MICRO 5 Course Outline as of Fall 1997

CATALOG INFORMATION

Dept and Nbr: MICRO 5 Title: GENERAL MICROBIO
Full Title: General Microbiology
Last Reviewed: 8/14/2023

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	5.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	5.00	Lab Scheduled	6.00	6	Lab Scheduled	105.00
		Contact DHR	0		Contact DHR	0
		Contact Total	9.00		Contact Total	157.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 262.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
Physiology and genetics of micro-organisms with emphasis on the bacteria. Principles of host-parasite interaction. Usually offered fall and summer.

Prerequisites/Corequisites:
Completion of CHEM 60 or higher (V6) and Completion of BIO 10 or higher (V7)

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: Physiology, genetics, and toxonomy of micro-organisms with emphasis on the bacteria. Principles of host-parasite interaction. (Grade Only)
Prerequisites/Corequisites: Completion of CHEM 60 or higher (V6) and Completion of BIO 10 or higher (V7)
Recommended:
Limits on Enrollment:
Transfer Credit: CSU;UC. (CAN BIOL14)

Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**		Effective:	Inactive:
	C	Natural Sciences	Fall 1981	
CSU GE:	**Transfer Area**		Effective:	Inactive:
	B2	Life Science	Fall 1981	
	B3	Laboratory Activity		
IGETC:	**Transfer Area**		Effective:	Inactive:
	5B	Biological Sciences	Fall 1981	
	5C	Fulfills Lab Requirement		

CSU Transfer:	Transferable	Effective:	Fall 1981	Inactive:
UC Transfer:	Transferable	Effective:	Fall 1981	Inactive:

CID:

Certificate/Major Applicable:
Not Certificate/Major Applicable

COURSE CONTENT

Outcomes and Objectives:
On completion of the course students should be able to:
1. Relate the discovery of micro-organisms to ubiquity, pleiomorphism and spontaneous generation.
2. Establish the role of micro-organisms in geochemical processes, biotechnology, and disease by applying Koch's Postulates.
3. Describe the connections between basic principles of chemistry and cell organization.
4. Describe the connection between DNA structure and it's functions.
5. Explain the workings of protein synsthesis and the relationship between protein structure and function.
6. Describe the current model of the cell membrane.
7. Describe the chemical basis for the functional unity of cells.
8. Explain why the division of life into procaryotes and eucaryotes is the great divide evolutionarily.
9. Sterilize various media using a variety of techniques.
10. Construct appropriate culture media.
11. Grow cells in pure culture.
12. Construct and analyze a standard growth curve.
13. Identify various types of micro-organisms by microscopy and staining.
14. Biotype various procaryotes.
15. Isolate novel organisms using enrichment culture.
16. Prepare, innoculatate, monitor and harvest a biofermenter.
17. Isolate and transfer plasmids.
18. Select for and isolate recombinant cultures.
19. Titrate and identify a virus.
20. Isolate and identify members of the normal human microbial flora.

21. Test the effects of antibiotics on bacterial cell cultures.
22. Define genotype and phenotype in molecular terms.
23. Define mutation and natural selection and explain their role in microbial evolution.
24. Define recombination.
25. Explain the role of mobile genetic elements in recombination.
26. Describe transformation, conjugation, and transduction and relate to recombination.
27. Describe the role of enzymes in recombination.
28. Explain the strategies for selecting and isolating recombinants.
29. Describe environment's role in determining nature of microbial population.
30. Explain the "antibiotic paradox".
31. Describe the discovery of the connection between virus and disease.
32. Define virus and place it in the hierarchy of biological organization.
33. Explain the interaction of virus and cells.
34. Relate virus cell interactions to antiviral vaccination and antiviral chemotherapy.
35. Describe the eradication of small pox and polio.
36. Describe the role of virus in biotechnology.
37. Explain the special interaction of virus and host genome in lysogeny and retro virus.
38. Relate the biochemical nature of micro-organism to difficulties in their taxonomy.
39. Compare and contrast traditional and modern methods of taxonomy.
40. Describe the taxonomy of some representative groups of procaryotes i.e. mycobacterium, lactobacillus.
41. Define symbiosis and explain its evolutionary origins.
42. Explain how symbiosis shifts the emphasis in disease from parasite to host.
43. Describe some major symbiotic interactions i.e. nitrogen fixation.
44. Explain the role of the normal flora in disease.
45. Describe how mechanisms of pathogenicity are defined and investigated.
46. Define and describe epidemiology.
47. Relate modern taxonomy to epidemiology and biotechnology.
48. Describe the basic structures and functions of non-specific resistance factors in disease.
49. Define and describe the immune system.
50. Relate various immune functions to disease resistance.
51. Predict advances in management of infectious disease based on immune function.
52. Define vaccination and differentiate among various vaccine types.
53. Compare vaccination against viral disease to vaccination against diseases caused by procaryotic and eucaryotic cells.
54. Relate techniques in microbial genetics to advances in biotechnology.
55. Relate enrichment culture techniques to biotechnology.
56. Relate wine making to traditional and modern fermentation technology.

