Course Specifications

Revised November 2019

Course Title:	**Introductory Microbiology**
Course Code:	**4012401-4**
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:	**4 hours**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ■ Elective ☐
3. Level/year at which this course is offered:	**2nd Year / Level 3**
4. Pre-requisites for this course (if any):	**General Biology (4011012-4).**
5. Co-requisites for this course (if any)**:**	

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**	**42**
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

The course will cover the principle of eukaryotic and prokaryotic microbes and viruses, but will emphasize bacteria. This course will provide a conceptual and experimental background in microbiology sufficient to enable students to take courses that are more advanced in related fields.

2. Course Main Objective

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

- Define the principles and concepts of Microbiology.
- List roles the microorganisms in the nature
- Differentiate between Eukaryotes and Prokaryotes cell structure.
- Apply basic laboratory skills and techniques for studying microorganisms.
- Explain the bases of diversity, structure, physiology, microbial growth, environmental effects, growth and control, and general taxonomy of microorganisms.
- Describe the importance of microorganisms in relation to Biology and environment.
- Evaluate students' interest in ethical aspects in the exploitation of microbial biotechnology.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
	❖ **Upon successful completion of this course The student will be able to:** • Describe the importance of microorganisms in relation to biology and environment. • Define the principles and concepts of Microbiology. • Describe the growth and division of the cell. • List different bacterial cell morphologies. • Identify microbial structures from a given image. • Describe how the cell structure of Gram-negative and Gram-positive cells leads to a given Gram stain result. • Identify (model or diagram) major eukaryotic cell structures and their associated functions. • State unique structures present in Eukaryotes. • Label illustrative diagrams for key parts of microorganisms • Define the Scientific terms for antimicrobial activities • Describe factors influencing microbial growth • Describe the role of cyanobacteria in the oxygenation of the atmosphere.	
2	**Skills:**	
2.1	**Cognitive skills to be developed** ❖ Having successfully completed the course students should be able to: • Differentiate between prokaryotic and eukaryotic cells. • Diagram the structure of prokaryotic and eukaryotic cells. • Analyze requirements of microbial growth.	

	CLOs	Aligned PLOs
	• Evaluate methods of microbial control and apply proper methods. • Explain how microbial metabolism is important to a relevant societal issue (e.g., health and disease, agriculture, environment and biodegradation, etc.). • Write the positive and negative roles of microorganisms • Interpret how some microorganisms life well in some extreme environments. • Explain why some Gram positive bacteria become Gram-negative stain sometimes during Gram staining.	
2.4.	**Psychomotor Skills** ❖ Upon successful completion of this course, the student is expected to be able to: • Perform aseptic microbiological techniques. • Preparation different media for isolation and cultivation of bacteria • Perform isolation, culture, and identification techniques for studying microorganisms in a laboratory. • Cultivate the bacterial isolates on the agar plates. • Operate selected microbiological instruments.	
3	**Competence:**	
3.1	❖ Upon successful completion of this course, the student is expected to be able to: • Evaluate microbiological information. • Analyze microbiological data. • Judge the importance of controlling microbial growth. • Choose representative examples for each group of microorganisms. • 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:** - Including historical background. - Importance of microorganisms. -Studying concepts of classification, nomenclature, and identification of microorganisms. -An overview about the role of microorganisms in the environment and their applications in different fields - Distribution of microorganisms in the environment - Different between the prokaryotes and Eukaryotes	**2**	**6**
❖ **Bacterial cell morphology and structure** - Structure, cell shape and arrangement of bacteria. - External and internal structures**.**	**1**	**3**
❖ **Eukaryotic microorganisms (Fungi and Algae)** - General characteristics, occurrence, diversity, economic importance, morphology, structure and function, classification, nutrition, and reproduction**.**	**1**	**3**
❖ **Viruses** - General characteristics, occurrence, economic importance, morphology and structure, classification, replication, and bacteriophages.	**1**	**3**
❖ **Introduction to metabolism of microorganisms** -Basic definitions, modes of nutrition of microorganisms. Nutrient requirements and concepts of energetic.	**1**	**3**
❖ **Factors affecting microbial activity and growth** Nutritional factors, temperature, pH, water activity, Oxygen requirement.	**1**	**3**
❖ **Microbial growth and reproduction** Cell growth and reproduction in microorganisms. Microbial growth curve and phases of growth. Determination of microbial growth.	**1**	**3**
❖ **Control of microbial activity** Definition, importance of control of microbial activity, physical and chemical approach of control of microbial activity.	**1**	**3**
❖ **Applied Microbiology** Application of microorganisms in soil, water, sewage, food, dairy, industrial and medical microbiology.	**3**	**9**
❖ **Microbes and environment** Alternative energy resources (Biogas), bioremediation (biodegradation of hydrocarbon, industrial and domestic wastes and pesticides). Microbes and biological control. Genetic engineering and solving food deficiency problems (Single cell protein).	**2**	**6**
	14 weeks	**42hrs**
Practical Part:		
1. Learning the equipment of a common microbiology laboratory.		**3**
2. Preparation of culture media (agar/ broth).		**3**

