

Course Syllabus

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| 1 | Course title | Food Microbiology |
| 2 | Course number | 0643722 |
| 3 | Credit hours (theory, practical) | 3 lectures |
| | Contact hours (theory, practical) | 3 Hours |
| 4 | Prerequisites/corequisites | |
| 5 | Program title | M.Sc. Food Science and Technology |
| 6 | Program code | 042 |
| 7 | Awarding institution | The University of Jordan |
| 8 | School | School of Agriculture |
| 9 | Department | Human Nutrition and Food Technology |
| 10 | Level of course | Graduate |
| 11 | Year of study and semester (s) | First and second |
| 12 | Final Qualification | MSc |
| 13 | Other department (s) involved in teaching the course | |
| 14 | Language of Instruction | English |
| 15 | Date of production/revision | 2020 |

16. Course Coordinator: Prof. Hamzah Al-Qadiri

Office no. 57, 12:00-3:00 (Sun., Tue., and Thurs.) 10:00-12:00 (Mon., Wed.). h.qadiri@ju.edu.jo

17. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.

18. Course Description:

The course deals with the microbial ecology and its application in food preservation and safety. Microbial injury and its effect on survival and recovery. The course deals with the emerging foodborne pathogens, and sampling plans for the microbiological analysis of foods. Application of molecular techniques in detection and identification of microbial pathogens in food and water. Application of hazard analysis critical control point (HACCP) system to ensure food safety and the concept of risk assessment are explained.

19. Course aims and outcomes:

A- Upon completion of this course, the student is expected to:

- Define foods as microbiological ecosystems and identify the role of microbial flora.
- Define the concept “injury of microorganisms”, and know causes and forms of injury.
- Define the concept of "emerging" in foodborne pathogens, and the possible causes for it.
- Application of molecular techniques in detection and identification of microbial pathogens in food and water.
- Point out the significance of emerging foodborne pathogens.
- Determine and apply rapid methods for identification of groups of microorganisms important to selected foods.
- Identify the significance of food sampling for microbiological analysis.
- Apply sampling plans to selected foods.
- Describe the principles of HACCP system.
- Implement HACCP system in food establishments.
- Identify components of risk assessment.

B- Intended learning outcomes

- Subject specific skills
- At the end of the course students will be able to:
- List food intrinsic and extrinsic factors and implicit microbial factors affecting foodborne microorganisms.
- Determine methods of resuscitation of injured foodborne microorganisms.
- Describe the concept of sampling plans.
- Application of molecular techniques in detection and identification of microbial pathogens in food and water.
- Point out the significance of emerging foodborne pathogens.
- Determine and apply rapid methods for identification of groups of microorganisms important to selected foods.
- List types of sampling plans.
- Define terms related to sampling plans.
- Define different types of foodborne hazards.
- Identify critical control points develop monitoring ways of critical control points.
- Define terms related to microbiological risk analysis.

C- Core academic skills

- At the end of the course, students are expected to:
- Develop control strategies of foodborne microorganisms.
- Identify impact of microbial injury on food quality and safety.
- Determine and apply of molecular techniques in detection and identification of microbial pathogens in food and water.
- Point out the significance of emerging foodborne pathogens.
- Determine and apply of rapid methods for identification of groups of microorganisms important to selected foods.
- Point out ways of controlling microorganisms in selected foods.
- Define selected applications of HACCP system.
- Define selected application of microbiological risk assessment.

D- Personal and key Skills

At the end of the course, students are expected to:

- Determine microbial flora of foods and distinguish their role in spoilage.
- List foodborne pathogens.
- Define characteristics, vehicle and control of each emerging foodborne pathogen.
- Distinguish selected traditional foods as microbial ecosystem.
- Identify microorganisms affecting quality and safety of selected traditional foods.
- Appraise the significance of food safety.
- Be acquainted with ICMSF and its activities.
- Identify limitation of traditional methods of ensuring food safety.
- Appraise the significance of risk assessment.

