# Course Specification
## (Bachelor)

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|---|---|
| **Course Title:** | **Bacteriology** |
| **Course Code:** | **BIO 1242** |
| **Program:** | Bachelor of Science in Biology |
| **Department:** | Biology |
| **College:** | Science |
| **Institution:** | Imam Mohammad Ibn Saud Islamic University |
| **Version:** | *Course Specification Version Number* |
| **Last Revision Date:** | *Pick Revision Date.* |

## Table of Contents

## A. General information about the course:

### 1. Course Identification

| 1. Credit hours: 4 (3 Lectures + 2 Lab + 0 Tutorials). | | | | | |
|---|---|---|---|---|---|
| **2. Course type** | | | | | |
| A. | ☐University | ☐College | ☐Department | ☐Track | ☐Others |
| B. | ☒ Required | | ☐Elective | | |
| **3. Level/year at which this course is offered: (.....)** | | | | | |
| **4. Course General Description:** | | | | | |
| **The course covers the fundamental principles related to bacteria mainly of bacterial organization importance and their interaction with host cells and molecular events during their replication.** | | | | | |
| **5. Pre-requirements for this course** (if any): | | | | | |
| **General Microbiology – BIO 241** | | | | | |
| **6. Co-requisites for this course** (if any): | | | | | |
| None | | | | | |
| **7. Course Main Objective(s):** | | | | | |
| **By the end of the semester, the student should be able:**<br>**To identify the basic shapes of bacteria.**<br>**To describe the structure and organization of bacteria.**<br>**To describe Bacterial requirement for growth and multiplication.**<br>**To classify bacteria on the basis of preferred temperature range.**<br>**To explain how microbes are classified on the basis of oxygen requirement.**<br>**To describe Bacterial growth curve.** | | | | | |

### 2. Teaching mode (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | Traditional classroom | √ | 100% |
| 2 | E-learning | | |
| 3 | Hybrid<br>• Traditional classroom | | |

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| | • E-learning | | |
| 4 | Distance learning | | |

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

| No | Activity | Contact Hours |
|---|---|---|
| 1. | **Lectures** | 45 |
| 2. | **Laboratory/Studio** | 30 |
| 3. | **Field** | 0 |
| 4. | **Tutorial** | 0 |
| 5. | **Others (specify)** | 0 |
| **Total** | | 75 |

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Code of CLOs aligned with program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| **1.0** | **Knowledge and understanding** | | | |
| 1.1 | To list the general characteristics of bacteria and how to study them and to define the growth, metabolism and genetics of bacteria. | 1.1 | Three hours weekly containing lectures and laboratory classes. | Students will be evaluated on their ability to present complete solutions to problems. |
| 1.2 | To state how specific bacterial pathogens, interact with their host to cause disease. | 1.1-1.2 | To encourage making regular visits during office hours where they can ask any questions about the course. | Performance must include class examinations, frequent homework assignments midterm 1, midterm 2, final lab. Exam and final exam) |

| Code | Course Learning Outcomes | Code of CLOs aligned with program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| ... | | | | |
| **2.0** | **Skills** | | | |
| 2.1 | To develop a knowledge base of principles of microbial taxonomy, structure, physiology and function. | 2.1 | Self-study is an important method for students' learning. Introduce some concepts by examples from real-life problems (i.e. laboratory) | Questions in lectures. Short quizzes and exams |
| 2.2 | To demonstrate the ability to use the laboratory to diagnose infections, including appropriate specimen collection and test ordering. | 2.2-2.3 | Motivate students to work cooperatively with their class mates to develop individual skills. | Participation through class work. |
| ... | | | | |
| **3.0** | **Values, autonomy, and responsibility** | | | |
| 3.1 | To illustrate the ability to communicate their ideas with the instructor at all times during and after the class. | 2.2-3.1 | Encourage the students to use electronic mail and network in submitting home works and assignments. | Evaluating the laboratory written reports and calculation skills. |
| 3.2 | To operate laboratory instruments and computers. | 3.3 | Presentations.<br>Virtual labs. | Laboratory performance and reports. |
| 3.3 | To demonstrate the different types of microorganisms. | 2.2-3.1 | Virtual labs and demonstrations | Group work and oral presentations |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | Cell organization. Cell size, shape and arrangement, glycocalyx, capsule, flagella, endoflagella, fimbriae and pili. Cell-wall: Composition and detailed structure of gram positive and gram-negative cell walls, Archaebacterial cell wall, Gram and acid-fast staining mechanisms, lipopolysaccharide (LPS), | 3 |

