



Course Specifications

Revised November 2019

Course Title:	Microbial physiology
Course Code:	4013452-3
Program:	BSc Microbiology
Department:	Department of Biology
College:	Faculty of Applied Science – Department of Biology
Institution:	UM AL – QURA UNIVERSITY
Revision Date	November 2019

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A. Course Identification

1. Credit hours: 3 hours
2. Course type
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: 3rd Year / Level 6
4. Pre-requisites for this course (if any): Biochemistry (4012312-3) / Introductory Microbiology (4012401-4)
5. Co-requisites for this course (if any): Microbial physiology (4012452-3)

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	50 %
2	Blended		-
3	E-learning		-
4	Correspondence		-
5	Other	30	50 %

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	30
2	Laboratory/Studio	42
3	Tutorial	-
4	Practical/Field work/Internship	6
5	Others (specify)	30
	Total	102
Other Learning Hours*		
1	Study	30
2	Assignments	8
3	Library	15
4	Projects/Research Essays/Theses	10
5	Others (specify)	-
	Total	63

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed for students of applied microbiology to cover the basic aspects of microbial physiology. To explain prokaryotic and eukaryotic structure and composition as well as the means by which nutrients are transported into cells across membranes. The important metabolic processes that occur in prokaryotes and eukaryotic microorganisms under different environmental conditions will be discussed. Explain the central metabolic pathways starting from glucose, as well as other trophic variations found in prokaryotes including the use of organic compounds other than glucose, anaerobic fermentation, anaerobic respiration, chemolithotrophy and photosynthesis. Kinetic of the energy and biochemistry of Nitrogen fixation also will be covered. The regulation of metabolism through control of gene expression and enzyme activity is also covered. Finally, development of the laboratory skills for students will be targeted.

2. Course Main Objective

❖ **After completing this course student should be able to:**

- Distinguish between the eukaryotic and prokaryotic cell structure.
- Describe the bacterial cell components and its function role in the cell
- Define basic concepts of microbial physiology.
- Explain microbial growth, growth kinetics and factors affecting growth.
- Evaluate the importance of central pathways off carbohydrate metabolism for microbial physiology.
- Cell enzymes and its role in nutrition
- Illustrate macromolecular synthesis and processing.
- Link the microbial physiology to the genomics of cells.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge: <ul style="list-style-type: none"> ❖ Upon successful completion of this course The student will be able to: <ul style="list-style-type: none"> • Define basic concepts of microbial physiology. • List the factors effect on the physiological microorganisms • Distinguish between the eukaryotic and prokaryotic cell structure and function. • Explain microbial growth. • Define types of membrane transport for nutrient uptake and protein excretion. • Describe the bacterial cell components and its function role in the cell. • Explain microbial growth, growth kinetics and factors affecting growth. 	
2	Skills:	
2.1	Cognitive skills to be developed <ul style="list-style-type: none"> ❖ Having successfully completed the course students should be 	

CLOs		Aligned PLOs
	<p>able to:</p> <ul style="list-style-type: none"> • Evaluate the importance of central pathways of carbohydrate metabolism for microbial physiology • Link the microbial physiology to the genomics of cells. • Explain how some microorganisms can degrade the macromolecule polymers. • Calculate the kinetic energy in aerobic and anaerobic microbes. • Explain how the extremophiles live in their conditions 	
2.4.	<p>Psychomotor Skills</p> <p>Upon successful completion of this course, the student is expected to be able to:</p> <ul style="list-style-type: none"> • Perform the laboratory experiments precisely • Operate all devices in lab • Diagram biosynthesis pathway for amino acids, fatty acids, organic acids synthesis.. • Illustrate factors affecting the microbial physiology. • Carry out the Experiments to study the factors affecting enzymes and their activities 	
3	Competence:	
3.1	<ul style="list-style-type: none"> ❖ Upon successful completion of this course, the student is expected to be able to: • Developing oral presentations. • Communicating personal ideas and thoughts. • Work independently and as part of a team to finish some assignments. • Communicate results of work to others. • Use of needed precautions when dealing with pathogen microorganisms • Demonstrate professional attitudes and behaviors towards others. • propose the smart questions • understand and dissecting the problem so that it is fully solved understood. • Demonstrate the assertiveness for his decision. • Demonstrate his capability for the responsibility and Accountability • Show Effective verbal communication with clarity and must be characterize with the following interpersonal attributes; (verbal communication, non-verbal communication, good listening for the others, questioning, good manners, problem solving, social awareness, self-management, responsibility and accountability). • Enhancing the ability of students to use computers and internet. • Interpret the laboratory data • Know how to write a report 	

