

University of Houston-Downtown

Course Prefix, Number, and Title: MICRO 1305: Pre-nursing Microbiology

Credits/Lecture/Lab Hours: 3/3/0

Foundational Component Area: Life and Physical Sciences

Prerequisites: Credit or enrollment in MBIO 1105, CHEM 1305/1105 recommended

Co-requisites: None

Course Description: The morphology, classification, growth, physiology and genetics of microorganisms are covered, with emphasis on bacteria. Control of bacterial growth with antibiotics, antiseptics and disinfectants are also considered. Pathogenesis of disease-causing bacteria and the role of the immune system in protection from disease are studied.

TCCNS Number: N/A

Demonstration of Core Objectives within the Course:

Assigned Core Objective	Learning Outcome Students will be able to:	Instructional strategy or content used to achieve the outcome	Method by which students' mastery of this outcome will be evaluated
Critical Thinking Empirical & Quantitative Reasoning	Utilize scientific processes to identify questions pertaining to natural phenomena.	<p>A. Investigations (in co-requisite lab)</p> <p>Microbes in the Environment. Students will question how microorganisms live in pond water, hay and peppercorn infusions.</p> <p>Bacterial Catabolism. Students will question how bacteria breaks down carbohydrates and proteins.</p> <p>Bacterial Respiration. Students will question how bacteria live in the presence or absence of oxygen.</p> <p>Control of Microbial Growth. Students will question how bacteria survive exposures to</p>	<p>A. Investigations</p> <p>Students will complete a worksheet with their observations for each of the activities described. Worksheets will be graded.</p>

		<p>heat, UV radiation, disinfectants and antibiotics.</p> <p>Effectiveness of Hand Washing. Students will question if microorganisms are present on their skin before and after hand-washing.</p> <p>Panel Discussion: The Autism Vaccine Hoax. Students will question the validity of the statistical methods used in the study that unleashed the controversy.</p> <p>B. Panel Discussion Emerging Diseases and Outbreaks. Students question how current emerging diseases or outbreaks develop by analyzing published reports.</p> <p>C. Special Report Bacterial contamination in organic foods. Students will question the safety of organic vs. non-organic foods by analyzing published reports on food contamination outbreaks.</p>	<p>B. Panel Discussion The teams will present their positions and discuss the events as the controversy unfolded, participation in the discussion will be assessed and assigned a grade using a rubric.</p> <p>C. Special Report The students will write a Special Report that will be assessed and given a grade according to a rubric.</p>
<p>Critical Thinking Empirical & Quantitative Reasoning</p>	<p>Utilize scientific processes to develop hypotheses, collect and analyze data using quantitative and qualitative measures.</p>	<p>A. Student Investigations (co-requisite lab) Bacterial Catabolism. Students will form hypotheses regarding the catabolic capabilities of bacterial organisms. They will test the hypothesis inoculating several organisms into media containing carbohydrates, proteins, amino acids or other natural compounds.</p> <p>Bacterial Respiration. Students will form hypotheses regarding</p>	<p>A. Student Investigations For bacterial catabolism, bacterial respiration and control of bacterial growth exercises, students will record the media changes photographically, assemble a table with their observations and complete graded lab write-ups.</p> <p>For bacterial growth exercise, students will</p>

		<p>the ability of bacteria to live in the presence or absence of oxygen.</p> <p>Control of bacterial Growth. Students will form hypotheses regarding methods of bacterial control. Then, they will expose bacterial cultures to increasing lengths of heat, UV radiation, disinfectants and antibiotics.</p> <p>B. Unknown Reports (co-requisite lab) Bacterial Unknown Report 1. Students will form hypotheses regarding methods of bacterial identification. Students are provided with a bacterial culture and they perform techniques to morphologically identify the unknown organism.</p> <p>Bacterial Unknown Report 2. Students will form hypotheses regarding methods of bacterial identification. Students are provided with a bacterial culture and they perform morphological and catabolic assays to identify the unknown organism.</p> <p>C. Special Report Bacterial contamination in organic foods. Students will form hypotheses regarding safety of foods; read and analyze published reports related to current outbreaks. Quantitative and qualitative information will be gathered from sources such as the CDC or the FDA.</p> <p>D. Panel Discussion The Autism Vaccine Hoax.</p>	<p>compile their data to determine the necessary time/concentration of agent needed to kill the bacterial organisms. Students record their data and write a report with all their observations and this will be graded with a rubric.</p> <p>B. Unknown Reports For unknown reports students record data photographically, in data tables and flow charts; their compiled observations constitute a major report which will be graded for quality of both scientific information and written communication.</p> <p>C. Special Report The students will write a Special Report that will be assessed and given a grade using a rubric.</p> <p>D. Panel Discussion The teams will present their positions and discuss the events, participation in the discussion will be assessed and assigned a grade using a rubric.</p>
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Critical Thinking Empirical & Quantitative Reasoning Communication	Utilize scientific processes to effectively communicate the analysis and results using written, oral and visual communication.	<p>A. Panel Discussion The Autism Vaccine Hoax. Students will identify the issues that define scientific misconduct and ethics violations in this case.</p> <p>B. Special Report Bacterial contamination in organic foods. The economic and social impact of the outbreaks and food recalls will be identified in published reports.</p> <p>C. Staining techniques (co-requisite lab) Students will hypothesize which organisms will stain positively or negatively, experimentally test their hypotheses and report their findings.</p> <p>D. Unknown Reports Bacterial Unknown Report 1. Students will hypothesize the identity of their assigned organism, test their hypothesis and report their results in a written report including photographic proof of the morphology of the organism.</p> <p>Bacterial Unknown Report 2. Students will hypothesize the identity of their assigned organism, test their hypothesis and report their results in a written report including photographic proof of the morphology and catabolic characteristics of the organism.</p>	<p>A. Panel Discussion The teams will present their positions and discuss the events, participation in the discussion will be assessed and assigned a grade using a rubric.</p> <p>B. Special Report The students will write a Special Report that will be assessed and given a grade using a rubric .</p> <p>C. Staining Techniques Students will complete lab-write-ups and lab reports where they will have to convey in writing what they did and how they did it. Lab reports will be graded (see above).</p> <p>D. Unknown Reports Students will complete a lab report that summarizes in writing the results of the unknown investigations. Lab results will be graded as described above.</p>

