

Administrative Master Syllabus

Course Information

Course Title	Microbiology
Course Prefix, Num. and Title	BIOL 2420
Division	Life Sciences
Department	Biology
Course Type	Academic WCJC Core Course
Course Catalog Description	This course covers basic microbiology and immunology and is primarily directed at pre-nursing, pre-allied health, and non-science majors. It provides an introduction to historical concepts of the nature of microorganisms, microbial diversity, the importance of microorganisms and acellular agents in the biosphere, and their roles in human and animal diseases. Major topics include bacterial structure as well as growth, physiology, genetics, and biochemistry of microorganisms. Emphasis is on medical microbiology, infectious diseases, and public health. The lab component of this course also covers basics of culture and identification of bacteria and microbial ecology.
Pre-Requisites	TSI reading and writing requirements met; BIOL 1406 or BIOL 2401 with a grade of "C or better
Co-Requisites	Enter Co-Requisites Here.

Semester Credit Hours

Total Semester Credit Hours (SCH): Lecture Hours:	4:3:2
Lab/Other Hours	
Equated Pay Hours	4.2
Lab/Other Hours Breakdown: Lab Hours	2
Lab/Other Hours Breakdown: Clinical Hours	Enter Clinical Hours Here.
Lab/Other Hours Breakdown: Practicum Hours	Enter Practicum Hours Here.
Other Hours Breakdown	List Total Lab/Other Hours Here.

Approval Signatures

Title	Signature	Date
Prepared by:		
Department Head:		
Division Chair:		
Dean/VPI:		
Approved by CIR:		



Topical Outline: Each offering of this course must include the following topics (be sure to include information regarding lab, practicum, and clinical or other non-lecture instruction).

Lecture Outline

- A. An Introduction to Microbiology
 - 1. The Major Groups of Microbes
 - 2. The Importance of Microbes
 - 3. A Brief History of Microbiology
 - a. Microscopes
 - b. Spontaneous Generation
 - c. Germ Theory
 - d. Aseptic Technique
- B. Prokaryotic Organisms
 - 1. Comparison of Prokaryotic and Eukaryotic Cells
 - 2. Shapes and Arrangements of Prokaryotic Cells
 - 3. Prokaryotic Cell Structure
 - a. Glycocalyx – capsule, slime layer
 - b. Appendages – flagella, fimbriae, pili
 - c. Cell Wall – gram-positive, gram-negative, atypical
 - d. Plasma Membrane
 - e. Cytoplasm
 - f. Nucleoid
 - g. Ribosomes
 - h. Inclusions
 - i. Endospores
- C. Microbial Metabolism
 - 1. Catabolic and Anabolic Reactions
 - 2. Enzymes – structure, mechanism of action, inhibition
 - 3. Metabolic Pathways
 - a. Aerobic Respiration
 - b. Anaerobic Respiration
 - c. Fermentation
 - d. Photosynthesis
- D. Microbial Growth
 - 1. Physical Growth Requirements – temperature, pH, osmotic pressure
 - 2. Chemical Growth Requirements – C, N, S, P, O, organic
 - 3. Biofilms
 - 4. Bacterial Growth – binary fission, generation time, growth curve
- E. Control of Microbial Growth
 - 1. Physical Agents - mechanisms
 - 2. Chemical Agents - mechanisms
- F. Microbial Genetics
 - 1. Structure and Function of DNA
 - 2. DNA Replication
 - 3. RNA and Protein Synthesis – transcription and translation
 - 4. Mutation
 - 5. Genetic Recombination – transformation, conjugation, transduction

- G. Classification of Microorganisms
 - 1. The Three Domains
 - 2. Phylogenetic Hierarchy
 - 3. Evolution of Eukaryotes and the Endosymbiotic Theory
 - 4. Scientific Nomenclature and Taxonomic Hierarchy
- H. Characteristics and Reproduction of Eukaryotic Infectious Agents
 - 1. Fungi
 - 2. Protozoa
 - 3. Helminths
- I. Characteristics and Replication of Acellular Infectious Agents
 - 1. Viruses – bacteriophages and animal viruses
 - 2. Prions
- J. Disease and Epidemiology
 - 1. Normal Microbiota
 - 2. Opportunistic Microorganisms
 - 3. Etiology of Disease and Koch's Postulates
 - 4. Patterns of Disease
 - 5. Transmission of Disease
 - 6. Nosocomial Infections
 - 7. Emerging Diseases
 - 8. Virulence Mechanisms of Cellular and Acellular Infectious Agents
- K. Host Defenses
 - 1. Innate Immunity
 - a. First Line of Defense – physical and chemical factors
 - b. Second Line of Defense– phagocytes, inflammation, fever, complement, interferons
 - 2. Adaptive Immunity
 - a. Antigens and Antibodies
 - b. B Cells and Humoral Immunity
 - c. T Cells and Cellular Immunity
- L. Vaccines and Antimicrobial Drugs
 - 1. Types of Vaccines
 - 2. Action Modes of Antimicrobial Drugs
 - 3. Mechanisms of Antibiotic Resistance

Lab Outline – a departmental lab schedule detailing lab exercises will be provided to the instructor