C. Course Content

1 Topics to be Covered		
Topic	No of Weeks	Contact hours
❖ Introduction: -Overview of microbial physiology -Microbial diversity and relation to activity	1	2
❖ Microbial growth - Growth kinetics, growth curve, measurement of growth and growth yields. - Synchronous growth and Continuous culture. Factors affecting microbial growth.	2	4
❖ Metabolic diversity among microorganisms Respiration, Photosynthesis, acetogenesis, methanogenesis, nitrogen fixation, and hydrocarbon transformation in microorganisms.	2	2
❖ Central pathways and microbial activities - Carbohydrates: major pathways (EMP, TCA, Glyoxylate cycle). Biosynthesis of Oligosaccharides. Lipids: Fatty acid biosynthesis and oxidation	4	8
❖ Aerobic vs anaerobic processes - Respiratory chains (components and function) - Aerobic vs anaerobic respiration and relation to growth - Growth of anaerobes Fermentation and fermentative microorganisms	2	4
❖ Biocatalysis and Biocatalyst -Enzymes and their classification, Enzyme kinetics, allosteric enzymes, -Michaelis- Menten equation, - coenzyme, isozyme, -Enzyme inhibition and regulation. -Enzyme structure and function. -Factors affecting enzyme activity .	3	6
	14 weeks	28hrs

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		
1.1	Upon successful completion of this course The student will be able to: <ul style="list-style-type: none"> Define basic concepts of microbial physiology. List the factors effect on the physiological microorganisms Distinguish between the 	<ul style="list-style-type: none"> The methodology includes a combination of lectures by the lecturer, seminar 	<ul style="list-style-type: none"> Periodical exam and reports 10% Mid- term theoretical exam 20% Mid-term practical exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	<p>eukaryotic and prokaryotic cell structure and function.</p> <ul style="list-style-type: none"> • Explain microbial growth. • Define types of membrane transport for nutrient uptake and protein excretion. • Describe the bacterial cell components and its function role in the cell. • Explain microbial growth, growth kinetics and factors affecting growth. 	<p>presentation by the students and web-interactions.</p> <ul style="list-style-type: none"> • At the end of the programme, students will be divided into groups for seminar presentation on important areas of the course to assess their understanding and comprehension of the course. • All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions. • Using images and movies • Encouraging students to collect the new information about what the new in microbial physiology • Enable the reference books and scientific sites concerning bacteriology in internet. 	<p>5%</p> <ul style="list-style-type: none"> • Final practical exam 15% • Final exam 50%
2.0	Skills		
2.1	<p>Cognitive skills</p> <p>Having successfully completed the course students should be able to:</p> <ul style="list-style-type: none"> • Evaluate the importance of central pathways of carbohydrate metabolism for microbial physiology • Link the microbial physiology to the genomics of cells. • Explain how some 	<p>- Lectures - Brain storming - Discussion</p>	<p>- Exam must contain questions that can measure these skills. - Quiz and exams - Discussions after the lecture.</p>

