Suffolk County Community College
Eastern Campus - Riverhead, New York
General Microbiology – BIO244
Fall 2009
CRN # 91276 Section # 300

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Office Hours:
Tuesday 7:50 – 8:20, 11:50 – 1:00
Wednesday 9:15 –11:00
Thursday 7:50 – 8:20, 11:50 – 1:00
Or by appointment
Anytime via email!

Textbooks: Microbiology, an Introduction, by Gerard J. Tortora, Berdell R. Funke, and Christine L. Case, Publisher: Benjamin Cummings. 8th, 9th or 10th Edition
Tenth Edition: 2010, ISBN# 9780321550071
Ninth Edition: 2007, ISBN# 9780805347906
Eighth Edition: 2004, ISBN# 0805376135
Benson's Microbiological Applications Complete Version: Laboratory Manual in General Microbiology, Eleventh Edition, by Alfred E. Brown, McGraw-Hill, 2009. ISBN# 9780073522555
**Everyone will need his/her own copy of this (11th ed, complete) lab text.

Other necessary materials:

Lecture:
1. Notebook paper or printed notes from the website pertaining to the chapter being discussed
2. Writing implements
3. Instructor provided handout pertaining to the chapter being discussed when applicable

Lab:
1. Three-ring binder containing the instructor provided supplemental packet
2. Lab book
3. Sharpie or other thin permanent marker

East Campus Library Reserve Items:

Microbiology atlases, study guides and a notebook containing paper copies of lecture notes and the lab supplemental packet are available at the Eastern Campus Library at the reserve desk under Czura.

Course description:

This course will provide students with an introduction to microbiological concepts including cell biology, tools and techniques for analysis of microbes, physical and chemical methods for control of microbial growth, and the relationship of microorganisms to disease. Students will gain an appreciation for the fundamental differences between eukaryotes and prokaryotes through study of fungi, protists, and the various groups of bacteria. Viruses will also be examined. The usefulness of microbes in food production and biotechnology will also be studied both in theory and in practice, highlighting the importance of microbes to our every day lives.

Learning objectives:

The Microbial World and You (Introduction)

- -Recognize the system of scientific nomenclature that uses two names: a genus and specific epithet.
- -Differentiate among the major characteristics of each group of microorganisms.
- -List the three domains.
- -Explain the importance of observations made by and.
- -Compare spontaneous generation and biogenesis.
- -Identify the contributions to microbiology made by Hooke, van Leeuwenhoek, Virchow, Pasteur, Lister, Koch, Jenner, Ehrlich, and Fleming.
- -Define bacteriology, mycology, parasitology, immunology, and virology.
- -List beneficial activities of microorganisms.
- -List harmful activities of microbes
- -Define normal microbiota and resistance.

Chemical Principles

- -Describe the structure of an atom and its relation to the chemical properties of elements.
- -Define ionic bond, covalent bond, hydrogen bond, molecular weights, and mole.
- -Diagram three basic types of chemical reactions.
- -List several properties of water that are important to living systems.
- -Define acid, base, salt, and pH.
- -Distinguish between organic and inorganic compounds.
- -Identify the structure and function of carbohydrates.
- -Identify the structure and function of lipids.
- -Identify the structure and function of proteins.
- -Identify the structure and function of nucleic acids.
- -Describe the role of ATP in cellular activities.

Observing Microorganisms Through a Microscope

- -List the metric units of measurement, including their metric equivalents that are used for microorganisms.
- -Define total magnification and resolution.
- -Compare and contrast brightfield, darkfield, phase-contrast, differential interference contrast, fluorescence, and confocal microscopy
- -Explain how electron microscopy differs from light microscopy.
- -Identify one use for the TEM, SEM, and scanned-probe microscopes.
- -Differentiate between an acidic dye and a basic dye.
- -Compare simple, differential, and special stains.
- -List the steps in preparing a Gram stain, and describe the appearance of gram-positive and gram-negative cells after each step.
- -Compare and contrast the Gram stain and the acid-fast stain.
- -Explain why each of the following is used: capsule stain, endospore stain.

Functional Anatomy of Prokaryotic and Eukaryotic Cells

- -Compare and contrast the overall cell structure of prokaryotes and eukaryotes.
- -Identify the three basic shapes of bacteria.
- -Describe the structure and function of the glycocalyx, flagella, axial filaments, fimbriae, and pili.
- -Compare and contrast the cell walls of gram-positive bacteria, gram-negative bacteria, acid-fast bacteria, archaea, and mycoplasmas.
- -Describe the structure, chemistry, and functions of the prokaryotic plasma membrane.
- -Define simple diffusion, facilitated diffusion, osmosis, active transport, and group translocation.
- -Identify the functions of the nuclear area, ribosomes, and inclusions.
- -Describe the functions of endospores, sporulation, and endospore germination.
- -Describe the process of binary fission.
- -Differentiate between prokaryotic and eukaryotic flagella.
- -Compare and contrast prokaryotic and eukaryotic cell walls and glycocalyxes.
- -Compare and contrast prokaryotic and eukaryotic plasma membranes.
- -Compare and contrast prokaryotic and eukaryotic cytoplasms.
- -Define organelle.
- -Describe the functions of the nucleus, endoplasmic reticulum, ribosomes, Golgi complex, lysosomes, vacuoles, mitochondria, chloroplasts, peroxisomes, and centrosomes.
- -Discuss evidence that supports the endosymbiotic theory of eukaryotic evolution.
- -Compare and contract Mitosis and Meiosis.

