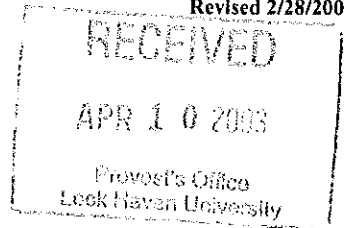


Lock Haven University  
University Curriculum Committee



PROPOSAL COVER SHEET

440  
4xx

Course #: B10L(440) Title: Environmental Microbiology 3 sh

\*\* See the back for instructions on listing the course number and how this document should be routed through the curricular process.

New Course  Drop Course  New Degree  Drop Degree  Revision  Other

Briefly state the reason for the revision NA

Applicable overlay(s)  IL  MC  EE \_\_\_\_\_ (units)  WE

Prerequisites:  Not Applicable  Change (Addition/Removal)

Please Specify any changes B10L 340, CHEM 205/220, or permission

Please Specify the effective date of these changes Spring 2003

	<u>2/7/03</u>	<input checked="" type="radio"/> Approve	<input type="radio"/> Disapprove
Signature: Department Chairperson	Date	Recommendation	

	<u>2-27-03</u>	<input checked="" type="radio"/> Approve	<input type="radio"/> Disapprove
Signature: Chairperson, College Curriculum Subcommittee or Graduate Curriculum Subcommittee	Date	Recommendation	

	<u>4/7/03</u>	<input checked="" type="radio"/> Approve	<input type="radio"/> Disapprove
Signature: Chairperson, University Curriculum Committee	Date	Recommendation	

	<u>4-10-2003</u>	<input checked="" type="radio"/> Approve	<input type="radio"/> Disapprove
Signature: Vice President for Academic Affairs	Date	Recommendation	

PROVOST - Does this proposal need to go to the:  Board of Governors  Council of Trustees

	<u>4/11/03</u>	<input checked="" type="radio"/> Approve	<input type="radio"/> Disapprove
Signature: President	Date	Recommendation	

AM sent  
04/17/03

## Syllabus

# ENVIRONMENTAL MICROBIOLOGY

## BIOL 4 \_\_

### I.) Introductory Information

A.) Department Name:	Biological Sciences
B.) Department Catalog Number:	BIOL 4 __
C.) Course Title:	Environmental Microbiology
D.) Semester Hours of Credit:	Three (3)
E.) Clock Hours Per Week:	Five (2 h Lecture / 3 h Laboratory)
F.) General Education Overlays:	None
G.) Restrictions Upon Student Registration:	

Meets the Biology Elective requirement for majors. Enrollment will be restricted to students who have successfully completed the following courses: BIOL 340, and CHEM 205 or CHEM 220, or students who have obtained permission from the instructor.

### II.) Course Description

Provides a fundamental knowledge base of general microbiology, microbial ecology, and specific microbial processes essential to many sub-disciplines of environmental microbiology. Through intensive discussions, applied research investigations, and hands-on laboratory- and field-based experiences, students will be introduced to a variety of topics that are central to understanding microbial diversity and microbial evolution.

### III.) Exposition

A.) **Objectives:** Upon successful completion of this course, students will be able to do the following:

- 1.) Demonstrate knowledge and applied understanding of the basic principles of environmental microbiology, the essential role that microorganisms play in life on Earth, and key historical developments as they relate to the emergence of microbial ecology as an essential sub-discipline in the field of microbiology.
- 2.) Demonstrate knowledge and understanding of microbial diversity, prokaryotic taxonomy based on a systematic approach, and the evolution of the microbial world.
- 3.) Demonstrate knowledge and applied understanding of microbial metabolism, the diversity of microbial processes, the role and significance of emerging pathogens in soil, water, food, and air and their impact on humans, and the beneficial role of microorganisms in agriculture, industry and bioremediation.
- 4.) Critically evaluate primary literature and reference materials for assessment of methodologies employed in published research. Demonstrate proficiency in employing these methods and techniques for sample collection from various environments and subsequent analysis of specific microorganisms and/or microbial processes.
- 5.) Demonstrate knowledge and proficiency in field and laboratory manipulations necessary for the successful enrichment, isolation, and identification of microorganisms from a variety of environments.

**B.) Activities, Requirements, and Assessment:**

- 1.) Course will require regular participation in class discussions, laboratory exercises, and research projects.
- 2.) Students will be responsible for reading assignments within the course textbook, as well as outside readings including, but not limited to, materials in periodicals, handouts, and on reserve at the Stevenson library.
- 3.) Assessment of course objectives will be accomplished by various means (e.g. examinations, quizzes, assignments). Students will conduct research projects (both group and individual) within the laboratory component of the course and be required to present the results of their investigations through written and/or oral summaries.
- 4.) Students will be required to demonstrate proficiency in field and laboratory techniques related to scheduled exercises and during research projects. Additionally, students will demonstrate proper laboratory safety procedures and be required to keep an accurate laboratory notebook.

