MERCER COUNTY COMMUNITY COLLEGE  
MATH, SCIENCE, HEALTH PROFESSIONS DIVISION  
COURSE SYLLABUS  

BIO 115 Microbiological Science Concepts  
Spring 2015  

3 credits  

Instructor: Professor Diane N. Hilker, Program Coordinator  
Office: MS 122  
Telephone: 609 –570-3367  
e-mail: hilkerd@mccc.edu  

NOTE: YOU ARE RECEIVING THE COURSE REQUIREMENTS IN A CLEAR, WRITTEN FORM. TO AVOID ANY MISUNDERSTANDINGS, PLEASE READ CAREFULLY! CONTINUATION IN BIO 115 AUTOMATICALLY CONSTITUTES YOUR ACCEPTANCE OF THE CONDITIONS BELOW.  

This is a non-traditional type course. The course is delivered through the ANGEL learning management system. The student MUST take the responsibility of working on his/her own.  

Catalog Description:  
This microbiology course is for non-science majors and is based on the Unseen Life on Earth series developed with the American Society of Microbiology. Topics include microbial cell biology, biotechnological uses of microbes, and microbial evolution and ecosystems. Also explores the control of microorganisms and relationships between microbes and higher organisms. This is a non-laboratory course.  

Prerequisites: ENG 030 or proficiency  

Textbook:  

The textbook package may be purchased at the College Bookstore; SC 222. Hours of operation are posted on the door of the College Bookstore. There is also a copy of the textbook and study guide at the circulation desk at the WWC and JKC College’s Libraries.
Grading and Course Evaluation:

*Discussion Boards (11) 30%
*Unit Quizzes (11) 25%
**Exams (Midterm & Final -15% each) 30%
Microbiological Science Concepts Paper 15%
TOTAL 100%

*Discussion Boards/Unit Quizzes: the lowest quiz grade and discussion board question out of the 12 Units will be dropped.

**Exams: exams are to be taken once and may be curved based on student performance. Exam questions will come from the online course video series, videos, animations, readings from the Textbook and Study Guide, and the course activities (Interactive Activities and Study Guide Review Questions).

- **Midterm Exam**: The midterm exam is to be taken at a proctored Testing Site (e.g. Testing Center at the MCCC West Windsor Campus, Learning Center at the MCCC James Kerney Campus, or another proctored testing site). The midterm exam will consist of multiple choice, matching, and true/false questions.
  
  o Information on the location, hours, policies of the MCCC campus testing sites can be found on the following website: [http://www.mccc.edu/student_services_testing.shtml](http://www.mccc.edu/student_services_testing.shtml)
  
  o It is your responsibility to abide by the policies of the proctoring site.

- **Final Exam**: The final exam will be taken online through the ANGEL learning management system. The final exam will consist of multiple choice, matching, and true/false questions.

**MCCC’s Grading Scale:**

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<th>Label</th>
<th>Minimum Percent</th>
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TIPS FOR ACADEMIC SUCCESS FOR THIS COURSE

1. **READ:** The Textbook readings along with the information in the Study Guide for each unit.

2. **VIEW:** View the course video along with the accompanying videos and animations that support the readings.

3. **ACTIVITIES:** Do the activities (Study Guide Review Questions and Interactive Activities) that enhance your understanding of the unit. These are **not graded** nor are they handed in.

4. **ASSIGNMENTS:** There are graded assignments that are required to be completed each week for each of the 12 units that include; quizzes and discussion board questions. Your lowest quiz grade and discussion board assignment will be dropped. There is one required paper in the course; a microbiological concepts paper.

5. **DO NOT FALL BEHIND:** Keep up with the course on a weekly basis. Each unit of the course builds upon knowledge gained in previous units.

6. **DO NOT WAIT TO STUDY:** Most students that have difficulty save all of their studying until a day or two prior to the test. There is too much material covered on the tests to learn in a day or two.

**IF YOU ARE DOING ALL OF THE THINGS LISTED ABOVE AND ARE STILL HAVING TROUBLE, CONTACT YOUR COURSE INSTRUCTOR IMMEDIATELY!**
Course Competencies/Goals:

The student will be able to:
- Identify and discuss technological, historical, and scientific developments that have influenced the understanding of microbial life.
- Compare and contrast the overall cell structures of various types of living organisms and understand their specialized metabolic processes.
- Contrast how microbes are both essential to the planet but also detrimental to life.
- Describe genetic diversity in microbial populations and how it has led to new theories in evolution.
- Explain how microbial populations achieve genetic diversity through changes in their genetic information.
- Assess how human defense mechanisms contribute to the prevention of infectious disease and the need to control these diseases globally.

