

Course Specification

— (Postgraduate Programs) عبدالمحسن بن عبدالعزيز آل سعود

Course Title: Industrial Microbiology 1

Course Code: BIO-6234

Program: Master of Science in Applied Biology (Industrial and Environmental Biotechnology)

Department: Biology عبدالمحسن بن عبدالعزيز آل سعود

College: Science

Institution: Imam Mohammad Ibn Saud Islamic University

Version: 1

Last Revision Date: Pick Revision Date.

عبدالمحسن بن عبدالعزيز آل سعود



عبدالمطعم بن أبي الطموزي رحمه الله ورحمتهم أجمعين

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عبدالمطعم بن أبي الطموزي رحمه الله ورحمتهم أجمعين





A. General information about the course:

1. Course Identification:

1. Credit hours: 3(2 Lecture 2 + Lab 2)

2. Course type

A. ☐ University ☐ College ☐ Department ☒ Track
B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (Level 2 / first year)

4. Course General Description:

Throughout this course, you will:

Demystify the world of microorganisms: Discover the diverse roles of bacteria, fungi, and yeast in food production, understanding their interactions and metabolic pathways.

Uncover the secrets of fermented delights: From cheese and yogurt to bread and kimchi, explore the intricate processes of microbial fermentation that bring flavor, texture, and nutritional benefits to our food.

Investigate the power of added microbes: Learn about the exciting developments in microbial protein production, probiotics, and their potential to revolutionize the food chain.

Dive into the animal feed frontier: Discover how microorganisms are enhancing animal feed, exploring options like methanotrophic bacteria, microalgae, and biofloc technology in aquaculture.

Gain practical insight: Throughout the course, you'll encounter real-world case studies, industry insights, and opportunities to connect the theoretical with the practical applications of industrial microbiology.

By the end of this course, you will be equipped to:

Understand the fundamental principles of industrial microbiology and its applications in food and feed production.

Analyze and evaluate different microbial processes used in food fermentation and preservation.

Explain the potential and challenges of incorporating novel microbial sources into the food chain.

Critically assess the sustainability and ethical considerations of industrial microbiology practices.

Prepare for a career in this dynamic field, contributing to the development of innovative and sustainable food and feed solutions.

5. Pre-requirements for this course (if any):

6. Co-requisites for this course (if any):

7. Course Main Objective(s):



- Develop a comprehensive understanding of the role microorganisms play in various food and feed production processes.
- Analyze the principles of microbial fermentation and their applications in diverse food products like dairy, bread, fermented vegetables, and beverages.
- Evaluate the potential of adding microorganisms to the food chain, including microbial protein production, probiotics, and their impact on nutritional value and gut health.
- Examine the use of specific microorganisms like methanotrophic bacteria, microalgae, and biofloc technology in enhancing animal feed quality and sustainability.

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2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	-	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning	-	-
4	Distance learning	-	-

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
	Total	60



B. Course Learning Outcomes, Teaching Strategies, Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Gain a comprehensive understanding of the role of microorganisms in food and feed production processes.		Two credits weekly lectures	-Quizzes -Presentations -Assignments -written exams
1.2	Master the principles of microbial fermentation and its applications in various food products.		Two credits weekly lectures	Quizzes -Presentations -Assignments -written exams
1.3	Explore the potential and limitations of adding microorganisms to the food chain, including microbial protein, probiotics, and biofloc technology		Two credits weekly lectures	Quizzes -Presentations -Assignments -written exams
1.4	Analyze the use of specific microorganisms in animal feed production, like methanotrophic bacteria and microalgae.		Two credits weekly lectures	Quizzes -Presentations -Assignments -written exams
1.5	Evaluate the sustainability and ethical considerations associated with industrial microbiology practices. Evaluate the potential of "Omics" technologies for		Two credits weekly lectures	Quizzes -Presentations -Assignments



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	improving sensitivity, specificity, and early detection of environmental toxicity.			-written exams
2.0	Skills			
2.1	Develop critical thinking and problem-solving skills to analyze and troubleshoot microbial processes in food and feed production.		-Two credits weekly lectures -Tutorials	-Presentations -Assignments -written exams
2.2	Design and interpret experiments related to microbial growth, fermentation, and product quality.		-Two credits weekly lectures -Tutorials	-Presentations -Assignments -written exams
2.3	Effectively communicate the principles and applications of industrial microbiology to diverse audiences.		-Two credits weekly lectures -Tutorials	-Presentations -Reports
2.4	Stay updated with the latest advancements and trends in the field of industrial microbiology.		-Two credits weekly lectures -Tutorials	-Presentations -Reports
2.5	Apply theoretical knowledge to solve practical problems encountered in food and feed industries		-Two credits weekly lectures -Tutorials	-Presentations -Reports
3.0	Values, autonomy, and responsibility			
3.1	Values Food Security and Sustainability: Develop an awareness of the role industrial microbiology plays in addressing global food security challenges and promoting		Group discussions	-Presentations -Reports