**C.) Major Units and Time Allotted:**

Lecture and Laboratory Topics	Weeks
Introduction and Course Overview Microbial Diversity Prokaryotic vs. Eukaryotic Microorganisms	1.5
Historical Perspectives in Microbial Ecology Microbial Evolution Systematics Taxonomy of Prokaryotes	1.5
Importance of Chemical Redox Potential Environmental Influences on Microbial Processes Microbial Metabolism and Bioenergetics	1.5
Quantitative Microbial Ecology - Analysis <ul style="list-style-type: none"> <li>• Microscopy</li> <li>• Culture Methods</li> <li>• Physiological Methods</li> <li>• Nucleic Acid-based Methods</li> </ul>	1.5
Microbial Interactions <ul style="list-style-type: none"> <li>• Host-Microbe</li> <li>• Microbe-Microbe</li> <li>• Biofilms</li> </ul>	1.5
Microbial Environment: Human Body	1
Microbial Environment: Food	1
Microbial Environment: Terrestrial Biogeochemical Cycling	1.5

Lecture and Laboratory Topics (cont'd)	Weeks
Microbial Environment: Aquatic (Marine and Freshwater)	1
Beneficial and Pathogenic Microbes Environmentally Transmitted Pathogens	1
Indicator Organisms Domestic Water and Wastewater Treatment	1
Bioremediation and Biodegradation <ul style="list-style-type: none"> <li>• Organic Pollutants</li> <li>• Metals</li> </ul> Microbial Risk Assessment	1

#### D.) Materials and Bibliography

- 1.) **Suggested Textbook:** To be determined at the time the course is taught. Possible texts that could be used for this course include the following:

Atlas, R.M. and R. Bartha. 1998. *Microbial Ecology, 4th ed.* Benjamin/Cummings Publishing Company, Inc., Menlo Park, CA.

Madigan, M.T., J.M. Martinko, and J. Parker. 2003. *Brock Biology of Microorganisms, 10th ed.* Prentice Hall - Pearson Education, Inc., Upper Saddle River, NJ.

Maier, R.M., I.L. Pepper, and C.P. Gerba. 2000. *Environmental Microbiology.* Academic Press, San Diego, CA.

- 2.) **Other Materials:** None.

- 3.) **Basic Bibliography:** All of the following Journals/Periodicals, Reference Manuals, and Relevant Textbooks are available at the LHU Stevenson library, through interlibrary loan, and/or are part of the instructor's personal library of which students in this course would have access to for review upon permission. Several books from the instructor's library are housed in the Microbiology laboratory.

##### Journals/Periodicals (LHU Stevenson Library)

Annual Review of Microbiology

Applied and Environmental Microbiology

Canadian Journal of Microbiology (*Available fulltext via EBSCO Online*)

Microbiology (*Available fulltext via EBSCO Online*)

Microbiology and Molecular Biology Reviews

##### Reference Manuals (LHU Stevenson and Instructor's Personal Libraries)

*Bergey's Manual of Determinative Bacteriology, 9th ed.* 1994. J.G. Holt, N.R. Krieg, P.H.A. Sneath, J.T. Staley, and S.T. Williams (eds.). Williams and Wilkins, Baltimore, MD.

*Bergey's Manual of Systematic Bacteriology, 1st ed., Vol I - IV.* 1984 (I), 1986 (II), 1989 (III and IV). J.G. Holt (editor-in-chief). Williams and Wilkins, Baltimore, MD.

*Bergey's Manual of Systematic Bacteriology, 2nd ed., Vol I.* 2001. D.R. Boone and R.W. Castenholz (eds.), G.M. Garrity (editor-in-chief). Springer Publishing, New York, NY.

*Compendium of Methods for the Microbiological Examination of Foods, 4th ed.* 2001. F.P. Downes and K. Ito (eds.). American Public Health Association (APHA), Washington, D.C.

*Manual of Clinical Microbiology, 6th ed.* 1995. P.R. Murray (editor-in-chief). American Society for Microbiology (ASM) Press, Washington, D.C.

*Manual of Environmental Microbiology.* 1997. C.J. Hurst (editor-in-chief). American Society for Microbiology (ASM) Press, Washington, D.C.