Course-specific General Education Knowledge Goals and Core Skills.

**General Education Knowledge Goals**

**Goal 1. Communication.** Students will communicate effectively in both speech and writing.

**Goal 3. Science.** Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

**Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

**Goal 7. History.** Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.

**Goal 8. Diversity.** Students will understand the importance of a global perspective and culturally diverse peoples.

**Goal 9. Ethical Reasoning and Action.** Students will understand ethical issues and situations.

**MCCC Core Skills**

**Goal A. Written and Oral Communication in English.** Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.

**Goal B. Critical Thinking and Problem-solving.** Students will use critical thinking and problem solving skills in analyzing information.

**Goal C. Ethical Decision-Making.** Students will recognize, analyze and assess ethical issues and situations.

**Goal E. Computer Literacy.** Students will use computers to access, analyze or present information, solve problems, and communicate with others.
Goal F. Collaboration and Cooperation. Students will develop the interpersonal skills required for effective performance in group situations.

Units of study in detail.

Unit 1: Microbial Universe
Learning Objectives
The student will be able to...
- Identify and describe the contributions made by scientists in the field of microbiology. (Course Competencies 1; Gen Ed Goal 1, 4, 7; Core Skills A, B, E, F)
- Identify and describe the major characteristics of bacteria, archaea, fungi, protozoa, algae, and viruses. (Course Competencies 1,3, 4; Gen Ed Goal 4; Core Skills A, B)
- Explain how microorganisms have influenced history. (Course Competencies 1; Gen Ed Goal 1, 4, 7; Core Skills A, B, E,F)
- Distinguish between medical, environmental, and industrial microbiology. (Course Competencies 1; Gen Ed Goal 1, 4 ; Core Skills A, B,F)

Unit 2: The Unity of Living Things
Learning Objectives
The student will be able to...
- Discuss the similarities and differences between prokaryotic and eukaryotic cells. (Course Competencies 1,2,3; Gen Ed Goal 3,4; Core Skills B, E)
- Identify structures unique to the prokaryotic and eukaryotic cell. (Course Competencies 1,2,4,5; Gen Ed Goal 3,4; Core Skills B,E)
- Describe the structure and function of proteins and nucleic acids. (Course Competencies 1,2; Gen Ed Goal 1,3,4 ; Core Skills A,B,E,F)
- Describe the structures of a virus and explain how they are capable of invading host cells. (Course Competencies 1,2; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)

Unit 3: Metabolism
Learning Objectives
The student will be able to...
- Explain the function and importance of metabolism. (Course Competencies 2; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)
- Describe the field of applied microbiology, specifically fermentative and wastewater treatment processes. (Course Competencies 1,2,3 ; Gen Ed Goal 1, 3, 4; Core Skills A, B, E,F)
- Compare and describe the phases of microbial growth and describe their relation to doubling or generation time. (Course Competencies 2; Gen Ed Goal 3,4 ; Core Skills B, E)
Unit 4: Reading the Code of Life

**Learning Objectives**

The student will be able to...

- Describe the structure of DNA and how it is replicated. *(Course Competencies 1; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)*
- Describe how proteins are synthesized including the process of transcription and translation. *(Course Competencies 1,2 ; Gen Ed Goal 1, 3, 4; Core Skills A, B, E,F)*
- Explain how genetic mutation and recombination in microbes provide material for natural selection to act on. *(Course Competencies 3, 5; Gen Ed Goal 1,3,4 ; Core Skills A, B, C, E)*

Unit 5: Genetic Transfer

**Learning Objectives**

The student will be able to...