Microbial Metabolism

- -Define metabolism, and describe the fundamental differences between anabolism and catabolism.
- -Identify the role of ATP as an intermediate between catabolism and anabolism.
- -Identify the components of an enzyme.
- -Describe the mechanism of enzymatic action.
- -List the factors that influence enzymatic activity.
- -Explain what is meant by oxidation–reduction.
- -List and provide examples of three types of phosphorylation reactions that generate ATP.
- -Explain the overall function of biochemical pathways.
- -Describe the chemical reactions of glycolysis.
- -Explain the products of the Krebs cycle.
- -Describe the chemiosmotic model for ATP generation.
- -Compare and contrast aerobic and anaerobic respiration.
- -Describe the chemical reactions of, and list some products of, fermentation.
- -Describe how lipids and proteins undergo catabolism.
- -Provide examples of the use of biochemical tests to identify bacteria.
- -Compare and contrast cyclic and noncyclic photophosphorylation.
- -Compare and contrast the light-dependent and light-independent reactions of photosynthesis.
- -Compare and contrast oxidative phosphorylation and photophosphorylation.
- -Summarize energy production in cells.
- -Categorize the various nutritional patterns among organisms according to carbon source and mechanisms of carbohydrate catabolism and ATP generation.

-Describe the major types of anabolism and their relationship to catabolism.
-Define amphibolic pathways.

Microbial Growth

-Classify microbes into five groups on the basis of preferred temperature range.
-Identify how and why the pH of culture media is controlled.
-Explain the importance of osmotic pressure to microbial growth.
-Provide a use for each of the four elements (carbon, nitrogen, sulfur, and phosphorus) needed in large amounts for microbial growth.
-Explain how microbes are classified on the basis of oxygen requirements.
-Distinguish between chemically defined and complex media.
-Justify the use of each of the following: anaerobic techniques, living host cells, candle jars, selective and differential media, enrichment media.
-Define colony.
-Describe how pure cultures can be isolated by using streak plates.
-Explain how microbes are preserved by deep-freezing and lyophilization (freeze-drying).
-Define bacterial growth, including binary fission.
-Compare the phases of microbial growth and describe their relation to generation time.
-Explain four direct methods of measuring cell growth.
-Differentiate between direct and indirect methods of measuring cell growth.
-Explain three indirect methods of measuring cell growth.

The Control of Microbial Growth

-Define the following key terms related to microbial control: sterilization, disinfection, antisepsis, degerming, sanitization, biocide, germicide, bacteriostasis, and asepsis.
-Describe the patterns of microbial death caused by treatments with microbial control agents.
-Describe the effects of microbial control agents on cellular structures.
-Compare the effectiveness of moist heat (boiling, autoclaving, pasteurization) and dry heat.
-Describe how filtration, low temperature, high pressure, desiccation, and osmotic pressure suppress microbial growth.
-Explain how radiation kills cells.
-List the factors related to effective disinfection.
-Interpret results of use-dilution tests and the disk-diffusion method.
-Identify the methods of action and preferred uses of chemical disinfectants.
-Differentiate between halogens used as antiseptics and as disinfectants.
-Identify the appropriate uses for surface-active agents.
-List the advantages of glutaraldehyde over other chemical disinfectants.
-Identify the method of sterilizing plastic labware.
-Explain how microbial control is affected by the type of microbe.

Microbial Genetics

-Define genetics, genome, chromosome, gene, genetic code, genotype, phenotype, and genomics.
-Describe how DNA serves as genetic information.
-Describe the process of DNA replication.
-Describe protein synthesis, including transcription, RNA processing, and translation.
-Explain the regulation of gene expression in bacteria by induction, repression, and catabolite repression.
-Classify mutations by type, and describe how mutations are prevented and repaired.
-Define mutagen.
-Describe the effect of mutagens on the mutation rate.
-Outline methods of direct and indirect selection of mutants.
-Compare the mechanisms of genetic recombination in bacteria.
-Differentiate between horizontal and vertical gene transfer.
-Describe the functions of plasmids and transposons.
-Discuss how genetic mutation and recombination provide material for natural selection to act on.

Biotechnology and Recombinant DNA

-Compare and contrast biotechnology, genetic modification, and recombinant DNA.
-Identify the roles of a clone and a vector in making recombined DNA.
-Compare selection and mutation.
-Define restriction enzymes, and outline how they are used to make recombinant DNA.
-List the properties of vectors.
-Describe the use of plasmid and viral vectors.
-Outline the steps in PCR and provide an example of its use.
-Describe ways of getting DNA into a cell.
-Describe how a gene library is made.
-Differentiate cDNA from synthetic DNA.
-Explain how each of the following are used to locate a clone: antibiotic-resistance genes, DNA probes, gene products.
-List advantages of engineering the following: bacteria, yeast, mammalian cells, plant cells.
-Discuss the value of the Human Genome Project.
-Define the following terms: random shotgun sequencing, bioinformatics, proteomics.
-Diagram the Southern blot procedure and provide an example of its use.
-Diagram DNA fingerprinting and provide an example of its use.
-List the advantages of, and problems associated with, the use of genetic modification techniques.

Classification of Microorganisms

-Define taxonomy, taxon, and phylogeny.
-Discuss the advantages of the three-domain system.
-List the characteristics of the Bacteria, Archaea, and Eukarya domains.
-Differentiate among eukaryotic, prokaryotic, and viral species.
-Explain why scientific names are used.
-List the major taxa.
-Differentiate between culture, clone, and strain.
-List the major characteristics used to differentiate the kingdoms of Eukarya.
-Compare and contrast classification and identification.
-Explain the purpose of Bergey's Manual.