| | | |
|---|---|---|
| | sphaeroplasts, protoplasts, and L-forms. Effect of antibiotics and enzymes on the cell wall. | |
| 2 | Cell Membrane: Structure, function and chemical composition of bacterial and archaeal cell membranes | 3 |
| 3 | Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids | 3 |
| 4 | Endospore: Structure, formation, stages of sporulation. | 3 |
| 5 | Bacteriological techniques. Pure culture isolation: Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, and accessing non-culturable bacteria. | 3 |
| 6 | Growth and nutrition. Nutritional requirements in bacteria and nutritional categories. | 3 |
| 7 | Culture media: components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media. | 3 |
| 8 | Sterilization and Disinfection. Physical methods of microbial control: heat, low temperature, high pressure, filtration, desiccation, osmotic pressure, radiation Chemical methods of microbial control: disinfectants, types and mode of action. | 3 |
| 9 | Reproduction in Bacteria. Asexual methods of reproduction, logarithmic representation of bacterial populations, phases of growth, calculation of generation time and specific growth rate. | 3 |
| 10 | Bacterial Systematics. Aim and principles of classification, systematics and taxonomy, concept of species, taxa, strain; conventional, molecular and recent approaches to polyphasic bacterial taxonomy, evolutionary chronometers, rRNA oligonucleotide sequencing, signature sequences, and protein sequences. Differences between eubacteria and archaebacteria. | 3 |
| 11 | Important archaeal and eubacterial groups. According to Bergey's Manual of Systematic Bacteriology (Second Edition). Archaebacteria: General characteristics, phylogenetic overview, genera belonging to Nanoarchaeota (Nanoarchaeum), Crenarchaeota (Sulfolobus, Thermoproteus) and Euryarchaeota. [Methanogens (Methanobacterium, Methanocaldococcus), thermophiles (Thermococcus, Pyrococcus, Thermoplasma), and Halophiles (Halobacterium, Halococcus). | 3 |
| 12 | Eubacteria: Morphology, metabolism, ecological significance and economic importance of following groups. Gram Negative: Non proteobacteria Aquifex, Thermotoga, Deinococcus, Thermus, Chlorobium, Chloroflexus, Chlamydiae, Spirochaetes. Alpha proteobacteria Rickettsia, Coxiella, Caulobacter, Rhizobium, Hyphomicrobium, Agrobacterium. Beta proteobacteria Neisseria, Burkholderia, Thiobacillus Gamma proteobacteria Enterobacteriaceae family, Purple sulphur bacteria, Pseudomonas, Vibrio, Beggiatoa, Methylococcus, Haemophilus. Delta proteobacteria Bdellovibrio, Myxococcus Epsilon proteobacteria Helicobacter, Campylobacter | 6 |

| | | |
|---|---|---|
| 13 | Gram Positive: Low G+ C (Firmicutes) Mycoplasmas, Clostridium, Heliobacterium, Lactobacillus, Lactococcus, Staphylococcus, Streptococcus, Leuconostoc, Bacillus. High G+C (Actinobacteria) Arthrobacter, Bifidobacterium, Corynebacterium, Frankia, Mycobacterium, Nocardia, Streptomyces, Thermomonospora, Propionibacterium. | 3 |
| 14 | Cyanobacteria. Revision. | 3 |
| **Total** | | **45** |

## D. Students Assessment Activities

| No | Assessment Activities * | Assessment timing (in week no) | Percentage of Total Assessment Score |
|---|---|---|---|
| **1.** | Midterm 1 | Around 6th -7th week | 15% |
| **2.** | Midterm 2 | Around 11th - 12th week | 15% |
| **3.** | Quizzes, Attendance, Participation, Home works. | All the semester | 10 % |
| **4.** | Lab reports. | All the semester | 5% |
| **5.** | Lab Exam. | Around 15th week | 15 % |
| **6.** | Final Exam. | Around 15th - 16th week | 40 % |
| **...** | **TOTAL** | | 100% |

*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** | Salle A. J. (2007): Fundamental Principles of Bacteriology, Even press, ISBN10: 1406707376, ISBN-13: 978-1406707373. • Ted R. (2015): Johnson. Laboratory Experiments in Microbiology 11th ed.,ISBN-13: 9780321994936. |
| **Supportive References** | https://legacy.saylor.org/bio407/Intro/. |
| **Electronic Materials** | https://archive.org/details/fundamentalprinc029784mbp |

| Other Learning Materials | CD for Bacteriology |
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## 2. Required Facilities and equipment

| Items | Resources |
|---|---|
| **facilities**<br>(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.) | Each classroom is equipped with PC and retro projector with a maximum of 30 students. And the laboratory room is equipped with many laboratory instruments with a maximum of 20 students. |
| **Technology equipment**<br>(projector, smart board, software) | The computers are equipped with different software's. and connected to data show and to smart board. |
| **Other equipment**<br>(depending on the nature of the specialty) | Specific laboratory equipment for this course including posters, models of different experimental animals, dissection instruments, light microscopes, dissection microscopes, microtome instrument, slide preparations, mixer, fluorescent microscopes, ELISA unit for detecting Ag-Ab reactions, different media for cultures and sensitivities, centrifuges, incubators, ovens and other glasswares. |

## F. Assessment of Course Quality

| Assessment Areas/Issues | Assessor | Assessment Methods |
|---|---|---|
| Effectiveness of teaching | Specialized committees | Indirect |
| Effectiveness of Students assessment | Students | Direct |
| Quality of learning resources | Course coordinator | Direct |
| The extent to which CLOs have been achieved | Faculty | Indirect |
| Other | | |

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

## G. Specification Approval

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|---|---|
| COUNCIL /COMMITTEE | Head of biology department |
| REFERENCE NO. | |
| DATE | |