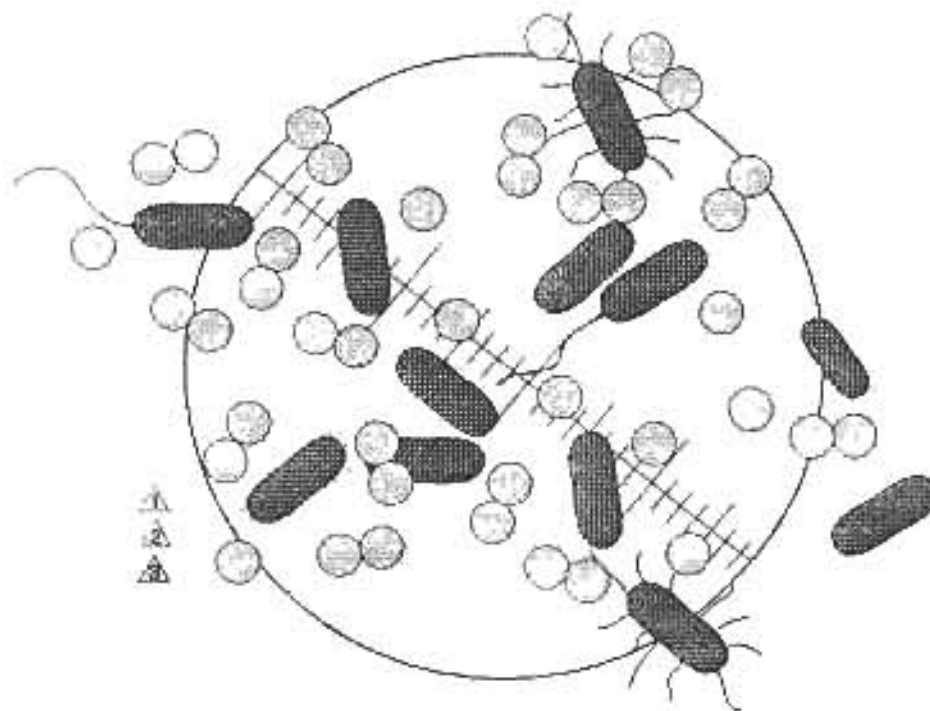


*Dept. of Science & Technology
Grande Prairie Regional College*

**MI 2650
General Microbiology**

Course Outline
W1997-98



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Schedule: Classes - Monday, Wednesday, Friday 1400-1450
Labs - Tuesday 1500-1850

Description: This course covers aspects of bacterial physiology such as nutrient uptake, metabolism, extracellular proteins, chemotaxis and differentiation. Eucaryotic microbes, such as fungi, will also be discussed in terms of their ecological role and culture. Symbiotic associations and interaction of microbes with the environment are major topics. Basic principles of industrial microbiology and the use of biotechnology for the production of economically and medically important substances will be covered. Laboratory exercises are designed to compliment the material included in the classes.

Text-book: A list of relevant articles will be provided to each student, and it is strongly recommended that they be read. The recommended reading list is fairly long, therefore the most important articles will also be placed in a binder on reserve in the library. A set of transparency masters will also be made available on reserve in the library. Students can make their own copies from these. A specific text-book has not been recommended for this course. However, the following books have been placed on reserve in the GPRC Library, and students are advised to take advantage of their availability.

ALCAMO, I.E. (1997)
Fundamentals of Microbiology (5th Edition)
Addison-Wesley Longman Inc.

INGRAHAM J.L. & INGRAHAM C.A. (1995)
Introduction to Microbiology
Wadsworth Publishing Co.

PERRY J.J. & STALEY J.T. (1997)
Microbiology - Dynamics and Diversity
Saunders College Publishing

TORTORA, G.J., FUNKE, B.R. & CASE C.L. (1995)
Microbiology - An Introduction
Benjamin Cummings Publishers

VOLK W.A. & BROWN J.C. (1997)
Basic Microbiology (8th Edition)
Benjamin Cummings Publishers

Requirements:	Lab Reports	15%
	Quizzes	10%
	Mid-term Exam	20%
	Final Lab Exam	20%
	Final Exam	35%
	TOTAL	100%

In order to successfully complete MI 2650, students must attend ALL laboratory sessions and achieve a mean score of 50% on the Lab Reports, Lab Quizzes and Final Lab Exam.

All assignments **MUST** be handed in by the time and date specified.
Late reports will not be marked!

Many of the Laboratory exercises require that students perform some of the procedures at times other than the scheduled lab period. To do this, prior arrangements must be made with **Mr. Rick Scott**, the Biology Lab. Technologist. In case of injury, it is preferable that students work with at least one partner when coming into the laboratory outside of scheduled times.

Quizzes in both class and laboratory sessions may be given without any advanced notice to students.

Since participation in lectures, and completion of assignments are important components of this course, students will serve their best interests by regular attendance. Those who chose not to attend must assume whatever risks are involved. In this regard, your attention is directed to the Academic Guidelines of Grande Prairie Regional College.

