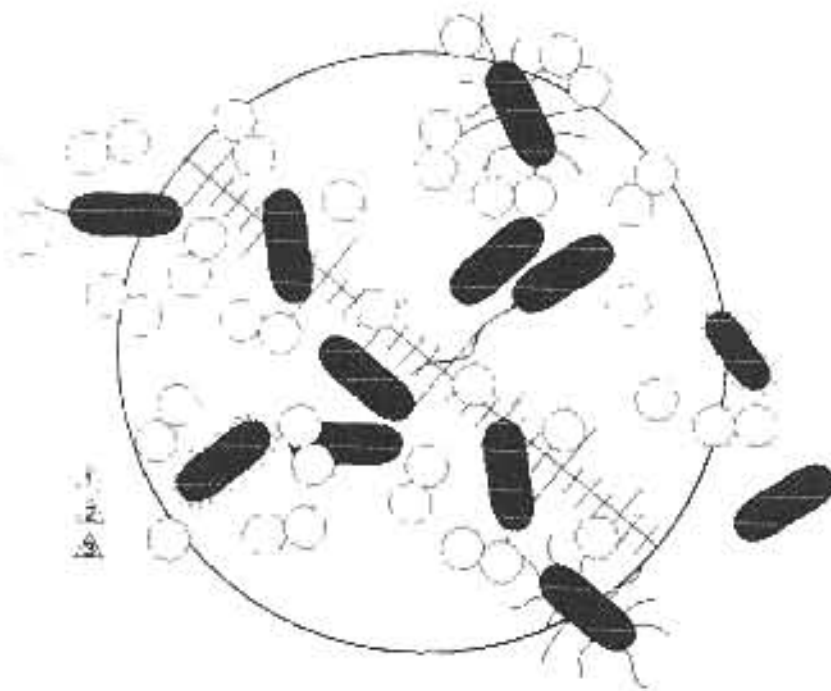


SEP 06 2000
Dept. of Science & Technology
Grande Prairie Regional College

MI 2650

General Microbiology

Course Outline
W 1999-2000



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Schedule: Classes - Tuesday & Thursday 1300-1420
Labs - Friday 1200-1550

Description: This course covers aspects of bacterial physiology such as nutrient uptake, metabolism, extracellular proteins, chemotaxis and differentiation. 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: Brock - Biology of Microorganisms (9th edition)
MADIGAN, MARTINKO & PARKER (2000)
Prentice-Hall Publishers

- - This text-book is recommended for the course - it is not compulsory. For extra help with the text, Prentice-Hall Publishers are making available a web page containing Chapter summaries, self-tests, and other information that you may find useful. The URL address for this web-page is:

<http://www.prenhall.com/~bookbind/pubbooks/brock>

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.

The following books have also 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

Text-books on World Wide Web:

'Medical Microbiology' (4th Edition) Editor: Samuel Baron
<http://129.109.136.65/microbook/toc.html>

'Microbiology 101 Internet Text' (Washington State University)
<http://www.wsu.edu/~harlbert/pages-101hmpg.html>

Other Available Resources:

MI 2650 web page at GPRC:

http://www.gprc.ab.ca/courses_and_programs/biology/mi2650nf.htm

MI 265 web page at University of Alberta:

<http://gause.biology.ualberta.ca/courses.hp/micrb.htm>

Requirements

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

Each student should maintain a **card file** on the **significant bacteria** mentioned in class. Keep a record of: Genus and species; cell morphology; Gram stain reaction; habitat; 4 or 5 interesting facts about the organism's growth, metabolism, pathogenicity, use in industry, etc. Do not keep records of taxonomic tests. Information can be obtained from text-books, lectures, "Bergey's Manual of Determinative Bacteriology", the Internet, or other sources. A question related to this information will appear on both the Mid-term and Final Exams.

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.

MI 2650 TOPIC OUTLINE

<u>TOPIC</u>	<u>READINGS</u>
Introduction to the course	2-12, 15-17, 26-28, 422-424
Functional morphology:	
Definitions and descriptions of microbes	50-53, 57-60, 77-79, 99-100, 237-238, 285-287, 432-442, 449-51, 724-726, 729, 733, 735-736
Cell structure and function	60-78, 91-95
Structural features in beneficial and harmful bacteria	85-87, 502-506, 645-647, 774-782, 784-788, 791-793, 923-929, 940-943, 974-976, 986-987, 988-989, 20-24
Motility and chemotaxis	79-85, 231-233, 495, 567-538
Microbial diversity and environments:	
Major nutritional types based on carbon and energy source	103-106, 642-650
Review of aerobic and anaerobic respiration	108-129, 601-603, 605-608,
Fermentation	118-121, 406-407, 477-482, 620-626, 504-506,
Photosynthesis	574-591
Practical examples of diverse nutritional types:	
methanogenesis	416-420, 553-556, 613-617, 681-685
bioleaching and bioremediation	631-634, 691-694, 696-703
extremophiles	670-675