3. Learning the techniques of sterilization		**3**
4. Isolation of pure culture.		**3**
5. Enumeration of microbial population.		**3**
6. Enumeration of microbial population.		**3**
7. Staining techniques to study morphology of miroorganisms		**3**
8. Staining technique for endospore, Gram staining.		**3**
9. Checking the motility of bacteria by hanging drop method		**3**
10. Estimation of proteins.		**3**
11. Estimation of glucose.		**3**
12.Measurement of bacterial growth spectrophotometrically		**3**
13. Isolation and cultivation of anaerobes		**3**
14. Checking the motility of bacteria by hanging drop method		**3**

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: • Describe the importance of microorganisms in relation to biology and environment. • Define the principles and concepts of Microbiology. • Describe the growth and division of the cell. • List different bacterial cell morphologies. • Identify microbial structures from a given image. • Describe how the cell structure of Gram-negative and Gram-positive cells leads to a given Gram stain result. • Identify (model or diagram) major eukaryotic cell structures and their associated functions. • State unique structures present in Eukaryotes. • Label illustrative diagrams for key parts of microorganisms • Define the Scientific terms for antimicrobial activities • Describe factors influencing microbial growth. • Describe the role of cyanobacteria in the oxygenation of the atmosphere.	• The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions. • Students will be given opportunity to understand the role of important microorganisms in different applications and human service. • 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	• Periodical exam and reports 10% • Mid- term theoretical exam 20% • Mid-term practical exam 5% • Final practical exam 15% • Final exam 50%

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		movies • Encouraging students to collect the new information about what the new bacteriology • - Enable the reference books and scientific sites concerning general microbiology in internet.	
2.0	**Skills**		
2.1	**Cognitive skills** ❖ Having successfully completed the course students should be able to: • Differentiate between prokaryotic and eukaryotic cells. • Diagram the structure of prokaryotic and eukaryotic cells. • Analyze requirements of microbial growth. • Evaluate methods of microbial control and apply proper methods. • Explain how microbial metabolism is important to a relevant societal issue (e.g., health and disease, agriculture, environment and biodegradation, etc.). • Write the positive and negative roles of microorganisms • Interpret how some microorganisms life well in some extreme environments. • Explain why some Gram positive bacteria become Gram-negative stain sometimes during Gram staining.	• Lectures • Brain storming • Discussion	• Exam must contain questions that can measure these skills. • Quiz and exams • Discussions after the lecture.
2.2	**Psychomotor Skills** ❖ Upon successful completion of this course, the student is expected to be able to: • Perform aseptic microbiological techniques. • Preparation different media for isolation and cultivation of bacteria • Perform isolation, culture, and identification techniques for studying microorganisms in a laboratory.	- Follow up students the students in lab and during carryout all the laboratory experiments	-Giving additional marks for the students they have accurate laboratory results and good seminar presentation -Practical exam.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	• Cultivate the bacterial isolates on the agar plates. Operate selected microbiological instruments.		
3.0	**Competence**		
3.1	❖ Upon successful completion of this course, the student is expected to be able to: • Evaluate microbiological information. • Analyze microbiological data. • Judge the importance of controlling microbial growth. • Choose representative examples for each group of microorganisms. • 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.	- 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.	- 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

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 Text(s):

-Book note prepared by Dr. Samir Organjii

-Brock Biology of Microorganisms, Twelfth edition by Madigan, Martinko, Dunlap and Clark; Publisher: Pearson Prentice-Hall, ISBN: 0132324601 (2008).

-Benson, H.J. (2002). Microbiological Applications. Laboratory Manual in General Microbiology, eighth edition.

Recommended Reading List

1-Prescott, L., Harley, J. and Klien, D. (2005). Microbiology, MacGraw

2-Larry McKane & Judy Kandel (1996) Microbiology–Essential and Applications, International Edition.

Electronic Materials, Web Sites
(eg. Web Sites, Social Media, Blackboard, etc.)

Other learning material such as computer-based programs/CD, professional standards/regulations
PPT prepared by prof. Dr. Khaled Elbanna.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• 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,	• Digital lab containing 15 computers.

Item	Resources
etc.)	
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	• Incubators, autoclaves, measuring equipment, water bath, digital balances, Microscopes, pH meters, safety facilities. • Availability of some reference bacterial strains • All chemicals, stains, media and reagents that needed

G. Course Quality Evaluation

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching • 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 • Revision of student answer paper by another staff member. • Analysis the grades of students.
3. Processes for Improvement of Teaching • 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) • After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • **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.)

H. Specification Approval Data

Prepared by faculty staff: **1. Dr. Samir Organjii**	**Signature:**
Date Report Completed: November 2019	
Revised by: 1. Dr. Khaled Elbanna 2. Dr. Hussein H. Abulreesh 3. Dr. Shady Elshahawy	**Signature:**
Date: November 2019	
Program Chair **Dr. Hussein H. Abulreesh**	**Signature:**
Dean	**Signature:**
Date:	