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TOPIC OUTLINE

1. Introduction to the course.
2. Review of bacterial structure and function.
3. Growth patterns in relation to oxygen availability.
4. The major nutritional types with emphasis on energy and carbon sources.
5. Nutritional requirements other than carbon.
6. Review of major metabolic pathways.
7. Transport of nutrients into the cell:
 - active transport
 - group translocation
 - proton motive force and symport
8. Export of proteins from the cell.
9. Function of extracellular proteins.
10. Translocation and targeting of extracellular proteins.
11. The Carbon Cycle:
 - microbiology, physiology and environmental importance,
 - photosynthesis,
 - methanogenesis,
 - syntrophic growth,
 - growth on C₁-compounds,
 - bioremediation.
12. The Nitrogen Cycle:
 - microbiology, physiology and environmental importance,
 - nitrogen-fixation by free-living and symbiotic organisms,
 - ammonification,
 - nitrification,
 - assimilatory and dissimilatory nitrate reduction.
13. The Sulphur Cycle:
 - microbiology, physiology and environmental importance,
 - oxidative reactions,
 - reductive reactions.

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(continued)

14. The Iron Cycle:
microbiology, physiology and environmental importance.
15. Sensory systems, cell differentiation and communication:
transcriptional control,
Sigma factors,
signalling between microbes and their plant hosts:
e.g. *Rhizobium*,
Agrobacterium,
Erwinia.
signalling between microbes and their animal hosts:
pathogenesis,
carcinogenesis.
16. Introduction to the fungi:
structure and taxonomy,
growth characteristics,
pathogenesis,
exploitation in biotechnology (especially the Yeasts).
17. Eucaryotic cell culture:
animal and plant cells,
transformed plant cell culture.
18. Biotechnology:
primary and secondary metabolites,
recombinant DNA technology.

MI 2650
RECOMMENDED READING LIST

Single copies of the following articles are available on reserve at GPRC library

Biotechnology Information Series (Iowa State University)

1. Bio-1: **Principles of Biotechnology**
 2. Bio-4: **Porcine Somatotropin (pST)**
 3. Bio-6: **DNA fingerprinting in human health and society**
 4. Bio-7: **DNA fingerprinting in agricultural genetics programs**
 5. Bio-8: **Genetically engineered fruits and vegetables**
 6. Bio-9: **Insect resistant crops through genetic engineering**
 7. Bio-10: **Pharmaceutical production in transgenic animals**
 8. Bio-11: **Regulation of genetically engineered organisms and products**
9. **Molecular mechanisms of bacterial virulence: Type III secretion and pathogenicity islands.** (1996)
J. Meccas and E.J. Strauss; Emerging Infectious Diseases 2(4), 271-288
10. **Bacterial Transporters** (1994)
P.C. Maloney; Current Opinion in Cell Biology, August 1994, 571-582
11. **Virulence factors in anaerobes** (1994)
B.I. Duerden; Clinical Infectious Diseases, 18 (suppl. 4), S253-259
12. **Understanding signal transduction during bacterial infection** (1996)
B. J. Ackerly and J.F. Miller; Trends in Microbiology, 4(4), 141-146
13. **Transgenic approaches for obtaining new products from plants** (1995)
V.C. Knauf; Current Opinion in Biotechnology, April 1995, 165-170
14. **Designing pathways for environmental purposes**
B.D. Ensley; Current Opinion in Biotechnology, June 1995, 249-252
15. **Biodegradation of detergents**
R.B. Cain; Current Opinion in Biotechnology, June 1995, 266-274
16. **Strategies for the improvement of aerobic metabolism of polychlorinated biphenyls**
D.D. Focht; Current Opinion in Biotechnology, June 1995, 341-346
17. **Dehalogenation in environmental biotechnology**
L.P. Wackett; Current Opinion in Biotechnology, June 1995, 260-265
18. **Phosphate and nitrate removal**
T. Egli and A.J.B. Zehnder; Current Opinion in Biotechnology, June 1995, 275-284

19. **Engineering proteins for environmental applications**
D.B. Janssen and J.P. Schanstra, Current Opinion in Biotechnology, June 1995: 253-259
20. **Environmental biotechnology**
J.M. Tiedje, Current Opinion in Biotechnology, June 1995: 273-274
21. **Environmental biotechnology**
K.N. Timmins, Current Opinion in Biotechnology, June 1995: 247-248
22. **Bioremediation of Contaminated Sediments and Dredged Materials**
Research Brief #9, Hazardous Substance Research Center, Atlanta, Georgia, USA (1995)
23. ***The role of the sigma factor σ (KatF) in bacterial global regulation (1994)**
P.C. Loewen, Annual Review of Microbiology 48: 53-80
24. ***Cross-talk between bacterial pathogens and their host cells (1996)**
J.E. Galan and J.B. Bliska, Annual Review of Cell & Developmental Biology, v. 12: 221-256
25. ***The cell biology of infection by intracellular bacterial pathogens (1995)**
J.A. Theriot, Annual Review of Cell & Developmental Biology, 11: 213-240
26. ***Cell-cell communication in Gram-positive bacteria (1997)**
G.M. Dunney and B.A.B. Leonard, Annual Review of Microbiology, 51: 527-564
27. ***Cell Biology of *Agrobacterium* infection and transformation in plants (1988)**
A.N. Binns, Annual Review of Microbiology, 42: 575-606
28. **Signal transduction and virulence regulation in *Bordatella pertussis* (1996)**
D. Beier *et al.*, Microbiologia 12: 185-196
29. **Regulation and virulence gene expression in pathogenic *Listeria* (1996)**
K. Brehm *et al.*, Microbiologia 12: 219-236
30. ***Virulence factors of *Bordatella pertussis* (1986)**
A.A. Weiss and S. Falkow, Annual Review of Microbiology 40: 661-686

* The Journals containing these articles are also available on Reserve in the Library