هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Industrial Fermentations**
Course Code:	**2064202-3**
Program:	**Bachelor in Food Science and Nutrition**
Department:	**Food Sciences and Nutrition Department**
College:	**College of Science**
Institution:	**Taif University**

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A. Course Identification:

1. Credit hours: 3 Hours
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: 10th Level / 4nd year
4. Pre-requisites for this course (if any)**: Molecular Biology (2062240-3)**
5. Co-requisites for this course (if any)**: None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	5	100%
2	**Blended**	---	---
3	**E-learning**	---	---
4	**Distance learning**	---	---
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	20
3	**Tutorial**	---
4	**Others** (specify)	---
	Total	**50**

B. Course Objectives and Learning Outcomes:

1. Course Description

This course deals with studying the fermentation process – cultures preservation - fermentation systems - environments and raw materials used in industrial fermentation - production of solvents and organic acids (ethanol alcohol, glycerol, acetic acid, lactic acid, citric acid) - biomass production (baker's yeast – single cell protein)- production of fermented food (pickles, fermented meat, fermented oriental foods)- production of some food additives (enzymes, vitamins, amino acids and antibiotics)- methods of recovering the fermented product - Quality and safety Fermented foods.

2. Course Main Objective:

1) Providing the student with information and bases related to the preservation and development of microbial cultures and the raw materials used.
2) Discussing and evaluating the different fermentation methods.
3) Production of fermented drinks, organic acids, alcohols, additives and fermented foods
4) Applying different methods to retrieve the fermented product and ensuring the quality and safety of fermented foods.

3. Course Learning Outcomes:

CLOs		Aligned PLOs
1.0	**Knowledge and understanding**	
1.1	Identifies and explains methods for preserving and reactivation of industrial microbes, raw materials used, and fermentation methods on an industrial scale.	**K1**
1.2	Describes the structure of the fermenter and conditions that must be considered in the design of fermenters.	**K2**
1.3	Recognize the optimal conditions for the production of industrial fermentation products at the industrial scale	**K3**

CLOs		Aligned PLOs
2.0	**Skills:**	
2.1	Design the experiments for transferring production conditions from the laboratory level to the industrial scale.	**S 1**
3	**Values:**	
3.1	Cooperate with colleagues in a group to prepare a reports on some of issues related to industrial fermentation in food.	**V 1**

C. Course Content:

No	List of Topics	Contact Hours
1	Introduction and describe the course specifications – Industrial fermentations in foods, and bioconversion requirements of microorganisms in industrial fermentations - Types of fermentation process.	3
2	Study the characteristics of different microorganisms with manufacturing capacity, their importance, and stages of pushing in the industrial fermentation process.	3
3	The important requirements that should be met in the raw materials used in the various microbial fermentation industries.	3
4	Types of industrial fermentors, their characteristics, and the most important specifications that must be met in the fermentors.	3
5	Separation, recovering and purification of the final fermentation product.	3
6	Production of Baker's Yeasts and single cell protein and single cell oil.	3
7	Production of some organic acids, amino acids and biodegradable plastic	6
8	Industrial fermentations in the field of medicine: Insulin and Tetracycline production.	3
9	Industries of cheese, pickles, salted fish, and treated meats.	3
Total		**30**
	Practical Topics	
1	Introduction to industrial fermentations - Methods of preserving microbial cultures (consecutive transfer - freezing – drying - lyophilization).	2
2	Production of cultures of microbial starters used in the fermentation industries.	2
3	Raw materials on which the fermentation industries are based.	2
4	Designing of Fermentors and the most important points should be considered in the installation of the fermenter.	2
5	Production of Baker's Yeasts- Baker's yeast quality tests (microbiological - physiological - chemical)	4
6	Production of ethanol, organic acids and vitamins.	2
7	Artificial algae	2
8	Bio-fertilizers	2
9	Biofuel-Bio-diesel- Biogas.	2
Total		**20**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Identifies and explains methods for preserving and reactivation of industrial microbes, raw materials used, and fermentation methods on an industrial scale.	- Lecture	- Written exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Describes the structure of the fermenter and conditions that must be considered in the design of fermenters.	- Lecture	- Written exam
1.3	Recognize the optimal conditions for the production of industrial fermentation products at the industrial scale	- Lecture	- Written exam
2.0	**Skills**		
2.1	Design the experiments for transferring production conditions from the laboratory level to the industrial scale.	- Lecture and discussion - Practical lessons	- Written and Practical exams
3.0	**Values**		
3.1	Cooperate with colleagues in a group to prepare a reports on some of issues related to industrial fermentation in food.	- Work in small groups	- Oral exam - Report evaluation

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignment and Interaction during lectures	Continues	10%
2	Midterm exam	5-6	20%
3	Weekly Lab. Reports	Continues	20%
4	Practical exam	11	10%
5	Final exam	12	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support:

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

- There are 6 h per week for this purpose and the students know these hours according to the time of professor who teach the course.
- Communicate 24 hours in 7 days via social media, chat, email and blackboard.
- Student satisfaction surveys are conducted for academic guidance.
- Develop an improvement plan for academic guidance based on the results of the questionnaire analysis.

F. Learning Resources and Facilities

1.Learning Resources:

Required Textbooks	- Sajeed Ali (2017). Fermentation and Industrial Microbiology (Ed). Edmonton, AB, Canada (ISBN-10: 8192756920 - ISBN-13: 978-8192756929) - Glazer, Alexander N. (2007). Microbial biotechnology: fundamentals of applied microbiology, 3Ed., Cambridge University Press. - Aydin Berenjian (2019). Essentials in Fermentation Technology. Springer International Publishing (ISBN- 13: 978-3-030-16230-6).
Essential References Materials	- Kuila, A., & Sharma, V. (2018). Principles and applications of fermentation technology. (Eds.). John Wiley & Sons. - Stanbury, P. F., Whitaker, A., & Hall, S. J. (2013). Principles of fermentation technology. Elsevier.
Electronic Materials	- Wikipedia - Sciencedirect.com - Springer - Wiley - PubMed.
Other Learning Materials	- None

2. Facilities Required:

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- Classroom (capacity not more than 40 students) for 3 h/week. - Microbial Lab (capacity not more than 20 students) for 3 h/week
Technology Resources (AV, data show, Smart Board, software, etc.)	- Data Show projectors, Karyotype analysis software and smart blackboard. - Computer Portable PowerPoint presentations to special lectures.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	- Data Show projectors, smart blackboard. - Computer Portable PowerPoint presentations to special lectures. - Autoclave, Incubators, Micropipettes and its tips, Petri dishes, Microscopes, Bioreactor (Fermenter), Disinfectants, Culture media and Samples of different foods.

G. Course Quality Evaluation:

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students, faculty, program leaders and Peer Reviewer	• Continuous monitoring by directors of program and quality assurance unit (Direct). • Applying questionnaires received from the Deanship of Academic Development for Student evaluation (indirect). • Evaluation of course report (indirect).
Extent of achievement of course learning outcomes	Students, faculty, program leaders and Peer Reviewer	• Applying Questionnaires for Student evaluation (indirect). • Evaluation of course report (indirect).
Quality of learning resources	Faculty, program leaders, administrative staff, independent reviewers.	• Continuous monitoring by directors of program and quality assurance unit (Direct). • Applying Questionnaires for Student evaluation (indirect). • Evaluation of course report (indirect).

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	**Department council - Academic Development Committee**
Reference No.	**Department council NO: 5 Subject NO: 2**
Date	**08 /07 /1444 H**