- A. Lab Safety
- B. Microscopy
- C. Aseptic Technique
- D. Techniques for Growth, Transfer, Isolation, Observation, and Identification of Bacteria
- E. Staining: Morphological, Gram, Capsule, and Spore Stains
- F. Biochemical Tests
- G. Direct Count
- H. Microscopic Morphology of Fungi and Parasites
- I. Microbial Control

Course Learning Outcomes:

Learning Outcomes – Upon successful completion of this course, students will:

1. Describe distinctive characteristics and diverse growth requirements of prokaryotic organisms compared to eukaryotic organisms.
2. Provide examples of the impact of microorganisms on agriculture, environment, ecosystem, energy, and human health, including biofilms.
3. Distinguish between mechanisms of physical and chemical agents to control microbial populations.
4. Explain the unique characteristics of bacterial metabolism and bacterial genetics.
5. Describe evidence for the evolution of cells, organelles, and major metabolic pathways from early prokaryotes and how phylogenetic trees reflect evolutionary relationships.
6. Compare characteristics and replication of acellular infectious agents (viruses and prions) with characteristics and reproduction of cellular infectious agents (prokaryotes and eukaryotes).
7. Describe functions of host defenses and the immune system in combating infectious diseases and explain how immunizations protect against specific diseases.
8. Explain transmission and virulence mechanisms of cellular and acellular infectious agents.
9. Use and comply with laboratory safety rules, procedures, and universal precautions.
10. Demonstrate proficient use of a compound light microscope.
11. Describe and prepare widely used stains and wet mounts, and discuss their significance in identification of microorganisms.
12. Perform basic microbiology procedures using aseptic techniques for transfer, isolation and observation of commonly encountered, clinically significant bacteria.
13. Use different types of bacterial culture media to grow, isolate, and identify microorganisms.
14. Perform basic bacterial identification procedures using biochemical tests.
15. Estimate the number of microorganisms in a sample using methods such as direct counts, viable plate counts, or spectrophotometric measurements.
16. Demonstrate basic identification protocols based on microscopic morphology of some common fungi and parasites.

Methods of Assessment:

Lab report, lab practical, essay, presentation, project, exam, case study, discussion (in-class or online), research paper, group activity, post-test, graph/table/chart

Required text(s), optional text(s) and/or materials to be supplied by the student:

Lecture: Tortora, Funke, and Case. *Microbiology, An Introduction*. Pearson. Current edition.

Lab: WCJC customized lab exercise sheets available in Blackboard

Suggested Course Maximum:

36

List any specific or physical requirements beyond a typical classroom required to teach the course.

laboratory classrooms with sinks and gas outlets required

Course Requirements/Grading System: Describe any course specific requirements such as research papers or reading assignments and the generalized grading format for the course.

Lecture Average		55%
Exam average (3-4 exams)	30-55%	
Other (Homework, quizzes, projects, etc.)	0-25%	
Lab Average (average of 2 lab practicals)		25%
Final Exam (includes at least 50% comprehensive material)		<u>20%</u>
		100%
90-100	A	
80-89	B	
70-79	C	
60-69	D	
59 and below	F	

Curriculum Checklist:

- Administrative General Education Course** (from ACGM, but not in WCJC Core) – No additional documents needed.
- Administrative WCJC Core Course.** Attach the Core Curriculum Review Forms
 - Critical Thinking
 - Communication
 - Empirical & Quantitative Skills
 - Teamwork
 - Social Responsibility
 - Personal Responsibility
- WECM Course** -If needed, revise the Program SCANS Matrix and Competencies Checklist

Core Curriculum Review Form

Foundational Component Area: Core 030: Life & Physical Science

Course Prefix & Suffix: BIOL 2420

Core Objective:

Critical Thinking Skills—to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information

Student Learning Outcome Supporting Core Objective:

For each core objective, there must be at least two different methods of assessment.

SLO Status	Student Learning Outcome (SLO)	Learning Activity	Assessment
State Mandated	Estimate the number of microorganisms in a sample using methods such as direct counts, viable plate counts, or spectrophotometric measurements.	Lecture; lab exercise in which students work in groups to calculate the concentration of a yeast cell suspension by using the direct count method.	Group lab activity and post-test
Choose a SLO status.	Insert SLO (from Administrative Master Syllabi)	Provide a brief name and description of the sample learning activity.	Provide a brief name and description of the sample quiz, exam, rubric, assignment, etc. for assessing the objective.
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Core Curriculum Review Form

Foundational Component Area: Core 030: Life & Physical Science

Course Prefix & Suffix: BIOL 2420

Core Objective:

Communication Skills—to include effective development, interpretation and expression of ideas through written, oral and visual communication

Student Learning Outcome Supporting Core Objective:

For each core objective, there must be at least two different methods of assessment.

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Core Curriculum Review Form

Foundational Component Area: Core 030: Life & Physical Science

Course Prefix & Suffix: BIOL 2420

Core Objective:

Empirical and Quantitative Skills—to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions

Student Learning Outcome Supporting Core Objective:

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Core Curriculum Review Form

Foundational Component Area: Core 030: Life & Physical Science

Course Prefix & Suffix: BIOL 2420

Core Objective:

Teamwork—to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal

Student Learning Outcome Supporting Core Objective:

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Foundational Component Area.