-Describe how staining and biochemical tests are used to identify bacteria.
-Differentiate Western blotting and Southern blotting.
-Explain how serological tests and phage typing can be used to identify an unknown bacterium.
-Describe how a newly discovered microbe can be classified by: DNA base composition, DNA fingerprinting, and PCR.
-Describe how microorganisms can be identified by nucleic acid hybridization, Southern blotting, DNA chips, ribotyping, and FISH.
-Differentiate a dichotomous key from a cladogram.

The Prokaryotes: Domains Bacteria and Archaea

-Distinguish among the alphaproteobacteria.
-Distinguish among the betaproteobacteria.
-Distinguish the orders of gammaproteobacteria.
-Distinguish among the deltaproteobacteria.
-Distinguish among the epsilonproteobacteria.
-Distinguish among the gram-negative nonproteobacteria.
-Compare and contrast the green and purple photosynthetic bacteria with the cyanobacteria.
-Distinguish among the low G + C gram-positive bacteria described in this chapter.
-Distinguish among the high G + C gram-positive bacteria described in this chapter.
-Distinguish Chlamydias, spirochetes, Cytophaga, Bacteroidetes, and Fusobacteria.

The Eukaryotes: Fungi, Algae, and Protozoa

-List the defining characteristics of fungi.
-Differentiate between sexual and asexual reproduction, and describe each of these processes in fungi.
-List the defining characteristics of the phyla of fungi.
-Identify beneficial and harmful effects of fungi.
-Describe the roles of the fungus and the alga in a lichen.
-List the defining characteristics of algae.
-List the outstanding characteristics of the phyla of algae.
-List the defining characteristics of protozoa.
-Describe the outstanding characteristics of the phyla of protozoa.
-Compare and contrast cellular slime molds and plasmodial slime molds.
-Define arthropod vector.

Viruses, Viroids, and Prions

-Differentiate a virus from a bacterium.
-Describe the chemical composition and physical structure of an enveloped and a nonenveloped virus.
-Define viral species.
-Give an example of a family, genus, and common name for a virus.
-Describe how bacteriophages are cultured.
-Describe how animal viruses are cultured.
-List techniques that are used to identify viruses.
-Describe the lytic cycle of T-even bacteriophages.
-Describe the lysogenic cycle of bacteriophage lambda.
-Compare and contrast the multiplication cycle of DNA- and RNA-containing animal viruses.
-Define oncogene and transformed cell.
-Discuss the relationship between DNA- and RNA-containing viruses and cancer.
-Differentiate between persistent viral infections and latent viral infections.
-Discuss how a protein can be infectious.
-Differentiate virus, viroid, and prion.

Principles of Disease and Epidemiology

-Define pathology, etiology, infection, and disease.
-Define normal and transient microbiota.
-Compare commensalism, mutualism, and parasitism, and give an example of each.
-Contrast normal and transient with opportunistic microbes.
-List Koch's postulates.
-Differentiate a communicable from a noncommunicable disease.
-Categorize diseases according to frequency of occurrence.
-Categorize diseases according to severity.
-Define herd immunity.
-Identify four predisposing factors for disease.
-Put the following terms in proper sequence in terms of the pattern of disease: period of decline, period of convalescence, period of illness, prodromal period, incubation period.
-Define reservoir of infection.
-Contrast human, animal, and nonliving reservoirs.
-Explain methods of disease transmission.
-Define nosocomial infections and explain their importance.
-Define compromised host.
-List several methods of disease transmission in hospitals.
-Explain how nosocomial infections can be prevented.
-Define epidemiology and describe three types of epidemiologic investigation.
-Identify the function of the CDC.
-Define the following terms: morbidity, mortality, and notifiable disease

Microbial Mechanisms of Pathogenicity

-Identify the principal portals of entry.
-Define LD50 and ID50.
-Using examples, explain how microbes adhere to host cells.
-Explain how capsules and cell wall components contribute to pathogenicity.
-Compare the effects of coagulases, kinases, hyaluronidase, and collagenase.
-Define and give an example of antigenic variation.
-Describe how bacteria use the host cell's cytoplasm to enter the cell.
-Describe the function of siderophores.

-Provide an example of direct damage, and compare this to toxin production.
-Contrast the nature and effects of exotoxins and endotoxins.
-Outline the mechanisms of action of A-B toxins, membrane-disrupting toxins, and superantigens. Classify diphtheria toxin, erythrogenic toxin, botulinum toxin, tetanus toxin, Vibrio enterotoxin, and staphylococcal enterotoxin.
-Identify the importance of the LAL assay.
-Using examples, describe the role of plasmids and lysogeny in pathogenicity.
-List cytopathic effects of viral infections.

Innate Immunity: Nonspecific Defenses of the Host

-Differentiate between innate and adaptive immunity.
-Describe the role of the skin and mucous membranes in innate immunity.
-Differentiate physical from chemical factors, and list examples of each.
-Describe the role of normal microbiota in innate resistance.
-Classify phagocytic cells, and describe the roles of granulocytes and monocytes.
-Define differential white blood cell count.
-Define phagocyte and phagocytosis.
-Describe the process of phagocytosis, and include the stages of adherence and ingestion.
-Identify methods of avoiding destruction by phagocytes.
-List the stages of inflammation.
-Describe the roles of vasodilation, kinins, prostaglandins, and leukotrienes in inflammation.
-Describe phagocyte migration.
-Describe the cause and effects of fever.
-List the components of the complement system.
-Describe pathways of activating complement.
-Describe three consequences of complement activation.
-Define interferons.
-Compare and contrast the actions of α-IFN and β-IFN with γ-IFN.
-Describe the role of transferrins in innate immunity.
-Describe the role of antimicrobial peptides in innate immunity.

