## COURSE SYLLABUS

<table>
<thead>
<tr>
<th>COURSE NUMBER</th>
<th>Course Title</th>
<th>Credits</th>
<th>Clock Hours Per Week: 5</th>
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</thead>
<tbody>
<tr>
<td>MCB-3010</td>
<td>Microbiology</td>
<td>4.0</td>
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</table>

### Department:  Biology  
**Prerequisites:** BSC 1010, BSC1011, CHM1045

### College:  Arts and Sciences

**Required Textbook(s):** Microbiology, Bauman, and Microbiology Laboratory Theory and Application, Leboffe

**Faculty Name:** Kimberly Lebby  
**Term and Year:** Fall 2010

**Office Location:** Science Research 121  
**Campus Telephone:** 561-2749

### Office Hours (Others by Appointment)

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
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<tbody>
<tr>
<td>10:30-12:15;</td>
<td>2:00-3:30</td>
<td>1:00-3:30</td>
<td>10:30-12:15;</td>
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### Course Description

This course is an introductory study of bacteria, viruses, fungi, and parasites, with particular emphasis on structure, physiology and their relationship to infection and disease. This course is designed for upper division Biology, Biology Education, Pre-Medicine, Pre-Dentistry, Pre-Veterinary Medicine, and Nursing Students.

### Course Purpose

Microbiology is a one semester course offered by the Department of Biological Sciences.  The goal of this course is to introduce the student to the microbial world so that they may understand the importance of microbes as it relates to human health, agriculture, and the environment.  Other topics to be discussed include bacterial characterization, microbial genetics, microbial evolution, microbial diversity, immunity, and sterilization. The laboratory is designed to instruct students in the use of laboratory instrumentation and experimental microbial techniques.

### Conceptual Framework

The Conceptual Framework in the Professional Education Unit (PEU) at Florida A&M University is an integrated approach to providing educational experiences that result in exemplary professional educators.  The Framework is comprised of six themes with the mission of developing high quality classroom teachers, administrators and support personnel.  The term “exemplary” refers to the kind of graduates the PEU strives to produce.  The figure below provides a diagram of the Exemplary Professional Conceptual Framework:

F=Florida Educator Accomplished Practices Standards (FEAPS)  
I=Interstate New Teacher Assessment and Support Consortium Standards (INTASC)  
(K)=Knowledge  (S)=Skill  (D)=Disposition

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TECHNOLOGY

• CF 2
• Through this focal area, the FAMU professional education candidate will:

| CF: 2.1 (S) | Use of available technology and software to support student learning. | F: 4,12 | I: 6 |
| CF: 2.2 (S) | Use technology to manage, evaluate and improve instruction. | F: 1,4,10,12 | I: 6,7 |
| CF: 2.3 (K) | Know fundamental concepts in technology. | F: 12 | I: 1,6 |
| CF: 2.4 (K) | Understand fundamental concepts in technology. | F: 2,12 | I: 6 |
| CF: 2.5 (S) | Use fundamental concepts in technology. | F: 12 | I: 6 |
| CF: 2.6 (S,D) | Facilitate access to technology for students. | F: 12 | I: 6 |
| CF: 2.7 (S) | Facilitate the use of technology by students. | F: 4,12 | I: 6 |

CRITICAL THINKING

• CF 4
• Through this focal area, the FAMU professional education candidate will:

| CF: 4.1 (K) | Understand a variety of instructional/professional strategies to encourage student development of critical thinking and performance. | F:4,7 | I: 4 |
| CF: 4.2 (S) | Use a variety of instructional/professional strategies to encourage students’ development of critical thinking and performance. | F:2,7 | I: 4 |
| CF: 4.3 (D) | Value critical thinking and self-directed learning as habits of mind. | F: 4 | I: 1,4 |
| CF: 4.4 (K) | Acquire performance assessment techniques and strategies that measure higher order thinking skills of student. | F:1,4 | I: 1,8 |
| CF: 4.5 (S) | Demonstrate the use of higher order thinking skills. | F: 8 | I: 4 |

Specific Behavioral Objectives
A student who successfully completes this course will be able to:

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- Understand of the major microbiological principles and terminology.
  - This outcome will be assessed by examinations in lecture and laboratory.
- Demonstrate oral and written communication skills.
  - This outcome will be assessed by examinations in laboratory, the scientific paper, and one oral presentation.
- Be able to analyze and interpret data, and critically interpret scientific information.
  - This outcome will be assessed by examinations in lecture and laboratory, especially the identification of microbial unknown. Also case studies, epidemiological analysis, and data interpretation will be included on worksheets and lab exercises.
- Demonstrate familiarity with basic scientific methodology and experimental procedures used in microbiology.
  - This outcome will be assessed by performance in the laboratory.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Behavioral Objectives</th>
<th>INTASC Standards</th>
<th>FEAPs</th>
<th>FTCE SAE</th>
<th>PEU Conceptual Framework</th>
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</thead>
<tbody>
<tr>
<td>Project 1. Science Investigation</td>
<td>Be able to analyze and interpret data, and critically interpret scientific information</td>
<td>I: 4, 6, 7, 8</td>
<td>FEAPs: 4.1:4b, 4c, 4g, 4j, 8.1:8b, 8c, 8f, 12.1:12b, 12c, 12i, 12j, 12k, 12l</td>
<td>FTCE: 1.1, 1.2, 1.3, 1.5 – 1.15, 2.3, 2.4, 3.3, 3.4, 3.5, 3.8, 3.10, 3.11, 3.12, 3.15, 3.17, 4.2, 4.3, 4.6, 5.1, 5.4 – 5.7, 6.1 – 6.5, 7.1, 8.10, 10.4, 10.10</td>
<td>CF: 2.1, 2.3, 2.4, 2.5, 2.6, 2.7 4.1, 4.2, 4.3, 4.4, 4.5</td>
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<tr>
<td>Report</td>
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<td>Project 2. Microbe of the Day</td>
<td>Demonstrate oral and written communication skills.</td>
<td>I: 4, 6, 7, 8</td>
<td>FEAPs: 4.1:4b, 4c, 4g, 4j, 8.1:8b, 8c, 8f, 12.1:12b, 12c, 12i, 12j, 12k</td>
<td>FTCE: 1.1, 1.2, 1.3, 1.5 – 1.15, 2.3, 2.4, 3.3, 3.4, 3.5, 3.8, 3.10, 3.11, 3.12, 3.15, 3.17, 4.2, 4.3, 4.6, 5.1, 5.4 – 5.7, 6.1 – 6.5, 7.1, 8.10, 10.4, 10.10</td>
<td>CF: 2.1, 2.3, 2.4, 2.5, 2.6, 2.7 4.1, 4.2, 4.3, 4.4, 4.5</td>
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<tr>
<td>Oral Presentation</td>
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<tr>
<td>Project 3. Laboratory Worksheet</td>
<td>Demonstrate familiarity with basic scientific methodology and experimental procedures</td>
<td>I: 4, 6, 7, 8</td>
<td>FEAPs: 4.1:4b, 4c, 4g, 4j, 8.1:8b, 8c, 8f, 12.1:12b, 12c, 12i, 12j, 12k</td>
<td>FTCE: 1.1, 1.2, 1.3, 1.5 – 1.15, 2.3, 2.4, 3.3, 3.4, 3.5, 3.8, 3.10, 3.11, 3.12, 3.15, 3.17, 4.2, 4.3, 4.6, 5.1, 5.4 – 5.7, 6.1 – 6.5, 7.1, 8.10, 10.4, 10.10</td>
<td>CF: 2.1, 2.3, 2.4, 2.5, 2.6, 2.7 4.1, 4.2, 4.3, 4.4, 4.5</td>
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**National and State Standards Addressed in the Course**

**Interstate New Teacher Assessment and Support Consortium (INTASC) Standards**

**Standard 1: Subject Matter:**
The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.

**Standard 4: Instructional Strategies**
The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.

**Standard 6: Communication**
The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom. Standard .

**Standard 8: Assessment**
The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social and physical development of the learner.

**Florida Educator Accomplished Practices (FEAPs)**

1. **CRITICAL THINKING**
   - 4.1 The preprofessional teacher is acquiring performance assessment techniques and strategies that measure higher order thinking skills in students and is building a repertoire of realistic projects and problem-solving activities designed to assist all students in demonstrating their ability to think creatively.
   - 4.PRE.b Identifies strategies, materials, and technologies that she/he will use to expand students' thinking abilities.
   - 4.PRE.c Has strategies for utilizing discussions, group interactions, and writing to encourage student problem solving.

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4.PRE.g Demonstrates and models the use of higher-order thinking abilities.
4.PRE.j Uses technology and other appropriate tools in the learning environment.

8. KNOWLEDGE OF SUBJECT MATTER
8.1 The preprofessional teacher has a basic understanding of the subject field and is beginning to understand that the subject is linked to other disciplines and can be applied to real-world integrated settings. The teacher’s repertoire of teaching skills includes a variety of means to assist student acquisition of new knowledge and skills using that knowledge.

