

## University of Houston-Downtown

**Course Prefix, Number, and Title:** MBIO 1310: Microbes and Society

**Credits/Lecture/Lab Hours:** 3/2/2

**Foundational Component Area:** Life and Physical Sciences

**Prerequisites:** Credit or enrollment in ENG 1301

**Co-requisites:** None

**Course Description:** An integrated lecture/laboratory course for non-science majors. This course will introduce the student to microorganisms including bacteria, fungi, protists and viruses and will explore their impact on humans. The numerous benefits of microorganisms (protection, food, genetic engineering, soil fertility, biofuels, recycling and bioremediation) will also be explored. Microorganisms that cause disease, food spoilage and corrosion will also be considered. *This course will not satisfy the microbiology requirement for nursing schools.*

**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.	Lecture, <b>Koch's Postulates</b> Lab Discussion of specific examples of disease agents  Lab discussion on the <b>Effects of Antibiotics</b> on inhibiting bacteria; Case study on the development of antibiotic resistance  Lecture on the role of bacteria in food manufacture Lab discussion on <b>Yogurt Production</b>	Students will write a formal lab report including background, question, hypothesis, materials and methods, and results and discussion on the validation of the Koch's Postulates, which guide the definitive discovery of the causative agent of a disease.  Students will in teams to perform statistical analysis of quantitative data on the best antibiotic against a particular bacterium. Teams will complete a worksheet showing their calculations.  Students will demonstrate an understanding of the role of microbes in food production by

			showing slides of stained bacteria found in prepared yogurt, and they will submit a worksheet which will be graded.
Critical Thinking Empirical & Quantitative Reasoning	Utilize scientific processes to develop hypotheses, collect and analyze data using quantitative and qualitative measures.	Six-week-long experiment demonstrating <i>Agrobacterium tumefaciens</i> as the causative agent of plant tumors ( <b>Koch's Postulates</b> )  Kirby Bauer lab technique to study the effects of specific antibiotics against BSL1 bacteria; Statistical analysis of data	Students will write a formal lab report including background, question, hypothesis, materials and methods, and results and discussion on the validation of the Koch's Postulates, which guide the definitive discovery of the causative agent of a disease.  Students will in teams to perform statistical analysis of quantitative data on the best antibiotic against a particular bacterium. Teams will complete a worksheet showing their calculations.
Critical Thinking Empirical & Quantitative Reasoning Communication	Utilize scientific processes to effectively communicate the analysis and results using written, oral and visual communication.	Formal Lab Report on the <b>Koch's Postulates</b> experiment  Debate: <b>Genetic Engineering</b>  Demonstration of microscopic slides of bacteria found in <b>prepared yogurt</b>	Students will write a formal lab report including background, question, hypothesis, materials and methods, and results and discussion on the validation of the Koch's Postulates, which guide the definitive discovery of the causative agent of a disease.  Students will research and debate the use of genetic engineering to modify foods or manufacture other items such as insulin. A rubric will be designed to evaluate the ability of the students to orally present (forum day) and debate the topic (debate day).  Students will demonstrate an understanding of the role of microbes in food production by

			showing slides of stained bacteria found in prepared yogurt, and they will submit a worksheet.
Teamwork	Collaborate in the evaluation of the quality of scientific evidence from multiple perspectives toward the goal of reaching a shared objective.	<p>Debate: <b>Genetic Engineering</b></p> <p>Group Analysis of Data from Lab Experiments <b>on Control of Bacterial Growth</b></p> <p>In class forum on <b>Global Antibiotic Usage and Resistance</b></p>	<p>Students will research and debate the use of genetic engineering to modify foods or manufacture other items such as insulin.</p> <p>Joint analysis of data collected during experiments done to test the effects of heat, ultraviolet radiation and pH on bacterial growth. Students will be tested on this topic. (A rubric will be designed to evaluate the ability of the students to orally present/debate the topic.)</p> <p>Students will research the use of antibiotics in the US and other developed and developing countries and present their findings in a forum.</p> <p>Students will in teams to perform statistical analysis of quantitative data on the best antibiotic against a particular bacterium. Teams will complete a worksheet showing their calculations.</p>

**Additional Course Outcomes:**

Students will

- Utilize the scientific process to identify questions pertaining to the role of microbes in daily life
- Utilize the scientific method to develop hypotheses
- Collect and analyze qualitative and quantitative data,
- Collaborate in the evaluation of the scientific evidence from multiple perspectives toward the goal of reaching a common conclusion,
- Communicate analyses and results using written and oral communication.

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

- Understand the scientific process used to solve microbially-related problems
- Apply scientific reasoning to explain microbial behavior
- Analyze the effects of microbes in food science, industry, and medicine
- Evaluate scientific data and report in written and oral form

**Course Outline:**

Lecture Topics

- The Microbial World
- Classification of Microbes, Microscopy
- Molecules of Cell, DNA Story
- Bacteria
- Viruses
- Protists
- Fungi
- Microbial Growth and Control of Growth
- Microbes and Food
- Microbes and Industry, Biotechnology
- Microbes and Agriculture
- Microbes and the Environment
- Diseases

Lab Topics

- Introduce Lab; Safety Info.
- Contamination Lab
- Vista
- Aseptic Transfer Discussion
- Aseptic Transfer, Streak Plate
- Use of Microscope
- Koch's Postulates
- Simple Stain
- Gram Stain
- View Structural Stains,
- Motility Test
- Throat Cultures
- Fungi, Protozoa
- Simulated Epidemic
- Physical Agents against Bacteria 11 A – Heat
- Physical Agents against Bacteria 11 B – UV
- Chem Agents and Antibiotics
- Biochemical Characteristics
- Slide Agglutination
- Microbiology of Food

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- Results of Yogurt Prep
- Microbiology of Water

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

<i>Course Grade</i>	<i>A: 90-100</i>	<i>B: 80-89</i>	<i>C: 70-79</i>	<i>D: 60-69</i>	<i>F: 0-59</i>
<b>Summary of Course Exams, Quizzes, Activities, and Final</b>					
	Lecture Quizzes			10%	
	3 Lecture Exams			30%	
	2 Lecture Assignments			6%	
	In-class Debate			5%	
	In-class Forum			5%	
	Lecture Final			6%	
	Lab Quizzes			6%	
	Lab Worksheets and Report			10%	
	Lab Final			10%	
	Attendance and Participation			5%	