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	<p>microorganisms can degrade the macromolecule polymers.</p> <ul style="list-style-type: none"> • Calculate the kinetic energy in aerobic and anaerobic microbes. • Explain how the extremophiles live in their conditions 		
2.2	<p>Psychomotor Skills Upon successful completion of this course, the student is expected to be able to:</p> <ul style="list-style-type: none"> • Perform the laboratory experiments precisely • Operate all devices in lab • Diagram biosynthesis pathway for amino acids, fatty acids, organic acids synthesis.. • Illustrate factors affecting the microbial physiology. • Carry out the Experiments to study the factors affecting enzymes and their activities 	<p>- Follow up students the students in lab and during carryout all the laboratory experiments</p>	<p>-Giving additional marks for the students they have accurate laboratory results and good seminar presentation -Practical exam.</p>
3.0	Competence		
	<p>❖ Upon successful completion of this course, the student is expected to be able to:</p> <ul style="list-style-type: none"> • Developing oral presentations. • Communicating personal ideas and thoughts. • Work independently and as part of a team to finish some assignments. • Communicate results of work to others. • Use of needed precautions when dealing with pathogen microorganisms • Demonstrate professional attitudes and behaviors towards others. • propose the smart questions • Understand and dissecting the problem so that it is fully solved understood. • Demonstrate the assertiveness for his decision. • Demonstrate his capability for the responsibility and Accountability • Show Effective verbal communication with clarity and must be characterize with the following 	<ul style="list-style-type: none"> • Lab work • Case Study • Active learning • Small group discussion • Homework (preparing a report on some topics related to the course depending on web sites). • Seminars presentation • Practical during carryout the experiments in the lab. 	<ul style="list-style-type: none"> • Oral exams. • Evaluate the efforts of each student in preparing the report. • Evaluate the scientific values of reports. • Evaluate the work in team • Evaluation of the role of each student in lab group assignment • Evaluation of students presentations

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	<p>interpersonal attributes; (verbal communication, non-verbal communication, good listening for the others, questioning, good manners, problem solving, social awareness, self-management, responsibility and accountability).</p> <ul style="list-style-type: none"> Enhancing the ability of students to use computers and internet. Interpret the laboratory data Know how to write a report 		

2. Assessment Tasks for Students

5. Schedule of Assessment Tasks for Students During the Semester				
Assessment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Exam duration	Proportion of Final Assessment
1	Periodical Exam (s)	4	15 min	10 %
2	Mid Term Exam (Theoretic)	8	60 min	20 %
3	Mid Term Exam (practical)	9	30 min	10 %
4	Reports and essay	11	--	5 %
5	Final Practical Exam	15	60 min	15 %
6	Final Exam	16	120 min	40 %
Total Marks				100%

*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 :

Office hours: 10hrs.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	<p>1- Book note prepared by Dr. Abdelrahman Assaedi</p> <p>2- Madigan, M.T; Martinko, J.M and Parker, J (2012). Brocks Biology of Microorganisms. (13th ed.). Prentice Hall International. ISBN-13: 978-0-321-64963-8</p>
Essential References Materials	<p>1-Moat, A.G; Foster, J.W and Spector, M.P (2002). Microbial Physiology (4th ed.). John Wiley & Sons Inc.</p> <p>2- Cappuccino, J.G and Sherman, N (2002). Microbiology, a Laboratory Manual (6th ed.). Benjamin Cummings</p> <p>1. Prescott, L., Harley, J. and Klien, D. (2005). Microbiology, MacGraw</p>

Electronic Materials	-BioCyc Database Collection (http://biocyc.org/) -ASM-Microb Library (http://www.microbelibrary.org/)
Other Learning Materials	<ul style="list-style-type: none"> • PPT prepared by Dr. Abdelrahman Asaedi

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> • Class room is already provided with data show • The area of class room is suitable concerning the number of enrolled students (68) and air conditioned
Technology Resources (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none"> • Digital lab containing 15 computers.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	<ul style="list-style-type: none"> • Incubators, autoclaves, measuring equipment, water bath, digital balances, pH meters, safety facilities. • Availability of some reference bacterial strains • Different media • All chemicals and reagents needed

G. Course Quality Evaluation

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching <ul style="list-style-type: none"> • Questionaries • Open discussion in the class room at the end of the lectures.
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department <ul style="list-style-type: none"> • Revision of student answer paper by another staff member. • Analysis the grades of students.
3. Processes for Improvement of Teaching <ul style="list-style-type: none"> • Preparing the course as PPT. • Using scientific movies. • Coupling the theoretical part with laboratory part • Periodical revision of course content.
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) <ul style="list-style-type: none"> • After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. <ul style="list-style-type: none"> • Periodical revision by Quality Assurance Units in the Department and institution

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

Prepared by faculty staff: 1. Dr. Abdelrahman S. Assaedi	Signature:
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2. Dr. Khaled Elbanna	
Date Report Completed: November 2019	
Revised by: 1. Dr. Khaled Elbanna 2. Dr. Hussein H. Abulreesh 3. Dr. Shady Elshahawy	Signature:
Date: 1.10.2019	
Program Chair Dr. Hussein H. Abulreesh	Signature:
Dean	Signature:
Date:	