

## **Course outline for “Fundamentals of Microbiology (BIOL 315)”**

Instructor Dr. Samina Mehnaz  
E-mail: [saminamehnaz@fccollege.edu.pk](mailto:saminamehnaz@fccollege.edu.pk)  
Office hour: Monday, Wednesday, Friday: 2:00 pm to 3:00 pm

### **Textbooks**

1. Tortora, G.J., *et al.* 2019. Microbiology – An Introduction. 13<sup>th</sup> Edition. Pearson Education, Inc. USA
2. Cappucino J. G. and Sherman N. 2013. Microbiology: A Laboratory Manual. 10<sup>th</sup> Edition. Pearson Education, Inc. USA

### **Course Introduction**

This course deals with History of microbiology, study of microbial life including Bacteria, Fungi, Virus, Protozoa, Algae; Different types of Viruses and their life cycles; Bacterial growth in different environments and on different media; Control of microbes by using different Physical and Chemical methods; Bacterial genetics, Mutation and its types, mutagens, transcription and translation in eukaryotes and prokaryotes; Antimicrobial Drugs, Anti-microbial resistance; Mechanisms used by microbes for their protection; antimicrobial drugs and their mode of action; Applications of microbes in Food industry, Biotechnology, Environmental science, wastewater treatment, biofuels.

### **Learning Objectives**

- To learn about different forms of microbial life including different viruses and their life cycles
- Learn about different types of bacteria, their growth, how to control and/ or kill the pathogenic microbes at home, public places, hospitals, etc.
- How antibiotics kills bacteria and how bacteria develop resistance against antibiotics?
- Role of Microbes and Microbiology in daily life
- How to apply knowledge in making decisions in routine life?

### **COURSE POLICIES**

- **Exam**  
All exams and quizzes will be conducted face to face or on-line according to situation as advised by administration.
- **Attendance:**  
Minimum 80% attendance in class and 80% in lab is required to sit in Midterm, final term and lab exam.

**“Kindly keep your cell phone on silent during class”**

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**Grading: Bonus Assignment/presentation = 5%**

<b>Activity to be Assessed</b>	<b>Weightage (%age)</b>
Midterm Exam	25
Final Exam	25
Quizzes (4)	(4 x 5) = 20
Attendance	5
Lab notebook	5
Lab Exam	20
<b>Total</b>	<b>100</b>

Quiz 1: After 25% syllabus covered

Quiz 2: After 50% syllabus covered

**Midterm: after 50% syllabus covered**

Quiz 3: After 75% syllabus covered

Quiz 4: After 100% Syllabus covered

**Final term: After 100% syllabus covered**

**Lab exam will be on last lab day. Complete checked Lab notebook has to be submitted on exam day.**

**All 4 quiz will be counted towards grade.**

**Assignment/Presentation will be announced in the first class and can be submitted/presented any time before final exam.**

**Kindly bring Lab Coats for each lab.**

**Food and drinks are not allowed inside the lab**

## Course Plan

Week	Contents	Laboratory Work
1	Introduction of microbiome, different types of microbes, Nomenclature and classification of living organisms, History of Microbiology (Chapter 1)	Introduction, lab safety, use of Stereoand Compound microscopes, Biosafety Cabinet, Autoclave, Oven, Incubator
2	Prokaryotic cell, structures external to cell wall, Cell wall, structures internal to cell wall (Chapter 4)	Sterilization techniques; Microscopic study of Prokaryotic and Eukaryotic cells from different sources like pond water, leaf epidermis, onion peel
3	Movement of material across cell membrane, nucleoid, ribosomes, inclusions, endospores; Eukaryotic cell, organelles of eukaryotes, evolution of prokaryotes to Eukaryotes (Chapter 4)	Study of Bacteria, Fungi, Algae, Protozoa, (Prepared Slides), Growth of protozoa culture, Fungal Culture (slide preparation), Gram Staining (slide preparation from Yogurt)
4	The Eukaryotes, Fungi; Characters, life cycle, medically important fungi, fungal diseases, importance of fungi; Lichens, types of lichens, economic importance (Chapter 12)	Isolation of bacteria from Soil, Serial dilution, Spread plate method, counting of bacterial colonies, maintaining pure culture, colony morphology
5	Algae; Characters, types, role in nature; Protozoa; Characters, medically important protozoa, slime molds and their life cycles (Chapter 12)	Growing bacterial in liquid medium, use of spectrophotometer for measuring bacterial growth
6	Viruses, Viroids and Prions: General characteristics, Virus Structure, Isolation, Cultivation, Identification (Chapter 13)	Biochemical tests for bacterial identification by using QTS 24 identification kits
7	Multiplication of viruses; RNA viruses, DNA viruses, retroviruses, viroids, prion (Chapter 13)	Antibiotic resistance of bacterial culture
8 & 9	Bacterial Growth: Physical and Chemical requirement for growth, culture media, Growth phases, measurement of growth (Chapter 6)	Screening of bacteria for plant growth promoting activities, colorimetric Assay for IAA production
10	Control of Microbial Growth: Action of microbial control agents, Physical methods (Chapter 7)	Nitrogen fixation Assay, Phosphate and Zinc solubilization assay
11	Chemical methods; Microbial characteristics and microbial control (Chapter 7)	Antifungal activity, HCN production Assay, Siderophore production Assay
12 & 13	Mutations: types of mutations, DNA repair, Mutagens, Genetic Transfer and recombination: Transformation, Conjugation, transduction, Plasmids and transposons (Chapter 8)	Extracellular enzyme production by Bacteria
14 & 15	Action of antimicrobial Drugs, Spectrum of Antibiotics, Antibacterial and Antifungal Drugs (Chapter 20)	Revision

16	Anti-protozoan, Anti-helminthus and antiviral Drugs, Resistance to antimicrobial drugs, Future of Chemotherapeutic agents (Chapter 20)	Lab exam
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