Adaptive Immunity: Specific Defenses of the Host

-Differentiate between humoral and cellular immunity.
-Define antigen, epitope, and hapten.
-Explain the function of antibodies and describe their structural and chemical characteristics.
-Name one function for each of the five classes of antibodies.
-Compare and contrast T-dependent antigens and T-independent antigens.
-Differentiate between plasma cell and memory cell.
-Describe clonal selection.
-Describe outcomes of an antigen-antibody reaction.
-Differentiate between helper T, cytotoxic T, and regulatory T cells.
-Differentiate between TH1 and TH2 cells.
-Define apoptosis.
-Define antigen-presenting cell.
-Describe the function of natural killer cells.
-Describe the role of antibodies and natural killer cells in antibody-dependent cell-mediated cytotoxicity.
-Identify at least one function of each of the following: cytokines, interleukins, interferons.
-Distinguish a primary from a secondary immune response.
-Contrast the four types of adaptive immunity.

Practical Applications of Immunology

-Define vaccine.
-Explain why vaccination works.
-Differentiate between the following, and provide an example of each: attenuated, inactivated, toxoid, subunit, and conjugated vaccines.
-Contrast subunit vaccines and nucleic acid vaccines.
-Compare and contrast the production of whole-agent vaccines, recombinant vaccines, and DNA vaccines.
-Define adjuvant.
-Explain the value of vaccines, and discuss acceptable risks for vaccines.
-Explain how antibodies are used to diagnose diseases.
-Define monoclonal antibodies, and identify their advantage over conventional antibody production.
-Explain how precipitation and immunodiffusion tests work.
-Differentiate direct from indirect agglutination tests.
-Differentiate agglutination from precipitation tests.
-Define hemagglutination.
-Differentiate precipitation from neutralization tests.
-Explain the basis for the complement-fixation test.
-Compare and contrast direct and indirect fluorescent-antibody tests.
-Explain how direct and indirect ELISA tests work.

Antimicrobial Drugs

-Name the microbes that produce most antibiotics.
-Describe the problems of chemotherapy for viral, fungal, protozoan, and helminthic infections.
-Define the following terms: spectrum of activity, broad-spectrum drugs, superinfection.
-Identify five modes of action of antimicrobial drugs.
-List the advantages of each of the following over penicillin: semisynthetic penicillins, cephalosporins, and vancomycin.
-Explain why INH and ethambutol are antimycobacterial agents.
-Describe how each of the following inhibits protein synthesis: aminoglycosides, tetracyclines, chloramphenicol, macrolides.
-Compare the mode of action of polymyxin B, bacitracin, and neomycin.
-Describe how rifamycins and quinolones kill bacteria.
-Describe how sulfa drugs inhibit microbial growth.
-Explain the modes of action of currently used antifungal drugs.
-Explain the modes of action of currently used antiviral drugs.

-Explain the modes of action of currently used antiprotozoan drugs.
-Describe two tests for microbial susceptibility to chemotherapeutic agents.
-Describe the mechanisms of drug resistance.

Microbial Diseases of the Skin and Eyes

-Describe the structure of the skin and mucous membranes and the ways pathogens can invade the skin.
-Provide examples of normal skin microbiota, and state their locations and ecological roles of its members.
-Differentiate staphylococci from streptococci, and name several skin infections caused by each.
-List the causative agent, method of transmission, and clinical symptoms of Pseudomonas, dermatitis, otitis externa, acne.
-List the causative agent, method of transmission, and clinical symptoms of these skin infections: warts, smallpox, chickenpox, shingles, cold sores, measles, rubella, fifth disease, roseola.
-Differentiate cutaneous from subcutaneous mycoses.
-List the causative agent of and predisposing factors for candidiasis.
-Define conjunctivitis.
-List the causative agent, method of transmission, and clinical symptoms of these eye infections: neonatal gonorrheal ophthalmia, inclusion conjunctivitis, trachoma.
-List the causative agent, method of transmission, and clinical symptoms of these eye infections: herpetic keratitis, Acanthamoeba keratitis.

Microbial Diseases of the Nervous System

-Define central nervous system and blood-brain barrier.
-Differentiate meningitis from encephalitis.
-Discuss the epidemiology of meningitis caused by H. influenzae, S. pneumoniae, N. meningitidis, and L. monocytogenes.
-Explain how bacterial meningitis is diagnosed and treated.
-Discuss the epidemiology of tetanus, including mode of transmission, etiology, disease symptoms, and preventive measures.
-State the causative agent, symptoms, suspect foods, and treatment for botulism.
-Discuss the epidemiology of leprosy, including mode of transmission, etiology, disease symptoms, and preventive measures.
-Discuss the epidemiology of poliomyelitis, rabies, and arboviral encephalitis, including mode of transmission, etiology, and disease symptoms.
-Compare the Salk and Sabin vaccines.
-Compare preexposure and postexposure treatments for rabies.
-Explain how arboviral encephalitis can be prevented.
-Identify the causative agent, reservoir, symptoms, and treatment for cryptococcosis.
-Identify the causative agent, vector, symptoms, and treatment for African trypanosomiasis and amebic meningoencephalitis.
-List the characteristics of diseases caused by prions.
-List some possible causes of chronic fatigue syndrome.