		An oral presentation describing the studied organism will be given.	
Teamwork	Collaborate in the evaluation of the quality of scientific evidence from multiple perspectives toward the goal of reaching a shared objective.	<p>A. Panel Discussion The Autism Vaccine Hoax Students will work in small teams to read and analyze several media articles related to the vaccine-autism controversy. The original publication that triggered the controversy will also be critically analyzed.</p> <p>B. Collection of Group Data Bacterial Metabolism. The student class will work as a team, collecting the results from several assays to characterize a collection of microorganisms. The assays will be performed along the semester, and after each test, the data collected by each student will be compiled into a large database available to the whole class through Blackboard.</p> <p>C. Panel Discussion Emerging Diseases and Outbreaks. Students will work in teams to analyze published reports covering current emerging diseases or outbreaks. Information will be gathered from sources such as the CDC or the FDA. The economic and social impact of the outbreaks and food recalls will be discussed, along with the role of individuals and the government in the whole process.</p>	<p>A. Panel Discussion The teams will present their positions and discuss the events as the controversy unfolded. Participation will be assessed and assigned a grade using a rubric</p> <p>B. Collection of Group Data Participation in this process will be assessed throughout the semester. Group participation will be required for the class to create a complete data table used by all students to identify their unknowns and will indirectly be evaluated on the successful final evaluation of all microbes.</p> <p>C. Panel Discussion The teams will present their positions and discuss the events as the outbreak unfolded. Participation will be assessed and assigned a grade using a rubric.</p>

Additional Course Outcomes:

Lecture: At the end of the course, the student should be able to

- Identify the scientific process used to classify microorganisms into prokaryotic, eukaryotic cellular organisms or viruses.
- Apply scientific reasoning to explain natural microbial growth and the molecular mechanisms of microbial control and antisepsis.
- Analyze the balance between disease-causing bacteria and the defense response of the human immune system during disease and health.
- Evaluate epidemiological data and report in written and oral form information showing the impact of human, animal and crop diseases in human societies throughout history and in our modern world.

Lab: At the end of this course, the student should be able to

- Understand the scientific process used to classify microorganisms into prokaryotic or eukaryotic cellular organisms and viruses.
- Apply scientific reasoning to explain natural microbial growth and the molecular mechanisms of microbial control and antisepsis.
- Utilize the scientific method to identify bacterial unknown organisms, testing their morphological and biochemical characteristics.
- Collaborate with peers to experimentally assess the effectiveness of physical and chemical methods to control bacterial growth.
- Develop hypotheses, collect and analyze experimentally obtained data; use quantitative and qualitative measures to create written, visual and oral reports.

Course Outline:

Lecture Topics:

- The Microbial World and You
- Chemical Properties
- Microorganisms and Microscopes
- Anatomy of cells
- Microbial Metabolism
- Microbial Growth
- Control of microbial growth
- Microbial Genetics
- Classification of Microorganisms
- Eukaryotes
- Viruses, Viroids, and Prions
- Disease, Epidemiology, & Pathogenicity
- Nonspecific Host Defenses
- Adaptive Immune System
- Immunology Applications
- Immune System disorders
- Antimicrobial Drugs
- Microbial Diseases

Lab Topics:

- Use of Microscope
- Transfer of Bacteria
- Examination of Living Organisms
- Smears, Simple stains
- Gram Stain
- Acid Fast Stain
- Spores & Capsules
- Microbes in the Environment/Isolation
- Isolation of Bacteria (Media)
- Isolation results/Review
- Carbohydrate Catabolism
- Protein Catabolism
- Respiration
- Microbial Growth – Oxygen
- Unknown Identification, IMViC
- Microbial Growth – Control
- Disinfectants and Antiseptics
- **Antimicrobial Drugs**
- Fungi, Phototrophs, Protozoa
- Epidemiology

Lecture-Grading/Course Content which Demonstrates Student Achievement of Core Objectives:

Course Grade	A: 90-100	B: 80-89	C: 70-79	D: 60-69	F: 0-59
Summary of Course Exams, Quizzes, Activities, and Final					
	3 Exams			50%	
	Best 5 Quizzes			15%	
	Written Assignments			5%	
	Panel Discussion			5%	
	Final			25%	
	Total			100%	

Lab-Grading/Course Content which Demonstrates Student Achievement of Core Objectives:

Course Grade	A: 90-100	B: 80-89	C: 70-79	D: 60-69	F: 0-59
Summary of Course Exams, Quizzes, Activities, and Final					
	Two Lab Practical's			40%	
	Practical Final			30%	
	2 Unknowns Reports			20%	
	5 Homework Exercises			10%	
	Total			100%	