20. Topic Outline and Schedule:

| Topic | Week | Instructor | Achieved ILOs | Evaluation Methods | Reference |
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| Microbial ecology of food: its effect on the quality and safety <ul style="list-style-type: none">• The concept of ecosystem and foods as microbial ecosystems• Food intrinsic and extrinsic factors and microbial implicit factors affecting foodborne microorganisms• Microbial flora of foods• Applying the concept of foods as ecosystems to control of foodborne microorganisms | 1 | Prof. Hamzah Al-Qadiri | A-1, A-4, B-4 | Exam, Assignments. | Chapter: 11 Wilson, C.L. |
| Microbial injury <ul style="list-style-type: none">• Injury in microorganisms: causes and forms• Impact of microbial injury on food quality and safety• Resuscitation of injured microorganisms | 2 | Prof. Hamzah Al-Qadiri | A-2, B-1, C-1 | Exam, Term papers assignments. | Chapters: 4, 7, 9 Wilson, C.L. |

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| <p>Emerging foodborne pathogens</p> <ul style="list-style-type: none"> • Why foodborne pathogens emerge? • Significance of emerging foodborne pathogens • Characteristics, vehicle and control of: <p>Listeria monocytogen Campylobacter jejuni Yersinia enterocolitica Aeromonas hydrophila Pathogenic Escherichia coli Salmonella enteritidis Vibrio vulnificus</p> | 3-6 | Prof. Hamzah Al-Qadiri | A-2, C-1, D-1 | Exam | Chapters: 12, 13, 14, 15, 16, chapter 9 Wilson, C.L. |
| <p>Microbial growth and metabolism</p> <ul style="list-style-type: none"> - Macromolecules Nutrition, laboratory culture, and metabolism of microorganisms Microbial Growth (bacterial growth) - Kinetics of bacterial growth - Growth curve of bacteria - Batch and continuous culture of bacteria Influence of environmental factors on the growth of microorganisms - Metabolic regulations Biosynthesis of macromolecules Microbial energetics (the generation of ATP) - Enzymes and microbial metabolism - Heterotrophic generation of ATP - Autotrophic generation of ATP | 7-10 | Prof. Hamzah Al-Qadiri | A-3, B-1, C-2, C-4, D-1, D-2 | Seminars. | Chapters: 3, 5, 6, 8 Wilson, C.L. |
| <p>Microbiology of some traditional foods Technology and traditional food as</p> | 5/ 4-6 th | Prof. Hamzah Al-Qadiri | A-4, B-4, C-1 | Seminars | Chapters: 17, 18, 19 Wilson, C.L. |

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| <p>ecosystems Hoummus and tourmmus Microbial flora and safety Identification of Enterobacteriaceae Labaneh Microbial flora and safety Identification of foodborne yeasts White boiled cheese Microbial flora and safety Identification of salt tolerant bacteria Fermented turnips Natural vs controlled fermentation of vegetables Microbiology of fermented turnips Identification of lactic acid bacteria</p> | | | | | |
| <p>Sampling of foods for microbiological analysis Significance of food sampling for microbiological analysis The concept of sampling plans The ICMSF Terms of sampling plans: lot, c, n, m Two and three Application of sampling plans to foods in international trade Sampling plans and Jordanian Standards</p> | 10-12 | Prof. Hamzah Al-Qadiri | A-5 | Assignments. | Chapters: 7, 10 and Chapter 15 Wilson, C.L. |
| <p>Hazard analysis and critical control point (HACCP) systems</p> <ul style="list-style-type: none"> • Food safety and its significance • Limitation of traditional methods of ensuring food safety • Foodborne hazards and critical control points • The seven principles of HACCP system • Steps of the application of HACCP system • Case studies of | 13-14 | Prof. Hamzah Al-Qadiri | B-1, B-2, C- 2, C-3 | Term paper assignments. | Chapter: 20 Wilson, C.L. |

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| HACCP system application | | | | | |
| Microbiological risk assessment <ul style="list-style-type: none"> • Aims of risk analysis • Components of risk analysis Risk assessment Risk communication Risk management <ul style="list-style-type: none"> • Terms related to microbiological risk assessment • Codex Alimentarius Commissions principles and guidelines for conduct of microbiological risk assessment • Case studies for microbiological risk assessment. | 15-16 | Prof. Hamzah Al-Qadiri | A-6, C-4 | Term paper assignments | Chapters: 21, 22 Wilson, C.L. |