Microbial Diseases of the Cardiovascular and Lymphatic Systems

-Identify the role of the cardiovascular and lymphatic systems in spreading and eliminating infections.
-List the signs and symptoms of septicemia, and explain the importance of infections that develop into septicemia.
-Differentiate gram-negative sepsis, gram-positive sepsis, and puerperal sepsis.
-Describe the epidemiologies of bacterial endocarditis and rheumatic fever.
-Discuss the epidemiology of tularemia.
-Discuss the epidemiology of brucellosis.
-Discuss the epidemiology of anthrax.
-Discuss the epidemiology of gas gangrene.
-List pathogens that are transmitted by animal bites and scratches.
-Compare and contrast the causative agents, vectors, reservoirs, symptoms, treatments, and preventive measures for plague, Lyme disease, and Rocky Mountain Spotted Fever.
-Identify the vector, etiology, and symptoms of diseases transmitted by ticks.
-Describe the epidemiologies of epidemic typhus, endemic murine typhus, and spotted fevers.
-Describe the epidemiologies of CMV inclusion disease, Burkitt's lymphoma, and infectious mononucleosis.
-Compare and contrast the causative agents, vectors, reservoirs, and symptoms for yellow fever, dengue, and dengue hemorrhagic fever.
-Compare and contrast the causative agents, modes of transmission, reservoirs, and symptoms for Ebola hemorrhagic fever and Hantavirus pulmonary syndrome.
-Compare and contrast the causative agents, modes of transmission, reservoirs, symptoms, and treatments for Chagas' disease, toxoplasmosis, malaria, leishmaniasis, and babesiosis.

Microbial Diseases of the Respiratory System

-Describe how microorganisms are prevented from entering the respiratory system.
-Characterize the normal microbiota of the upper and lower respiratory systems.
-Differentiate among pharyngitis, laryngitis, tonsillitis, sinusitis, and epiglottitis.
-List the causative agent, symptoms, prevention, preferred treatment, and laboratory identification tests for streptococcal pharyngitis, scarlet fever, diphtheria, cutaneous diphtheria, and otitis media.
-List the causative agents and treatments for the common cold.
-List the causative agent, symptoms, prevention, preferred treatment, and laboratory identification tests for pertussis and tuberculosis.
-Compare and contrast bacterial pneumonias.
-List the etiology, method of transmission, and symptoms of melioidosis.
-List the causative agent, symptoms, prevention, and preferred treatment for viral pneumonia, RSV, and influenza.
-List the causative agent, mode of transmission, preferred treatment, and laboratory identification tests for four fungal diseases of the respiratory system.

Microbial Diseases of the Digestive System

-Name the structures of the digestive system that contact food.
-List examples of microbiota for each part of the gastrointestinal tract.
-Describe the events that lead to dental caries and periodontal disease.
-List the causative agents, suspect foods, signs and symptoms, and treatments for staphylococcal food poisoning, shigellosis, salmonellosis, typhoid fever, cholera, gastroenteritis, and peptic ulcer disease.
-List the causative agents, modes of transmission, sites of infection, and symptoms for mumps.
-Differentiate between hepatitis A, hepatitis B, hepatitis C, hepatitis D, and hepatitis E.
-List the causative agents, mode of transmission, and symptoms of viral gastroenteritis.
-List the causes of ergot poisoning and aflatoxin poisoning.
-List the causative agents, modes of transmission, symptoms, and treatments for giardiasis, cryptosporidiosis, Cyclospora diarrheal infection, and amoebic dysentery.

Microbial Diseases of the Urinary and Reproductive Systems

-List the antimicrobial features of the urinary system.
-Identify the portals of entry for microbes into the reproductive system.
-Describe the normal microbiota of the upper urinary tract, the male urethra, and the female urethra and vagina.
-Describe modes of transmission for urinary and reproductive system infections.
-List the microorganisms that cause cystitis, pyelonephritis, and leptospirosis, and name the predisposing factors for these diseases.
-List the causative agents, symptoms, methods of diagnosis, and treatments for gonorrhea, NGU, PID, syphilis, LGV, chancroid, and bacterial vaginosis.
-List reproductive system diseases that can cause congenital and neonatal infections, and explain how these infections can be prevented.
-Discuss the epidemiology of genital herpes and genital warts.
-Discuss the epidemiology of candidiasis.
-Discuss the epidemiology of trichomoniasis.
-Discuss the progression of HIV infection to AIDS

Policy, attendance and student responsibilities:

Attendance

Attendance is mandatory, and you are expected to arrive on time. Regardless of excuse YOU are solely responsible for all material covered in class, both lecture and lab. There will be ***NO make-up*** lab exercises, quizzes, or exams. If you must miss a quiz for a VALID REASON you must contact me BEFORE the start of class (email or voicemail) to be excused from receiving the grade of zero. Because the lowest exam grade is dropped, a missed exam, regardless of reason, with a grade of zero, now becomes the grade you drop.

The college defines excessive absence or lateness as more then the equivalent of one week of class meetings during the semester. Excessive absence or tardiness may lead to failure of the course.

Cell phones and recorders

TURN OFF YOUR CELL PHONE!!! If your phone, pager, or other noise producing electronic device disrupts the lecture you will be asked to leave the class. The college does not permit the use of cell phones for any reason, including as a calculator, during exams. Talking on a cell phone, text messaging, web surfing, and other distracting activities are strictly prohibited. If you are caught engaged in activities not pertinent to the lesson, the distracting object may be confiscated or you may be asked to leave the class.

Use of audio recorders is permitted so long as they do not interfere with the learning process of others. You are welcome to place your recorder on the front table for better sound quality.