- Compare and contrast vertical and horizontal gene transfer. *(Course Competencies 1,2, 5; Gen Ed Goal 3, 4; Core Skills A, B, E, )* 
- Compare the various mechanisms of genetic recombination in bacteria; including transformation, conjugation and transduction. *(Course Competencies 1,2, 5; Gen Ed Goal 1, 3,4; Core Skills A, B, E,F)* 
- Explain recombinant DNA technology. *(Course Competencies 1,2,5; Gen Ed Goal 1,3,4 ; Core Skills A, B, E, F)* 
- Describe current applications of recombinant DNA technology in medicine, industry and agriculture and understand the economical and sometime ethical issues associated with these applications. *(Course Competencies 1,2,3,5; Gen Ed Goal 1,3,4,8,9 ; Core Skills A, B,C,E,F)*

Unit 6: Microbial Evolution

**Learning Objectives**

The student will be able to...

- Distinguish between the organisms that belong to the Bacteria, Archaea, and Eukarya domains. *(Course Competencies 1, 2, 4, 5; Gen Ed Goal 1, 3, 4; Core Skills A, B, E, F)*
- Understand how nucleic acids are a measure of evolutionary relatedness. *(Course Competencies 1,4, 5 ; Gen Ed Goal 1, 3,4; Core Skills A, B, E,F)*
- Explain the four methods of biological classification proposed by Linnaeus, Haeckel, Whittaker and Woese. *(Course Competencies 1, 2, 4, 5; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)*
Unit 7: Microbial Diversity

Learning Objectives
The student will be able to...
- Explain how the environment can affect microbial diversity. (Course Competencies 1,4,5; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)
- Distinguish between traditional methods of classification and the use of molecular tools for classification. (Course Competencies 1,2,5; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)
- Explain how microorganisms are essential in carrying out transformations in the biosphere. (Course Competencies 1,3; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)

Unit 8: Microbial Ecology

Learning Objectives
The student will be able to...
- Describe the carbon and nitrogen cycles and explain the roles of microorganisms in these cycles. (Course Competencies 1,2,3,5; Gen Ed Goal 1,3,4,9; Core Skills A, B, C, E, F)
- Explain the important niches of microorganism in various ecosystems. (Course Competencies 1,3; Gen Ed Goal 1,3,4; Core Skills A, B, C, E, F)
- Define bioremediation and provide examples of this technology. (Course Competencies 1,2,3; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)
- Differentiate between the three types of symbiosis: commensalism, mutualism and parasitism. (Course Competencies 1,2,3; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)

Unit 9: Microbial Control

Learning Objectives
The student will be able to...
- Describe the various physical and chemical methods of controlling microorganisms. (Course Competencies 1,3,6; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)
- Explain the importance of controlling microorganisms in the food industry and in hospitals and the specific measures that are taken to accomplish this. (Course Competencies 1,3,6; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)
- Explain how antibiotics control infectious diseases and how microorganisms can become resistant to them. (Course Competencies 1,3,6; Gen Ed Goal 1,3,4; Core Skills A, B, E, F)
Unit 10: Microbial Interactions

Learning Objectives
The student will be able to...

- Identify and discuss how communities of microorganisms may have a symbiotic mutualistic relationship with multicellular organisms. (Course Competencies 1, 2, 3; Gen Ed Goal 1, 3, 4; Core Skills A, B, E, F)
- Explain how microbes are essential in the carbon cycling of complex plant polymers. (Course Competencies 1, 2, 3; Gen Ed Goal 1, 3, 4; Core Skills A, B, E, F)
- Describe the difference between fungi and bacteria and the role of fungi as decomposers. (Course Competencies 1, 2, 3; Gen Ed Goal 1, 3, 4; Core Skills A, B, E, F)

Unit 11: Human Defenses

Learning Objectives
The student will be able to...

- Explain how normal biota or flora inhabit specific areas of the human body and pose no threat to the host. (Course Competencies 1, 3, 6; Gen Ed Goal 1, 3, 4; Core Skills A, B, E, F)
- Distinguish between the body's first, second and third lines of defense. (Course Competencies 1, 3, 6; Gen Ed Goal 1, 3, 4; Core Skills A, B, E, F)
- Define phagocytosis and explain its role in combating microorganisms. (Course Competencies 1, 3, 6; Gen Ed Goal 1, 3, 4; Core Skills A, B, E, F)
- Identify and discuss the principles behind immunization and how vaccines are prepared. (Course Competencies 1, 3, 6; Gen Ed Goal 1, 3, 4; Core Skills A, B, E, F)

Unit 12: Microbes and Human Diseases

Learning Objectives
The student will be able to...