21. Teaching Methods and Assignments:

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| <p>Learning Methodology</p> <p>Lectures, group discussion and student critical reading and presentation of research papers on food microbiology.</p> <p>Teaching tools include the use of the board, transparencies, power point presentation and handouts.</p> <p>Assignments – Critical reading and discussion of research papers</p> <p>Each student will critically read and then present a food microbiology research paper for class discussion. Photocopies of the research papers are to be provided to the lecturer and the students one week before the presentation.</p> |
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22. Evaluation Methods and Course Requirements:

| Evaluation | Point % | Date |
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| Midterm Exams Mid-term theory exam | 30 | |
| Term paper assignment and seminars | 30 | Throughout the course |
| Final Exam | 40 | To be assigned by the registration |

23. Course Policies:

A- Attendance policies:

According to the regulations applied at The University of Jordan.

B- Absences from exams and handing in assignments on time:

According to the regulations applied at The University of Jordan.

C- Health and safety procedures:

According to the regulations applied at The University of Jordan. (Biosafety Level I and II).

D- Honesty policy regarding cheating, plagiarism, misbehavior:

According to the regulations applied at The University of Jordan.

E- Grading policy:

According to the regulations applied at The University of Jordan.

F- Available university services that support achievement in the course:

According to the regulations applied at The University of Jordan.

24. Required equipment: (Facilities, Tools, Labs, Training....)

25. References:

Wilson, C.L. (2008)

Microbial Food Contamination, Second Edition. CRC Press, USA

Chin, J. (2000)

Control of Communicable Diseases Manual. American Public Health Association, 17th ed. USA

Garbutt, J. (1997)

Essentials of Food Microbiology. Arnold, London.

- **World Helath Organization (www.who.org)**
- **Codex Alimentarius (www.codexalimentarius.net)**
- **American Society for Microbiology (asm) (www.asm.org)**
- **Centers for Disease Control and Prevention (CDC) (www.cdc.gov)**
- **American Public Health Association (APHA) (www.apha.org)**

Adams, M.R. and M.O. Moss. (1995)

Food Microbiology. The Royal Society of Chemistry. UK.

Doyle, M.P. 1989.

Foodborn Bacterial Pathogens. Marcel Dekker, New York.

Holt, G.J. (E.d)

Bergeys Manual of Systematic Bacteriology

Volumes: 1 (1984) and 2 (1986)

Baltimore: The Williams & Wilkins Co.

ICMSF, International Commission on the Microbiological Specifications for Foods (1996).
Microorganisms in Foods 5: Microbiological Specifications of Food Pathogens. Blackie
Academic and Professional, London.

ICMSF, International Commission on the Microbiological Specifications for Foods (1988).
Microorganisms in Foods 4: The Application of the Hazard Analysis and Critical Control
Point (HACCP) System to Ensure the Microbiological Safety and Quality of Food.
Blackwell Scientific Publications, London.

ICMSF, International Commission on the Microbiological Specifications for Foods (1986).
Microorganisms in Foods 2: Sampling for Microbiological Analysis: Principles and
Specific Applications. Blackwell Scientific Publications, London.

ICMSF, International Commission on the Microbiological Specifications for Foods (1980).
Microbial Ecology of Foods: Vol. 1. Factors Affecting Life and Death of Microorganisms.
Academic Press, New York.

Mossel, D. A. A., J. E. L. Corry, C. B. Struijk, R. M. Baird. (1995).
Essential of the Microbiology of Foods. John Wiley & Sons Ltd. England.

Ray, Bibek. (2001).
Fundamental Food Microbiology. CRC Press, Boca Raton.

Periodicals

- Applied and Environmental Microbiology
- Food Microbiology
- Food Technology
- International Journal of Food Microbiology
- Journal of Applied Microbiology
- Journal of Dairy Science
- Journal of Food Protection
- Journal of Food Science

26. Additional information:

Name of Course Coordinator: Prof. Hamzah Al-Qadiri Signature: ----- Date: -----

Head of curriculum committee/Department: ----- Signature: -----

Head of Department: ----- Signature: -----

Head of curriculum committee/Faculty: ----- Signature: -----

Dean: ----- -Signature: -----