<u>TOPIC</u> (continued)	<u>READINGS</u>
Microbial growth:	
Growth in relation to oxygen (use and toxicity)	158-162
Effects of temperature, nutrient levels and growth conditions	88, 147-158
Exponential growth curve	139-147
Prediction of growth rate and cell yield	136-139
Control of growth:	
heat, filters, etc.	742-749
chemicals (heavy metals, antibiotics)	387-389, 392-399, 749-762
Resistance to chemical agents (especially antibiotics)	765-772
Development of new antibacterial agents	
Sensory systems and intercellular communication:	
Transcriptional control systems in bacteria, sigma factors	191-194
Global regulation and quorum sensing	226-233
Nitrogen cycle and regulation	634-639, 685-686
Plant-microbe interactions:	
<i>Rhizobium</i> spp	709-717
<i>Agrobacterium</i> spp.	706-708
Biotechnology:	
Recombinant DNA technology	368-374, 378-382
<i>Agrobacterium</i> Ti plasmid and transgenic plants	374-376

**MI 2650 LABORATORY SCHEDULE
WINTER 1999-2000**

DATE	EXERCISE	STEPS	TOPICS
January 14	1	A1-4 B1	Isolation of component bacteria from a mixture. Gram stain of the bacteria in the mixture
	2	A1-4 B1-2 C1 D1	Standard Method Plate Count Isolation and identification of <i>Escherichia coli</i> Enrichment of <i>Streptococcus faecalis</i> Enrichment of <i>Staphylococcus aureus</i>
January 17	1		Check TCS plates and isolate pure cultures
	2	A5 B3-5 C2-3 D2-3	Read plate counts Isolation and identification of <i>E. coli</i> (contd.) Enrichment of <i>S. faecalis</i> (contd.) Enrichment of <i>S. aureus</i> (contd.)
January 21	1		Perform Oxidase test on each pure culture Identification of Gram negative enteric bacteria (API 20E strip)
	2	B6 C4-6 D4-5	Gram stain of pure <i>E. coli</i> Gram stain and Catalase test on presumed faecal streptococci Gram stain and Coagulase test on β -hemolytic bacterium
	3	1-9 D1-4 E1-2	Preparation of yogurt Examination of commercial yogurt Examination of culture after incubation at 46-48°C
January 24	1		Read API 20E strip results
	2	C7	Check BHI tubes for growth
January 28			HAND IN REPORT FROM EXERCISE 1
	3	10-13	Examination of prepared yogurt
	4		Identification of unknown bacteria
	5	A1-2	Preparation of enzyme from <i>Trichoderma</i> cultures
January 31	4		Obtain results from: MacConkey's Medium EMB agar Blood haemolysis
February 4			HAND IN REPORT FROM EXERCISE 3
	4	A10-11 B7	Competition (contd.) Commensalism (contd.)
	5	A3 B1-6 C1-3	Filtration of Test Enzyme Enzyme assay Measurement of reducing sugar

Laboratory
Schedule
(continued)

February 11			HAND IN REPORT FROM EXERCISE 2
	7	all	Regulation of the <i>lac</i> operon
February 18	NO LAB		HAND IN REPORT FROM EXERCISE 4
February 25	NO LAB		WINTER BREAK
March 3	6	A1-7 B1-4 C1-9	HAND IN REPORT FROM EXERCISE 5 Nitrogen-fixation Ammonification Denitrification
	8	1-2	Production of penicillin
March 10			HAND IN REPORT FROM EXERCISE 7
	6	B5-10 C10	Ammonification (contd.) Denitrification (contd.)
	8	A3-10 B1-5	Quantification of penicillin Activity spectra
	9	A1-2 B1-8	Preparation of competent <i>E. coli</i> cells Transformation of <i>E. coli</i>
March 13	8		Determine Optical Density of bioassay tubes Measure Zones of Inhibition
	9	C1-3	Selection of transformed <i>E. coli</i>
March 17			HAND IN REPORT FROM EXERCISE 6
	9	D1-2 E1-3	Aldehyde detection Ethanol production by <i>E. coli</i>
March 20	9	E4-5	Ethanol production by <i>E. coli</i> (contd.)
March 24			HAND IN REPORT FROM EXERCISE 8
	9	F1 G1-19	pH of fermentation broth Quantitation of ethanol: dichromate reduction
March 31			HAND IN REPORT FROM EXERCISE 9 LAB EXAM (written)