Required Reading and Preparation

You are required to read the chapters pertaining to the lecture and lab in advance to be familiar with the material. The lecture experience is a much more useful when the time can be spent learning the concepts rather than attempting to decipher new and unfamiliar vocabulary. You are expected to fully comprehend all material outlined in class. Reading of the text on your own outside of class will likely be necessary to accomplish an adequate mastery of the material.

You are required to provide an outline of the lab activities for the day each day. Your outline will be a written synopsis of what you are to do in the lab period that day. This will require you to read the lab book and supplemental materials BEFORE class in order to adequately complete the outline. Failure to provide a complete outline will result in the loss of one point from your final grade for each outline not turned in. Failure to prepare yourself for the lab activities each day will result in your inability to complete the lab assignment in the prescribed time.

Withdrawal and Failure

Do not vanish from the course. If you decide that you no longer wish to be enrolled in the class, regardless of reason, you *must officially withdraw yourself* at the registrar's office by the mid-semester withdrawal date indicated on the academic calendar. If you fail to attend the assigned meeting times and exams without filing withdrawal paperwork you will be issued a permanent grade of "F" for the course. I will allow withdrawls from the course up to and including last day for anyone who does not achieve a C or higher as the final grade. You will need to acquire and fill out the proper form, have it signed by me, and

submit it to the registrar no later than 5pm on the last day of class. Do note that a W will not affect your GPA, but it also does not count as credits toward full-time status.

Regardless of your situation at any point in the semester, come speak to me BEFORE withdrawing so we can assess your standing. Many students panic over one bad grade and it would be a shame for you to throw the course away if you are doing better than you think. Since I do allow you to withdraw at the end, there is no risk in sticking it out.

How to get the most out of this course (a.k.a. how to get a good grade):

The texts

All quiz and exam questions will be derived from material outlined in class, therefore your notes are very important. Your textbook is a required reference tool to aid in your thorough understanding of material covered in class. You are not held responsible for material in addition to that being outlined in class, however your reading of the pertinent text is essential to your learning. You are responsible for complete comprehension of all of the material outlined in class and that can only be accomplished by extensive reading on your own. We simply do not have time to cover it all in adequate detail to insure your complete understanding in class alone.

For the lab component of the course, it is absolutely necessary and required to read the activities prior to class. You will not be able to complete all your necessary activities in the time provided if you do not have a good idea what your tasks are before the lab begins. On many occasions you will have multiple activities to perform at once and you must coordinate effectively with your lab partner(s) to accomplish all the tasks in the time provided.

Your notes

PDF files or hard copy prints of the Power Point slides/overheads used in class can be found in the library at the reserve desk or on my web site at www2.sunysuffolk.edu/czuraa. Students who know that they are slow note-takers often choose to come to class with the Power Point notes and take margin notes as necessary while I lecture. Other students choose to copy notes from the projected slides during the lecture. Either way, you should get in the habit of recopying your notes after each lecture, using your textbook as a guide to add clarity where necessary. The recopying will serve three purposes:

1. It will reinforce the material, as repetition is the key to learning
2. It will make you aware of anything you were unclear on so that you could ask for clarification in the next class period or during office hours while the material is still timely
3. It will provide you with a nice clear study aid for exams and quizzes so you can spend your study time learning from your notes instead of trying to decipher them.

It may seem like extra work, but faithful recopying will shorten your study time and lower your frustration level later, as well as allowing you to really learn the material instead of just memorizing facts in the short term. The more you write and read and hear the material, the better you will be able to retain it. This is not the kind of course where you catch up easily if you fall behind. Keep up on the material.

Make connections

Do not make the mistake of treating the lecture and the lab as completely different courses. Although the timing may not perfectly coincide, both aspects of the course deal with similar information. Many of the microbiology lab activities involve performing procedures that are briefly discussed in lecture. Something that may have not made a lot of sense to you in a written paragraph in your text book may become very clear once you have done it yourself. Go back and make the connection for yourself between what you have learned and what you are doing. It will make both the lecture and lab experience more rewarding.

Exam strategy

Always write something on exams and quizzes. There is no penalty for wrong answers. Partial credit will be given for any information that is accurate, even if the answer is incomplete. Certainly on true/false, multiple choice and matching questions you might as well take a guess. Sometimes you know things you don't know you know and sometimes you can just get lucky.

Use office hours

I have office hours. Ask when you fail to understand something, do not just ignore it and hope it goes away. There are no stupid questions and you will not be bothering me. The office hours are for you and I am more than willing to try to find a way to explain something to you so it will make sense.

Use the time you paid for

Utilize the entire lab period. You are allowed to work at your own pace and leave whenever you feel you are finished, so there is the temptation to get out as early as possible. This is your time to get one-on-one instruction from me if you are in need of clarification. Make use of me! It might be your only chance to really make sure you understand what is going on, particularly if you are confused in lab. Although lecture material can generally be found in the textbook for clarification, many of the nuances of the lab exercises are learned while doing them and if you miss the point, there may be no way to teach yourself at home after the fact.

Student assessment:

Your comprehension of the material will be determined by your performance on weekly quizzes, lecture exams, lab practical exams, and the correct identification of, and reporting on, an unknown culture.

Quizzes

Quizzes will be given weekly and will cover the material since the previous quiz or exam, generally two lectures worth of material. You will be given approximately five minutes at the start of class to complete the quiz. Do not be late to class as quizzes will be collected promptly at five minutes past the start of class, regardless of when you arrived. If you wish more time you may come to class ten minutes early and begin on arrival. The purpose of the quizzes is to insure that you are keeping up on the material. Just cramming the night before an exam is a sure way to fail a course as dense as this one.