8.PRE.b Increases subject matter knowledge in order to integrate the learning activities.
8.PRE.c Uses the materials and technologies of the subject field in developing learning activities for students.
8.PRE.f Develops short- and long-term personal and professional goals relating to knowledge of subject matter.

12. TECHNOLOGY
12.1 The preprofessional teacher uses technology as available at the school site and as appropriate to the learner. She/he provides students with opportunities to actively use technology and facilitates access to the use of electronic resources. The teacher also uses technology to manage, evaluate, and improve instruction.
12.PRE.b Uses technology tools on a personal basis.
12.PRE.c Demonstrates awareness of and models acceptable use policies and copyright issues.
12.PRE.i Selects and utilizes educational software tools for instructional purposes based upon reviews and recommendations of other professionals.
12.PRE.j Uses digital information obtained through intranets and/or the Internet (e.g., e-mail and research).
12.PRE.k Uses technology to collaborate with others.
12.PRE.l Develops professional goals relating to technology integration.

Florida Teacher Certification Examination (FTCE) Subject Area Examination (SAE) Competencies and Skills
1 Knowledge of the investigative processes of science
1.1 Identify components, proper use, and care of light microscopes.
1.2 Distinguish between the types of microscopy (e.g., scanning electron microscopy, transmission electron microscopy, phase contrast) and their applications.
1.3 Identify proper techniques for common laboratory procedures (e.g., dissecting; reserving, staining, and mounting microscope specimens; 1.5 Select appropriate uses of common laboratory procedures (e.g., polymerase chain reaction, chromatography, spectrophotometry, centrifugation, gel electrophoresis).
1.6 Calculate measurements in the appropriate metric units.
1.7 Differentiate between assumptions, inferences, observations, hypotheses, conclusions, theories, and laws.
1.8 Interpret empirical data (e.g., charts, graphs, tables, diagrams).
1.9 Differentiate the characteristics and methodologies of scientific and nonscientific knowledge.
1.10 Identify relationships between the variables and possible outcomes of a specific experiment.
1.11 Relate the validity and reliability of scientific knowledge to reproducibility, statistical significance, technological limitations, bias, and types of error.
1.12 Identify the development of biological theories and knowledge through important historical events, creative endeavors of diverse individuals, and experimental evidence.
1.13 Differentiate between qualitative and quantitative data in experimental, observational, and modeling methods of research.
1.14 Determine the elements of a well-designed and controlled experiment.
1.15 Identify evidence of the dynamic nature of science in the face of new scientific information.

2 Knowledge of the interaction of science, technology, and society, including ethical, legal, and social issues
2.3 Analyze the effects (e.g., multidrug resistance, rapid transmission across international boundaries) of globalization on the spread and treatment of pathogens and invasive species.
2.4 Identify pertinent legislation and national guidelines (e.g., National Association of Biology Teachers, International Society of Environmental Forensics, Occupational Safety and Health Administration chemical safety guidelines, material safety data sheets) regarding laboratory safety, hazardous materials, experimentation, and the use and handling of organisms in the classroom.

3 Knowledge of the chemical process of living things
3.3 Predict the effects of changes in pH, temperature, substrate concentration, and enzyme concentration on reaction rate.
3.4 Identify substrates, products, and relationships in aerobic respiration (e.g., glycolysis, the Krebs cycle, electron transport), including metabolism of carbohydrates, fats, and amino acids, and in anaerobic respiration (e.g., alcoholic fermentation, lactic acid fermentation).
3.5 Compare end products and energy yields of anaerobic and aerobic respiration.
3.8 Analyze the role of chemiosmosis in photosynthesis and respiration.
3.10 Evaluate the components and roles of the antigen-antibody reaction.

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3.11 Compare active and passive immunity.

3.12 Evaluate the roles of cell recognition (e.g., cell-to-cell signaling, autoimmune diseases, tissue rejection, cancer, pollen or stigma-style interaction) in normal and abnormal cell activity.

3.17 Identify specific and nonspecific immune responses to vaccines and inoculations.

4 Knowledge of the interaction of cell structure and function
4.2 Distinguish between the major structural characteristics of prokaryotic and eukaryotic cells.
4.3 Compare characteristics of the major taxa (e.g., domains, kingdoms, phyla), including cellular characteristics.