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	sustainable food production practices. Environmental Stewardship: Foster a commitment to reducing the environmental footprint of industrial microbiology practices by minimizing waste, optimizing resource use, and exploring renewable energy sources. Animal Welfare: Encourage responsible and ethical use of microorganisms in animal feed production, prioritizing animal health and well-being while promoting efficient nutrient utilization. Public Health and Safety: Emphasize the importance of adhering to rigorous safety standards and regulations in industrial microbiology applications to ensure consumer health and product safety.			
3.2	Autonomy: Critical Thinking and Innovation: Encourage students to think critically about the implications of different industrial microbiology practices, propose innovative solutions to address food and feed challenges, and contribute to the advancement of the field.		Group discussions	-Presentations -Reports



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	Lifelong Learning: Cultivate a passion for continuous learning and professional development, encouraging students to stay updated with the latest research and advancements in industrial microbiology. Independent Research and Problem-Solving: Provide opportunities for students to conduct independent research projects, analyze data, and develop solutions to real-world problems in the field. Effective Communication and Collaboration: Enhance communication skills to convey complex scientific concepts to diverse audiences, fostering collaboration and knowledge exchange within the food and feed industry.			
3.3	Responsibility: Ethical Research and Development: Instill a commitment to ethical research practices in industrial microbiology, ensuring transparency, integrity, and responsible use of microorganisms.		Group discussions	-Presentations -Reports

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	Risk Assessment and Management: Promote awareness of potential risks associated with industrial microbiology practices, emphasizing the importance of risk assessment and effective safety measures. Social Responsibility and Equity: Encourage students to consider the social and economic implications of their work, advocating for equitable access to safe and nutritious food for all. Professional Accountability and Transparency: Emphasize the responsibility of industrial microbiologists to contribute to sustainable solutions, transparency in food production processes, and accountability for the environmental and social impacts of their work.			

C. Course Content:

No	List of Topics	Contact Hours
1	Introduction	2
2	Microorganisms in food production process - microbiology of dairy product	6



3	- baking and Fermented Vegetables	6
	Added microorganisms in food chain, applications and production	
4	- microbial protein	10
	- probiotic industry	
4	Added microorganism in an animal feed, applications and production	10
	- Methanotrophic bacteria as a protein source	
	- Microalgae as protein source.	
	- Biofloc and life feed production in aquacultures industry	
Total		30

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm exam-1	5 th week	15%
2.	Midterm exam-2	10 th week	15%
3.	Assignments, presentations, attendance, data search, participation	Throughout the course duration	10%
	Final lab exam	15 th week	20%
4.	Final exam	16 th week	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:





Essential References

- 1- Ingvar Sundh., Andrea Wilcks and Mark S. Goettel.2013. Beneficial microorganisms in agriculture, food and the environment: safety assessment and regulation. CABI.
- 2- David Wilson., Hermann Sahn., Peter Stahmann and Mattheos Koffas . 2019. Industrial Microbiology. Wiley-VCH.
- 3- Nduka Okafor and Benedict C. Okeke . 2017. Modern Industrial Microbiology and Biotechnology. CRC Press.
- 4- Anderson de Souza Sant'Ana. 2016. Quantitative Microbiology in Food Processing: Modeling the Microbial Ecology. Wiley.
- 5- El-Enshasy, Hesham Ali and Yang Shang-Tian. 2021. Probiotics, the Natural Microbiota in Living Organisms: Fundamentals and Applications. CRC Press.
- 6- Felix. S and Menaga. M. 2021. Applied Aquaculture Biofloc Technology. CRC Press.
- 7- Divya. K.R and Ramasubramanian. V. 2019. Mass production of fresh water live feed: The laboratory culture and Nutritional evaluation of the freshwater copepod Thermocyclops decipiens. LAP LAMBERT Academic Publishing.

Supportive References

Electronic Materials

Other Learning Materials

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
Technology equipment (Projector, smart board, software)	Projector, smart board
Other equipment (Depending on the nature of the specialty)	

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of students assessment	Faculty	Direct
Quality of learning resources	Faculty	Direct
The extent to which CLOs have been achieved	Faculty	Direct
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)





G. Specification Approval Data:

-	BIOLOGY DEPARTMENT COUNCIL
REFERENCE NO.	23
DATE	23/8/1445

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