Lecture Exams

Lecture material will be broken into four units with an exam on each unit. The exams will cover the material since the last exam and are not cumulative. You will have the entire lecture period (1 hour 15 minutes) to complete the exam on the day it is scheduled. Any format on the exams is possible. Often they are multi-format including such testing types as matching, true-false, multiple choice and short answer.

Lab Practical Exams

Lab material will be broken into two parts with an exam on each. The practical exams will cover material since the previous exam and are not cumulative. Lab practical exams tend to be in the format of question stations around the room where you are asked to identify features on the slide/specimen/object or interpret the results of a diagnostic test. Additionally you will be responsible for methods and reagents utilized in the laboratory activities. Spelling does matter and no word banks are provided. The time allotted to a lab exam will be determined by the complexity of the exam, but there will be no lab activities on an exam day.

Laboratory Activity Outlines

You must read and understand the planned activities for lab each day prior to your arrival in class or you will not be able to complete the required tasks in the short amount of time allotted. To insure that you

have read and know where to locate the directions for your activities, you are required to present an outline of the planned activities each day. No outlines will be accepted late, and each missed outline will result in the loss of one point from your final course average. There will be a total of 26 outlines due during the course of the semester so failure to submit outlines can result in a tremendous negative impact on your final grade. Each outline will be a written synopsis of what you are to do in the lab period that day and will include such details as the organisms you will use, the type and amount of media and equipment, and the methods that will be employed to accomplish the lab. You may refer to page numbers for step by step instructions instead of rewriting the complete instructions. Be sure to consult the lab supplemental packet for any changes to the lab activity so that you can incorporate the changes into your outline. An example outline has been provided in the supplemental packet. The purpose of the outline is to force you to prepare for the lab activity. Your preparation is more important than the perfect formatting of the outline.

Unknown Identification

You will be issued two organisms on or around the sixth lab period that you will be responsible for identifying by genus and species using various testing procedures during the subsequent eight labs. Upon completion of the tests, you will submit one data report in the correct format for your favorite of the two organisms. In the report you will identify the organism and summarize the results for all the tests you performed. The data report will count as half of one exam grade. The other half of the grade will come from a second report, written in formal scientific style, regarding the same unknown culture. This report will include background information and will demonstrate a logical flow of critical thinking to the solution of the identity of your unknown. A description of each of the lab report formats is provided in your laboratory supplemental packet and must be followed exactly as stated.

Optional Oral Presentation

During the last lab period, as an optional activity, we will explore how microbes contribute to our diet. You will choose a food product that is made of a microbe or is made using some microbial metabolism process. Your food item must be unique in the class. Solid foods, beverages and food supplements are all acceptable. You will give a roughly five-minute talk and visual presentation in which you will discuss the food, the microbes, and how the food is produced. Presentations and a food sampling party will occur during the last lab period. The oral presentation can be worth up to 2 points on the final average, depending on quality and creativity.

Grading:

Four lecture exams, ten quick quizzes, two lab practical exams, the identification of an unknown bacterial sample, subtraction of points for missed outlines, plus an optional oral presentation on microbial food products will determine your final grade. Each exam and the average of all the quizzes will count equally, and the lowest of these seven grades will be dropped. The unknown project will also count equally but may NOT be dropped. Each of these exam components will count for ~14.3% of the total grade. The optional oral presentation will be worth **up to** 2 points on the final average, depending on quality and creativity. Each laboratory outline not turned in will result in the loss of one point from the final average. There are **no** additional curves or extra credit projects, as your grade *should* represent the overall percentage of material you mastered in this course. Your final grade will be calculated as follows:

88% and up = A
82 - 87.99% = B+
76 - 81.99% = B
70 - 75.99% = C+
64 - 69.99%= C
58 - 63.99%= D+
52 - 57.99% = D
Below 52% = F

Record your grades here to keep track of your progress

Quiz 1	
Quiz 2	
Quiz 3	
Quiz 4	
Quiz 5	
Quiz 6	
Quiz 7	
Quiz 8	
Quiz 9	
Quiz 10	
QUIZ AVERAGE	

1. Exam 1	
2. Exam 2	
3. Exam 3	
4. Exam 4	
5. Practical 1	
6. Practical 2	
7. QUIZ AVERAGE	
Unknown **(NO drop!)**	

To calculate your final grade, add the 6 highest of the assignments 1-7 above, then the unknown, and divide by seven.

Subtract one point for each outline not turned in, and add two points if you do a very good, very complete, with visual aids and food, food presentation. Then consult the grading scale above to determine your final letter grade.

Grades often seem a mystery to students. The numerical convention is to express grades as a percentage so that regardless of the number of questions on any one exam we are all representing the percent of material you got correct. When there are 100 points, you do the percent math automatically in your head, since percents are based on 100. So if you got 85 of them correct, you got 85% of them correct and thus a grade of 85% [(85 ÷100) x 100]. When there are 83 questions and you got 71 of them correct, you got 85% percent of the questions correct and thus an 85% as a grade. (85.54% actually, [(71÷83) x 100].) The formula is always the same: number of questions correct divided by the total number of questions, multiplied by 100 equals the percent of questions correct and thus your grade. It is no mystery, just simple math!