5 Knowledge of genetic principles, processes, and applications
5.1 Evaluate the relationships between structure and function in nucleic acids.
5.2 Evaluate the relationships between the functions of DNA and RNA.
5.3 Distinguish between the regulatory systems for prokaryotic and eukaryotic protein synthesis.
5.4 Distinguish between the functions of DNA and RNA.
5.5 Distinguish between the regulatory systems for prokaryotic and eukaryotic protein synthesis.
5.6 Identify proper techniques for recombinant DNA technology (e.g., Southern blotting, creation of transgenic organisms, gene splicing, mitochondrial DNA isolation).
5.7 Evaluate possible effects of environmental and genetic influences (e.g., viruses, oncogenes, carcinogenic agents, mutagenic agents, epigenetic factors) on gene structure and expression.

6 Knowledge of the structural and functional diversity of viruses and prokaryotic organisms
6.1 Distinguish the structure and function of viruses and prokaryotic organisms.
6.2 Identify the effects of viruses (e.g., AIDS, influenza, measles, feline leukemia, some human cancers) and prokaryotes (e.g., tuberculosis, bubonic plague, cholera) on organisms.
6.3 Relate the structures and functions (e.g., morphology, motility, reproduction and growth, metabolic diversity) of prokaryotes to their behavior and identification.
6.4 Differentiate the major types of viral genetic recombination (i.e., transduction, transformation, conjugation).
6.5 Relate microbial processes and products to their uses in biotechnology.

7 Knowledge of the structural and functional diversity of protists, fungi, and plants
7.1 Identify major types of protists, fungi, and plants.

8 Knowledge of the structural and functional diversity of animals
8.10 Analyze how body systems contribute to the human immune response.

10 Knowledge of evolutionary mechanisms
10.4 Apply a taxonomic (e.g., dichotomous) key to a set of objects.
10.10 Analyze aspects of modern scientific theories (e.g., primitive precell, endosymbiotic) on the origin and early evolution of life on Earth.

National Science Teachers Association Standards
C.2.a. Core Competencies. All teachers of biology should be prepared to lead students to understand the unifying concepts required of all teachers of science, and should in addition be prepared to lead students to understand
2. Similarities and differences among animals, plants, fungi, microorganisms, and viruses.
4. Scientific theory and principles of biological evolution.

C.2.b. Advanced Competencies. In addition to these core competencies, teachers of biology as a primary field should be prepared to effectively lead students to understand
14. Biochemical interactions of organisms with their environments
17. Causes, characteristics and avoidance of viral, bacterial, and parasitic diseases.
20. How to design, conduct, and report research in biology.

C.2.c. Supporting Competencies. All teachers of biology should also be prepared to effectively apply concepts from other sciences and mathematics to the teaching of biology including basic concepts of:
22. Chemistry, including general chemistry and biochemistry with basic laboratory techniques.

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Course Evaluation and Grading

Grades are calculated on a total points system:
4 lecture tests x 100 points = 400
Points from worksheets and/or tests in lab = 270
Scientific paper = 50
Quizzes/worksheets (4, it may vary) x 10 points = 40
Microbe for the Day oral presentation = 15

To calculate your grade at any point during the semester, follow these steps:
First, divide the total points you have earned to date by the total possible points you have taken thus far, and then multiply this number by 100.

90-100% = A
80-89% = B
70-79% = C
60-69% = D
> 59% = F

Teaching Methods
Lectures, class discussions, brainstorming sessions, problem centered hands on investigations, research and technologies such as internet, CD-ROM, blackboard and computer animations

Topical Outline and Tentative Class Schedule

Week | Topic(s) for discussion and the corresponding chapter in the textbook
--- | ---
8/29/05 | History of Microbiology - Chapter 1
    | Spontaneous Generation; Biogenesis; Golden Age of Microbiology; Germ Theory of Disease; Chemotherapy; Modern
    | Developments in Microbiology; Microbial Diversity; Microbes and Human Welfare, Microbes and Human diseases
    | (Read on your own) Fundamentals of Chemistry - Chapter 2
    | Atoms; Molecules and Chemical Bonds; Acids, Bases and Salts; Organic Compounds
    | (Read on your own) Cell structure and Function - Chapter 3
    | The Prokaryotic Cell: Glycocalyx, Flagella, Axial Filaments, Fimbriae and Pili; Cell Wall; Plasma Membrane and Transport;
    | Cytoplasm, DNA, Plasmids and Ribosomes; Inclusions; Endospores; The Eukaryotic Cell; Evolution of Eukaryotes
9/5/05 | Microscopy; Staining and Classification – Chapter 4 and Cell Wall Structure (Chapter 3)
    | Microscopy; Dark field Microscopy; Phase-Contrast Microscopy, Electron Microscopy; Special Application Microscopes
    | (Differential Interference Contrast, Fluorescence, Confocal, Electron, Scanning Tunneling and Atomic Force Microscopes);
    | Simple and Differential Stains; Special Stains, Taxonomy
9/12/05 | Microbial Metabolism - Chapter 5
    | Reactions; Enzymes, their Activity and Inhibition; Biochemical Pathways and Energy Production: Aerobic Respiration, Anaerobic
    | Respiration, Fermentation; Photosynthesis
    | LECTURE EXAMINATION I
9/19/05 | Microbial Genetics - Chapter 7
    | Structure and Function of Genetic Material; Regulation of Gene Expression in Bacteria;
    | Mutation; Genetic Transfer and Recombination; Genes and Evolution

