Teaching methods or activities

Students will increasingly be able to:	
1. systemically search, select the literature/legislation and other relevant materials on food safety and food quality in Lab activities	Case studies, laboratory visits, practical work, on-line directed self-learning, Group study
2. Plan and manage to do lab analysis and identify issues related to food safety	Case studies, laboratory visits, practical work, on-line directed self-learning, Group study
3. Be responsible regarding laboratory activities and management	Case studies, laboratory visits, practical work, on-line directed self-learning, Group study
4. Manage lab methodology part of an R&D project	Case studies, laboratory visits, practical work, on-line directed self-learning, Group study

### **Learning Resources:**

**Textbooks:** No designated textbook, but class notes and handouts will be provided.

### **Reference Books:**

1. Debby N. (2013). *Food Safety Management Programs: Applications, Best Practices and Compliance*, CRC Press, UK and USA.
2. Yasmine M., & Hubb, L. (2013). *Food Safety Management: A Practical Guide to the Industry*. Elsevier.
3. Ludwig Huber (2007) *Validation and Qualification in Analytical Laboratories*, Second Edition CRC Press
4. Donnell R. Christian, Jr., Stephanie Drilling (2009) *Implementing Quality in Laboratory Policies and Processes: Using Templates, Project Management, and Six Sigma*. CRC Press
5. Neusely da Silva & Al.,(2012). *Microbiological Examination Methods of Food and Water: A Laboratory Manual*. CRC Press

### **Journals and Magazines:**

1. Food Control, Elsevier
2. Food Policy, Elsevier
3. Food Research International, Elsevier
4. Innovative Food Sciences and Emerging Technologies, Elsevier
5. Trends in Food Science and Technology, Elsevier
6. Journal of Food Safety, John Wiley & Sons

## **TEACHING AND LEARNING METHODS**

The course is delivered via lectures, webinars, reading materials including the recent literatures and practical problem solving in food safety and food quality issues. Additional online and recent information will be provided to enhance self-learning experiences. Practical works will be done by students. Active learning is encouraged and students' understanding of each modules or subtopics is evaluated via featured examples, practical questions, practical work, relevant case studies, assignments and presentation.

## **TIME DISTRIBUTION AND STUDY LOAD:**

1. Lecture: 45 hours
2. Assignments: 15 h
3. Case study and presentation: 30 h
4. Self-study: 15 hours

Course /Chapter	Lecture hour	Lab practices	Presentation/ Case study	Self-study/Assignment
1	15		10	10
2	20	25	15	15
3	10	20	5	5
<b>Total</b>	<b>45</b>	<b>45</b>	<b>30</b>	<b>30</b>

## EVALUATION SCHEME

The final grade will be based on the following weight distribution: Quizzes (14%), Assignments (27%), mid semester exam (16%) and final exam (43%)

An “A” would be awarded if a student can show the ability having elaborative knowledge on; elaborate, formulate and solve problems related to specific concepts presented in the course.

A “B” would be awarded if a student shows an overall understanding of the topics covered.

A “C” would be given if a student meets below expectation on both knowledge acquired and analysis.

A “D” would be given if a student does not meet basic expectations of the topics presented in the course.

### Assessment Specification Grid

Activities	LO1	LO2	LO3	LO4	LO5	LO6	LO7	Total
2.1.1	X						X	0
Quizzes	2							2
Mid Term Exam	4						2	6
Final Exam	8						4	12
Assignment1	6						4	10
2.1.2		x	x	x	x	x	x	0
Quizzes		1	0	1	1	1		4
Mid Term Exam		2	2	2	2	2		10
Final Exam		2	2	3	3	2	2	14
Assignment2		1	1	2	1	1	1	7
<b>2.1.3</b>		<b>x</b>	<b>x</b>		<b>x</b>			<b>0</b>
Quizzes		4	2		2			8
Final Exam		5	6		6			17
Assignment3		4	3		3			10
<b>Total 2.1</b>	<b>20</b>	<b>19</b>	<b>16</b>	<b>8</b>	<b>18</b>	<b>6</b>	<b>13</b>	<b>100</b>