BIO244 Lecture Schedule: Tuesdays & Thursdays 8:30 – 9:45 S212

Lec #	***DATE***	***TOPIC***	***CHAPTER for lecture***
1	9/1/09	Course Policy and Introduction	1
2	9/3/09	*Take Home Quiz Due* / Intro & Biomolecules	1, 2
3	9/8/09	Biomolecules, Prokaryotic Cell Structure	2, 4
4	9/10/09	*Quiz 1 (on Lecture # 1, 2, & 3 material)* / Prokaryotic & Eukaryotic Cell Structure	4
	9/15/09	***No Class: All College Day for Faculty***	
5	9/17/09	*Quiz 2 (Lec # 4)* / Eukaryotic Cell Structure	4
6	9/22/09	Microbial Metabolism	5
7	9/24/09	*Quiz 3 (Lec # 5, 6)* / Microbial Metabolism	5
	9/29/09	**Exam 1 (Chapters 1, 2, 4, 5) Lecture #1-7**	
8	10/1/09	Microbial Genetics	8
9	10/6/09	Microbial Genetics	8
10	10/8/09	*Quiz 4 (Lec # 8, 9)* / Microbial Genetics, Microorganism Classification,	8, 10
11	10/13/09	Microorganism Classification, Bacteria	10, 11
12	10/15/09	*Quiz 5 (Lec # 10, 11)* / Bacteria	11
13	10/20/09	Fungi and Protists	12
14	10/22/09	*(No Quiz: report due)* / Protists, Viruses	12, 13
15	10/27/09	Viruses	13
16	10/29/09	*Quiz 6 (Virus only)* / Disease and Epidemiology (on Exam 3 not Exam 2)	14
	11/3/09	**Exam 2 (Chapters 8, 10-13) Lecture #8-15**	
17	11/5/09	*Quiz 7 (Lec # 16)* / Pathogenicity	15
18	11/10/09	Nonspecific Host Defenses	16
19	11/12/09	*Quiz 8 (Lec # 17, 18)* / Immune Response	17
20	11/17/09	Immunology Applications	18
21	11/19/09	*Quiz 9 (Lec # 19, 20)* / Biotechnology	9
	11/24/09	**Exam 3 (Chapters 9, 14-18) Lecture #16-21**	
	11/26/09	***No Class: Thanksgiving Break***	
22	12/1/09	Growth and Control of Microorganisms	6, 7
23	12/3/09	*Quiz 10 (Lec # 22)* / Antimicrobial Drugs	20
24	12/8/09	Microbial Diseases	21-22
25	12/10/09	Microbial Diseases	23-24
26	12/15/09	Microbial Diseases	25-26
	12/17/09	**Exam 4 (Chapters 6, 7, 20-26) Lecture #22-26**	

BIO244 Lab Schedule: : Tuesdays & Thursdays 10:00 – 11:50

LAB #	*DATE*	*TOPIC*	*EXERCISE*
1	9/1/09	Microscopy lecture Microscopy, Ubiquity: test household surfaces for bacteria	Text Chapter 3 1, 5, 7, Supplement
2	9/3/09	Bacterial Growth lecture Aseptic and Pure Culture Techniques	Text Chapter 6 9, 10
3	9/8/09	Smear Preparation and Simple Staining	11, 12
4	9/10/09	Gram and Acid-fast Staining	15, 17
5	9/17/09	Negative, Capsular, and Spore Staining	13, 14, 16
6	9/22/09	Motility, Cultivation of Anaerobe, Unknown	18, 21, 39 Supplement
7	9/24/09	Unknown, Cultural Characteristics (Information in Exercise 44 may help you identify your unknown)	39, 40, 44
8	9/29/09	Gram Stain Unknown, Observe Demonstrations of Cultural Characteristics	15, 40
9	10/1/09	Library Research, Gram Stain and Cultural Characteristics continued,	15, 40
10	10/6/09	Oxidation and Fermentation Tests	41
11	10/8/09	Hydrolytic and Degradative Reactions	42
12	10/13/09	Multiple Test Media, Gram Negative Intestinal Pathogens	43, 72, Supplement
13	10/15/09	Staphylococci and Streptococci Identification Fungi: prepare cultures for lab 15	70, 71, Supplement Set up 24
14	10/20/09	Read Results (End material for Practical Exam 1)	
15	10/22/09	**Unknown Data Report Due**, Fungi	8, 24
16	10/27/09	**Practical Exam 1** (Covers material from Lab Days 1-14)	
17	10/29/09	Protista	6
18	11/3/09	Enumeration	22
19	11/5/09	Bacterial Counts on Foods, Examination of Water, Membrane Filter Method	60, 61, 62
20	11/10/09	**Draft Formal Report Due for Peer Review**, Bacterial Transformation	EDVO-Kit#300
21	11/12/09	Bacterial Transformation	EDVO-Kit#300
22	11/17/09	**Peer Review of Report Due**, Simulated PCR Screening, Agarose Gel Electrophoresis	68, Supplement, EDVO-Kit#124
23	11/19/09	Simulated PCR Screening, Agarose Gel Electrophoresis	68, Supplement, EDVO-Kit#124
24	11/24/09	Antibody Disease Screening	EDVO-Kit#271, 74
25	12/1/09	**Unknown Formal Report Due**, Effects of Temp, pH, Osmotic Pressure, and Microbial Antagonism on Growth	29, 30, 31, 32, 59
26	12/3/09	Effects UV and Lysozyme on Growth	33, 34
27	12/8/09	Effects of Alcohol, Washing, Antibiotics and Antiseptics on Growth	35, 38, 36, 37
28	12/10/09	Read Results (Last day for food presentation sign up)	
29	12/15/09	**Practical Exam 2** (Covers material from Lab Days 15-28)	
30	12/17/09	Presentations of Microbial Food Products	