- Contrast human, animal and environmental reservoirs of infections and give examples of each. (Course Competencies 1, 3; Gen Ed Goal 1, 3, 4; Core Skills A, B, E, F)
- Identify the various methods by which pathogens are transmitted including direct and indirect methods, fomites and arthropod vectors. (Course Competencies 1, 3, 6; Gen Ed Goal 3, 4; Core Skills B, E)
- Explain how epidemiology contributes to our understanding of infectious disease including the valuable information that is provided to assist in this understanding. (Course Competencies 1, 6; Gen Ed Goal 1, 3, 4; Core Skills A, B, E, F)
- Explain how public health organizations help in the prevention of infectious diseases. (Course Competencies 1, 6; Gen Ed Goal 1, 3, 4, 8; Core Skills A, B, E, F)
# BIO 115 Microbiological Science Concepts-Online
## Assignments and Schedule (Tentative: subject to change)

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<tr>
<th>Dates</th>
<th>Unit</th>
<th>Unit Title</th>
<th>Assignments</th>
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| 1/22/13-2/4/13   | 1    | Microbial Universe                     | • Textbook: Chapter 1  
• Study Review Questions: pgs. 5-7  
• Videos  
• 2 Interactive Activities: Drag/Drop and Sorting  
• Unit 1 Quiz and Discussion Board  
• Paper Assignment Introduced |
| (Week 1 & 2)     |      |                                        |                                                                                                                                           |
| 2/5/13-2/11/13   | 2    | The Unity of Living Systems            | • Textbook: Chapter 2 (pgs. 37-42); Chapter 4 (pgs. 82-107)  
• Study Review Questions: pgs. 13-15  
• Videos and animations  
• 2 Interactive Activities: Crossword Puzzle and Vocabulary Flashcards  
• Unit 2 Quiz and Discussion Board |
| (Week 3)         |      |                                        |                                                                                                                                           |
| 2/12/13-2/18/13  | 3    | Metabolism                             | • Textbook: Chapter 5 (pgs. 114-117); Chapter 8 (pgs. 201-207); Chapter 28 (pgs. 710-711); Chapter 29 (pgs. 722-724).  
• Study Review Questions: none  
• Videos and animations  
• 2 Interactive Activities: Drag/Drop and Sorting  
• Unit 3 Quiz and Discussion Board |
| (Week 4)         |      |                                        |                                                                                                                                           |
| 2/19/13-2/25/13  | 4    | Reading The Code of Life               | • Textbook: Chapter 6 (pgs. 144-155 & 161-165)  
• Study Review Questions: pgs. 31-33  
• Videos and animations  
• 2 Interactive Activities: Crossword Puzzle and Vocabulary Flashcards  
• Unit 4 Quiz and Discussion Board |
| (Week 5)         |      |                                        |                                                                                                                                           |
| 2/26/13-3/4/13   | 5    | Genetic Transfer                       | • Textbook: Chapter 6 (pgs. 167-171); Chapter 7 (pgs. 179-193)  
• Study Review Questions: none  
• Videos and animations  
• 2 Interactive Activities: Drag/Drop and Sorting  
• Unit 5 Quiz and Discussion Board |
| (Week 6)         |      |                                        |                                                                                                                                           |
| 3/5/13-3/11/13   |      | MIDTERM EXAM: Covers Units 1-5          | • Administered in a proctored testing site-MCCC WWC or JKC Testing Centers or designated High School for H.S Students ONLY  
• Objective questions |
<p>| (Week 7)         |      |                                        |                                                                                                                                           |
| 3/11/13          |      | Mid-Semester Survey                    |                                                                                                                                           |</p>
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<tr>
<th>Date Range</th>
<th>Week</th>
<th>Topic</th>
<th>Activities</th>
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<tr>
<td>3/12/13-3/25/13</td>
<td>6</td>
<td>Microbial Evolution</td>
<td>Textbook: Chapter 10 (pgs. 238-245) Study Review Questions: none Videos and animations 2 Interactive Activities: Crossword Puzzle and Vocabulary Flashcards Unit 6 Quiz and Discussion Board</td>
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<td>3/18/13-3/24/13</td>
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<td>SPRING BREAK</td>
<td>MCCC &amp; H.S. Students are both off Note: H.S. students will take their Spring break with the college. You are expected to follow the college’s schedule and plan accordingly.</td>