*Methods for General and Molecular Bacteriology.* 1994. P. Gerhardt (editor-in-chief), R.G.E. Murray, W.A. Wood, N.R. Krieg (eds.). American Society for Microbiology (ASM) Press, Washington, D.C.

*The Prokaryotes, 2nd ed., A Handbook on the Biology of Bacteria: Ecophysiology, Isolation, Identification, Applications, Vol I - IV.* 1992. A. Balows, H.G. Truper, M. Dworkin, W. Harder, and K-H. Schleifer (eds.). Springer-Verlag, New York, NY.

*Standard Methods for the Examination of Water and Wastewater, 20th ed.* 1998. L.S. Clesceri, A.E. Greenberg, and A.D. Eaton (eds.). Published jointly by the American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Washington, D.C.

#### **Textbooks:**

Alexander, M. 1994. *Biodegradation and Bioremediation.* Academic Press, San Diego, CA.

*Applied Biotechnology for Site Remediation.* 1994. R. Hinchee (ed.). Lewis Publishing, Boca Raton, FL.

Atlas, R.M. 1997. *Principles of Microbiology, 2nd ed.* Wm. C. Brown Publishers, Boston, MA.

*Bioremediation: Principles and Applications.* 1996. R.L. Crawford and D.L. Crawford (eds.). Cambridge University Press, New York, NY.

Doyle, M.P., L.R. Beuchat, and T.J. Montville. 2001. *Food Microbiology: Fundamentals and Frontiers, 2nd ed.* American Society for Microbiology (ASM) Press, Washington, D.C.

Ehrlich, H.L. 1981. *Geomicrobiology.* Marcel Dekker, Inc., New York, NY.

*Environmental Microbiology.* 1992. R. Mitchell (editor). Wiley-Liss, Inc., New York, NY.

Fenchel, T., G.M. King, and T.H. Blackburn. 1998. *Bacterial Biogeochemistry: The Ecophysiology of Mineral Cycling, 2nd ed.* Academic Press, New York, NY.

Gottschalk, G. 1986. *Bacterial Metabolism, 2nd ed.* Springer-Verlag, Inc., New York, NY.

Lengeler, J.W., G. Drews, and H.G. Schlegel. 1999. *Biology of the Prokaryotes.* Georg-Thieme Verlag, Stuttgart, Germany.

Paul, E.A. and F.E. Clark. 1989. *Soil Microbiology and Biochemistry.* Academic Press, Inc., New York, NY.

Postgate, J.R. 1984. *The Sulphate-reducing Bacteria*, 2nd ed. Cambridge University Press, Cambridge, England.

Prescott, L.M., J.P. Harley, and D.A. Klein. 2002. *Microbiology*, 5th ed. McGraw Hill, Inc., New York, NY.

Ray, B. 1996. *Fundamental Food Microbiology*. CRC Press, Inc., Boca Raton, FL.

Schlegel, H.G. 1993. *General Microbiology*, 7th ed. Cambridge University Press, Cambridge, England.

#### IV.) Standards:

Grades will be assigned in accordance with University policy. Grades will be based on a combination of examinations, quizzes, assignments, research projects, presentations, and class participation.

#### V.) Rationale and Impact:

- A.) This course will build upon former knowledge and practical applications gained in the prerequisite course (BIOL 340), but is intended to expand beyond the realm of topics that can effectively be covered in a one-semester course in microbiology. The laboratory component of this course will enhance students' proficiencies in inquiry-based investigations beyond the clinically-based format covered in the prerequisite course (BIOL 340).
- B.) This course is intended for Junior- and Senior-level students who have successfully completed the prerequisite course in Microbiology (BIOL 340).
- C.) No other department will be affected by the offering of this upper-level Biology elective course.

#### VI.) Cost and Staff Analysis:

- A.) This course will be taught by current faculty of the Department of Biological Sciences on a rotational basis with other upper-level elective courses.
- B.) Current reference manuals and relevant textbooks will continue to be ordered through the Stevenson library. The existing microbiology laboratory is well-equipped to handle most laboratory investigations planned for this course, however, the cost of expendables can be high. Current equipment must be maintained for optimal performance and it is anticipated that the initial years of this course offering may require the purchase of additional equipment such as incubators, refrigerators and materials to construct a gassing manifold for anaerobic manipulations. The CoyLab Anaerobic chamber currently housed in the microbiology laboratory will be an integral part of the laboratory investigations. This system will require the periodic purchase of pressurized gases and monthly costs will be required for deposit on the tanks. Several field trips are planned and therefore cost will be incurred for van rental for transportation.

#### VII.) Date Approved by University President:

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Signature

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Date