### Assessment of Case study and Assignments:

- Understanding the concept and topics properly
- Demonstrate the specifically sound of the evident-based case analysis
- Concise reviewing the relevant literature on relevant topics
- Interpret the acquired data and analyse scientifically
- Describe the results comprehensively and writing skills in the report
- Clear oral presentation

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**ALIGNMENT MATRIX OF MODULE LEARNING OUTCOMES**

Corresponding EQAS LO	Module LO	Units developing the LO	Extent of alignment with EQAS LO (maximum total for an EQAS LO 100%)
<b>Learning Outcomes for Food Safety and Microbiology</b>			
Describe the properties of common food spoilage organisms. Experimentally determine their presence and numbers. Demonstrate a critical understanding of instances of food spoilage, causation and prevention.	LO1: to understand legislation and standards specific to food safety and food quality.	2.1-1,	XX%
	LO2: to understand and identify food hazards, adulteration and traceability	2.1-1,	XX%
Describe the properties of common food poisoning organisms, their toxins and means of detection. Experimentally determine the presence of food poisoning organisms. Demonstrate a working knowledge of food-borne infections/intoxications, evaluating causation and prevention.	LO2: to understand and identify food hazards, adulteration and traceability	2.1-1,	
	LO4: to understand how to validate a method to monitor microbiological and/or chemical hazards in food (according to international guidelines)	2.1-2,	
<b>Learning Outcomes for Food Chemistry and Analysis</b>			
Demonstrate understanding of the basic concepts of organic chemistry, physical chemistry and biochemistry related to food. Demonstrate an understanding of the structure and function of major food components. Describe the physical and chemical properties of foods in production and supply chains. Demonstrate a comprehensive understanding of the structure, function and interactions of major and minor food components, vitamins, flavours, taste and colour.	LO4: to understand how to validate a method to monitor microbiological and/or chemical hazards in food (according to international guidelines)	2.1-2,	x%
Demonstrate a practical understanding of health and safety in the laboratory. Demonstrate the application of the principles of GLP, health and safety in the context of a food laboratory.	LO3: to understand quality management system for laboratories	2.1-2, 2.1-3	x%



<b>Corresponding EQAS LO</b>	<b>Module LO</b>	<b>Units developing the LO</b>	<b>Extent of alignment with EQAS LO (maximum total for an EQAS LO 100%)</b>
Carry out an analysis of the proximate composition of foods and of basic sensory properties. Undertake an extended analysis of the chemical, physical and sensory properties of foods, critically analyse and interpret the results.	LO4: to understand how to validate a method to monitor microbiological and/or chemical hazards in food (according to international guidelines)	2.1-2,	x%
<b>Quality Management and the Law</b>			
Demonstrate an understanding of the principles of quality management systems in the food industry, the range of documentation required and its use.	LO3: to understand quality management system for laboratories	2.1-2, 2.1-3	x%
	LO5: to implement, in testing laboratories, a quality management system according to ISO 17025.	2.1-2, 2.1-3	x%
	LO6: to keep the confidentiality of analytical results	2.1-2	x%
Describe the legal framework that applies to the food industry, the principle legal requirements, enforcement and the penalties that can be applied within a defined jurisdiction.	LO1: to understand legislation and standards specific to food safety and food quality.	2.1-1	x%
	LO4: to understand how to validate a method to monitor microbiological and/or chemical hazards in food (according to international guidelines)	2.1-1,	x%
Demonstrate a critical understanding of the role of food provenance in maintaining food quality. Undertake an analysis demonstrating how a food product can be authenticated.	LO1: to understand legislation and standards specific to food safety and food quality.	2.1-1	x%
	LO2: to understand and identify food hazards, adulteration and traceability	2.1-1	x%
<b>Generic Competences Communication abilities, ethics and personal skills</b>			
Evaluating their own achievement by developing a capacity for self-reflection and that of others by participating in peer-review.	LO5: to implement, in testing laboratories, a quality management system according to ISO 17025.	2.1-2, 2.1-3	x%
Demonstrate autonomy, self-direction, initiative and effective decision making in complex and unpredictable situations.	LO4: to understand how to validate a method to monitor microbiological and/or chemical hazards in food (according to international guidelines and legislation)	2.1-2	x%
	LO6: to keep the confidentiality of analytical results	2.1-2	x%