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<td>3/26/13-4/1/13</td>
<td>7</td>
<td>Microbial Diversity</td>
<td>Textbook: Chapter 10 (pgs. 245-254); Chapter 28 (pgs. 693-701) Study Review Questions: none Videos Interactive Activity: Drag/Drop Unit 7 Quiz and Discussion Board</td>
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<td>4/2/13-4/8/13</td>
<td>8</td>
<td>Microbial Ecology</td>
<td>Textbook: Chapter 14 (pgs.346-347); Chapter 28 (pgs. 701-716) Study Review Questions: pgs. 57-59 Videos 2 Interactive Activities: Sorting and Vocabulary Flashcards Unit 8 Quiz and Discussion Board</td>
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<td>4/9/13-4/15/13</td>
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<td>Microbial Control</td>
<td>Textbook: Chapter 3 (pgs.68-69); Chapter 9 (pgs. 223-234); Chapter 20 (pgs. 473-477); Chapter 21 (pgs. 489-491 &amp; 494-497) Study Review Questions: pgs. 65-68 Videos and animations Interactive Activity: Crossword Puzzle Unit 9 Quiz and Discussion Board</td>
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<td>4/16/13-4/22/13</td>
<td>10</td>
<td>Microbial Interactions</td>
<td>Textbook: Chapter 12 (pgs. 286-288 &amp; 298-299); Chapter 14 (pgs. 346-347); Chapter 28 (pgs. 695-700) Study Review Questions: pgs. none Videos Interactive Activity: Drag/Drop Unit 10 Quiz and Discussion Board</td>
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<td>4/23/13</td>
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<td>Microbiology Concepts Paper Due</td>
<td>Introduced in Week 2 online Submitted via the Drop Box 3-4 pgs in length</td>
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<td>Dates</td>
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<td>4/23/13-4/29/13</td>
<td>11</td>
<td>Human Defenses</td>
<td>Textbook: Chapter 14 (pgs. 342-346 and 357-358); Chapter 16 (pgs. 393-396); Chapter 17 (pgs. 408-414) and Chapter 20 (pgs. 479-483)</td>
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<td>Study Review Questions: pgs. none</td>
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<td>2 Interactive Activities: Crossword Puzzle and Vocabulary Flashcards</td>
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<td>Unit 11 Quiz and Discussion Board</td>
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<td>4/30/13-5/6/13</td>
<td>12</td>
<td>Microbes and Human Diseases</td>
<td>Textbook: Chapter 15 (pgs. 364-372); and Chapter 20 (pgs. 465-479)</td>
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<td>Study Review Questions: pgs. 87 – 89</td>
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<td>2 Interactive Activities: Crossword Puzzle and Vocabulary Flashcards</td>
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<td>Unit 12 Quiz and Discussion Board</td>
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<td>5/7/13-5/13/13</td>
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<td>Final Exam: Covers Units 6-12</td>
<td><strong>Administered online</strong> using the ANGEL learning management system</td>
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<td>Objective questions</td>
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<tr>
<td>5/16/13</td>
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<td>Course Summary and Survey</td>
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**Academic Integrity Policy:**

Students are required to perform all the work specified by the faculty and are responsible for the content and integrity of all academic work submitted, such as papers, reports, and examinations. A student will be guilty of violating the Rule of Academic Integrity if he or she:

- uses or obtains unauthorized assistance in any academic work;
- gives fraudulent assistance to another student;
- knowingly represents the work of others as his or her own or represents previously completed academic work as current;
- fabricates data in support of an academic assignment;
- inappropriately or unethically uses technological means to gain academic advantage

More information on the MCCC’s Academic Integrity Policy can be found at the following website: [http://www.mccc.edu/admissions_policies.shtml#1](http://www.mccc.edu/admissions_policies.shtml#1)

**Academic Support:**

Mercer County Community College is committed to supporting all students in their academic and co-curricular endeavors. Each semester, a significant number of students document disabilities, which may require learning, sight, hearing, manual, speech, or mobility accommodations to ensure access to academic and co-curricular activities. The college provides services and reasonable accommodations to all students who need and have a legal entitlement to such accommodations.

For more information regarding this you can contact Arlene Stinson, Director of Academic Support Services, in LB 214 or by email stinsona@mccc.edu.