

MICROBIOLOGY

Lecture syllabus for the academic year 2026/2027

1. Subject of microbiology. Pharmaceutical microbiology. Characterization and classification of microorganisms. Characteristics of eubacteria, cyanobacteria, archaea, fungi, algae, protozoa, and viruses. Role of microorganisms in nature. Structure and form of the prokaryotic (bacterial) cell. Bacterial cell walls, membranes, nucleus, ribosomes, glycocalyx, flagella, and fimbriae. Bacterial spores. Life cycle of spore-forming bacteria.
2. Bacterial growth. Bacterial culture and cultivation. Reproduction of bacterial cells. Biofilm. Communication between bacteria. Genetics of bacteria. Modifications and mutations. Mutagens and mutagenesis. Bacterial plasmids and transposons. Recombination, transformation, conjugation, and transduction in bacterial cells. Exploitation of microbial genetics in pharmacy.
3. Relationships between microorganisms and their hosts. Factors and principles of pathogenicity, virulence, and infection.
4. Classification and taxonomy of bacteria. Properties of selected bacterial species. Spirochetes, *Chlamydia*, and *Proteobacteria*. Morphology, habitat, pathogenicity, therapy, and prophylaxis of infections caused by these bacteria.
5. Morphology, habitat, pathogenicity, therapy, and prophylaxis of infections caused by Gram-positive bacteria.
6. Antibiotics and synthetic antimicrobial chemotherapeutics. Classification according to their structure and site of action. Mechanism of action of antibiotics and synthetic antimicrobial chemotherapeutics. Mechanisms of resistance of bacteria against antibiotics.
7. Bacterial resistance to antibiotics and non-antibiotic antimicrobial agents.
8. Structure, habitat, reproduction, and pathogenicity of fungi and protozoa. Medically important species. Antifungal and antiprotozoal antibiotics and chemotherapeutics
9. Properties, structure, and replication of viruses.
10. Classification of viruses. Properties of selected viral species. Pathogenicity of viruses, therapy, and prophylaxis of viral diseases. Bacteriophages.
11. Sterilization, disinfection, and preservation. Principles and practice. Sterilization control and sterility testing. Chemical disinfectants, antiseptics, and preservatives. Mode of action of non-antibiotic antimicrobial agents. Factors affecting the disinfection process.
12. Ecology of microorganisms as it affects the pharmaceutical industry. Microbial spoilage of pharmaceutical products. Microbiological control of drugs. Pharmacopoeial criteria for the microbial quality of drugs.

1st YEAR – WINTER SEMESTER

MICROBIOLOGY

Practical exercises for the academic year 2026/2027

IT IS OBLIGATORY TO WEAR A LAB COAT

AND DISPENSABLE GLOVES IN THE LABORATORY!!!

**Students without protective equipment WILL NOT BE ALLOWED INTO THE LABORATORY
and WILL NOT BE ABLE TO PARTICIPATE IN THE EXERCISE!**

Seminar 1 (28/09/2026)	Growth of microbial population. Measuring microbial growth.
Lab exercise 1 (12/10/2026)	Laboratory safety. Manipulation of microorganisms. Pipette handling. Aseptic technique. Gram stain. Examination of bacteria – Bright field microscopy.
Lab exercise 2 (26/10/2026)	Bacteria from the genus <i>Staphylococcus</i> . Properties and identification of the bacteria from the genus <i>Streptococcus</i> . 1st Pre-Test
Lab exercise 3 (09/11/2026)	Identification and properties of the bacteria of the order <i>Enterobacterales</i> . Differential plating. Biochemical Tests.
Lab exercise 4 (23/11/2026)	Bacterial resistance to antibiotics and non-antibiotic antimicrobial agents. Principles and methods of assaying antibiotics. Methods of evaluation of bacterial sensitivity. 2nd Pre-Test
Lab exercise 5 (07/12/2026)	Microscopic filamentous fungi.

CONDITIONS FOR ADMISSION TO FINAL EXAM:

1. Attendance at all practical exercises and seminars.
2. Preparation of reports from all practical exercises and seminars.
3. Achievement of minimally **60%** points from **each** re-Test.

PRE-TEST TOPICS:

1st Pre-Test (26/10/2026):

- Bacterial cell structure (Lecture 1)
- Relationships between microorganisms and their hosts. Factors and principles of pathogenicity, virulence, and infection (Lecture 2).
- Growth of microbial population. Measuring microbial growth (Seminar 1).

2nd Pre-Test (23/11/2026):

- Antibiotics and synthetic antimicrobial chemotherapeutics (Lecture 6).
- Bacterial resistance to antibiotics and non-antibiotic antimicrobial agents (Lecture 7).