Topics and Scope:

1. Historical development
   1. The pre-microbial world.
   2. Evolution of ubiquity.
   3. The discovery of microbial world and the development of the microscope.
   4. Pasteur's discovery of life without air.
   5. Wine and the transformation of organic matter.
   6. Spontaneous generation and pleiomorphism.
   7. Koch's Postulates establish causability.
   8. Superficiality of the classical model.
   9. Contribution of biochemistry and molecular biology to microbiology. Biotyping. Procaryotes and eucaryotes introduced.
2. Cell biology
   1. Atomic structure and molecular shape, high and low energy bonds in mucleic acids and proteins, free energy, activation energy, equilibria cells obey the laws of chemistry.
   2. Lipids, membranes and cells.
   3. DNA, RNA, Protein: Structure and functions.
   4. ATP synthesis and cell work.
   5. The eucaryotic cell - structure and function.
   6. The procaryotic cell - structure and function.
      a) Place of virus in hierarchy of organization.
3. Methodology
   1. Various methods of a sterilization: including heat and filtration.
   2. Various media and their construction and utilization.
   3. Various methods of obtaining pure cultures.
   4. Staining and microscopy.
   5. Analysis and manipulation of growth: the standard curve.
   6. Enrichment culture.
   7. Fermentation: theory and practice.
   8. Isolation of mutants and recombinants.
   9. Virus titration.
4. Microbial genetics
   1. Genome and phenotype.
   2. Mutation, selection, adaptation.
   3. Recombination.
      a) mobile genetic elements (virus, plasmid, etc.).
      b) enzymes and mechanisms.
      c) isolation and identification of recombinants.
   4. The environment and the genome.
      a) The antibiotic paradox.
5. Virus
   1. Definitions and historical background.
   2. Interactions with cells.
      a) retrovirus and lysogeny.
   3. Viral disease.
      a) vaccination and treatment: the eradication of small pox and polio.
      b) HIV disease.
6. Taxonomy
   1. Problems intrensic to taxonomy.

2. Traditional verus modern approaches.
3. Taxonomy of selected groups.

7. Symbiosis
   1. Evolutionary origins.
   2. Specific types i.e. nitrogen fixation, cellulose digestion.
   3. Impact on our model of infectious disease.
8. Infectious disease
   1. Role of normal flora.
   2. Mechanisms of pathogencity.
   3. Epidemiology.
   4. Role of the host in disease.
      a) Non-specific resistance.
      b) Immune system.
      c) Factors influencing host resistance.
   5. Vaccination.
9. Applied microbiology
   1. Modern biotechnology or "genetic" engineering.
   2. Enrichment culture in biotechnology.
   3. Traditional enrichment and fermentatioon biology. Wine and cheese.

Assignment:

Assignments for Microbiology 5 include:
1. Specific reading and study assignments (averaging a chapter per week from the text and 10-12 pages of outside reading per week)
2. Lab reports (6-8 per semester averaging 2-3 pages)

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Written homework, Lab reports, Essay exams	Writing 40 - 50%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Objective exams	Problem solving 10 - 30%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Class performances	Skill Demonstrations 5 - 20%

Exams: All forms of formal testing, other than skill performance exams.

Multiple choice, True/false, Matching items, Completion	Exams 10 - 40%

Other: Includes any assessment tools that do not logically fit into the above categories.

None	Other Category 0 - 0%

Representative Textbooks and Materials:
THE MICROBIAL WORLD: 5th edition, by Roger Y. Stanier, Prentice-Hall, 1986.
INTRODUCTION TO MICROBIOLOGY: 1st edition, by John and Catherine Ingrahan, Wadsworth, 1995