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Recombinant DNA Technology - Chapter 8
Overview of Recombinant DNA Procedures; Biotechnology Tools and Techniques, Applications of Genetic Engineering; Safety, Issues, Ethics and Future of Genetic Engineering

9/26/05
Viruses - Chapter 13
General characteristics- Structure; Taxonomy of Viruses; Isolation, Culture and Identification of Viruses; Multiplication; Viruses and Cancer- Latent and Slow Viral Infections; Viroids; Prions

Infection, Infectious Diseases, and Epidemiology - Chapter 14
Pathology, Infection and Disease- Normal Microbiota- Etiology of an Infection; Classification of Infections, Spread of Infections- Nosocomial Infections; Patterns of Disease, Epidemiology and Prevention

10/3/05
LECTURE EXAMINATION II
Nonspecific Host Defenses- Chapter 15

10/10/05
Specific Defense Chapter 16
Humoral immunity, cell-mediated immunity, acquired immunity

10/17/05
Immunization and Immune Deficiencies – Chapter 17 and 18
Types I (Anaphylactic) Reactions; Type II (Cytotoxic Reactions); Type III (Immune Complex) Reactions; Type IV (Cell-Mediated) Reactions; Diseases and Reactions Related to the Human Leukocyte Antigen Complex; Immune Deficiencies; AIDS; Immune Response to Cancer

10/24/05
Immunization and Immune Deficiencies – Chapter 17 and 18

10/31/05
Pathogenic Gram Positive Cocci and Bacilli – Chapter 19

11/7/05
LECTURE EXAMINATION III

11/14/05
Pathogenic Gram negative Cocci and Bacilli – Chapter 20

11/21/05
Miscellaneous Bacterial Pathogens, Pathogenic Fungi – Chapter 21 and 22

11/28/05
Pathogenic DNA Viruses – Chapter 24

12/5/05
Pathogenic RNA Viruses - Chapter 25

Finals week
LECTURE EXAMINATION IV

Growth and Culturing of Bacteria - Chapter 6 – will be covered in the laboratory
Physical Requirements: Temperature, pH, Osmotic Pressure; Chemical Requirements: Carbon, Nitrogen, Sulfur and Phosphorus, Trace Elements, Oxygen, Organic Growth Factors; Culture Media And Types; Preserving Bacterial Cultures; Growth of Bacterial Cultures; Division and Generation Time; Measurement of Microbial Growth; Estimation of Microbial Numbers

Controlling Microbial Growth Chapter 9- will be covered in the laboratory
Chemical agents, dry heat, moist heat, radiation, filtration, freeze-drying

Course Policies

Policy Statement on Non-Discrimination It is the policy of Florida Agricultural and Mechanical University to assure that each member of the University community be permitted to work or attend classes in an environment free from any form of discrimination including race, religion, color, age, disability, sex, marital status, national origin, veteran status and sexual harassment as prohibited by state and federal statutes. This shall include applicants for admission to the University and employment.

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Academic Honor Policy The University’s Academic Honor Policy is located in the FANG Student Handbook, under the Student Code of Conduct- Regulation 2.012 section, beginning on page 55-56.

ADA Compliance To comply with the provisions of the Americans with Disabilities Act (ADA), please advise instructor of accommodations required to insure participation in this course. Documentation of disability is required and should be submitted to the Learning Development and Evaluation Center (LDEC). For additional information please contact the LDEC at (850) 599-3180.

References

3. Escherichia coli and Salmonella typhimurium, J. L. Ingraham et al. (eds.), American Society for Microbiology, Washington, D.C., USA, 1987
5. Industrial Microorganisms, R. H. Baltz & G. D. Hegemann (eds.), American Society for Microbiology, Washington, D.C., USA, 1993
10. Applied Microbiology and Biotechnology, H.J. Rehm, Editor-in-Chief, Vol. 1- , Springer Verlag Berlin, Germany
11. Archives of Microbiology, Vol. 1-, G. Drews (ed.), Springer Verlag Berlin, Germany

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