OFFICIAL UNDERGRADUATE COURSE OUTLINE (page 1)

COURSE IMPLEMENTATION DATE:	January 2014
COURSE REVISED IMPLEMENTATION DATE:	May 2015
COURSE TO BE REVIEWED:	May 2020
(six years after UEC approval)	*(month, year)*

OFFICIAL UNDERGRADUATE COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.
Shaded headings are subject to change at the discretion of the department – see course syllabus available from instructor

BIO 426	Faculty of Science/Biology	4
COURSE NAME/NUMBER	FACULTY/DEPARTMENT	UFV CREDITS

Environmental Microbiology
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

There has been an increase in interest in environmental microbiology since the late 1980s. This exciting field encompasses the physiology, ecology, biochemistry, and genetics of microorganisms, with potential for environmental applications. This course will place emphasis on environmental sustainability. To this end, studies will focus on agricultural uses of micro-organisms, interactions between micro-organisms and with higher organisms, tracking pathogens in the environment, nutrient cycling, pollution, and bioremediation. Success in environmental sustainability will require the application of molecular biology to microbial ecology and the use of genetically engineered micro-organisms. As well, it will require an interdisciplinary approach with an interface between microbiology, biogeochemistry, aquatic and organic chemistry, hydrogeology, and soil physics. This course will therefore also provide students with an introduction to molecular biological techniques and how they pertain to environmental microbiology and interaction with these other disciplines.

Note: Students with credit for BIO 326 may not take BIO 426 for further credit.

PREREQUISITES: BIO 201 and 309
COREQUISITES:
PRE or COREQUISITES:

SYNONYMOUS COURSE(S):
(a) Replaces: **BIO 326**
(b) Cross-listed with:
(c) Cannot take: **BIO 326** for further credit.

SERVICE COURSE TO: *(department/program)*

TOTAL HOURS PER TERM: **90**
STRUCTURE OF HOURS:

Lectures:	**45**	Hrs
Seminar:		Hrs
Laboratory:	**45**	Hrs
Field experience:		Hrs
Student directed learning:		Hrs
Other (specify):		Hrs

TRAINING DAY-BASED INSTRUCTION:
Length of course:
Hours per day:

OTHER:
Maximum enrolment: **24**
Expected frequency of course offerings: every other year
(every semester, annually, every other year, etc.)

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)	☐ Yes	☐ No
WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)	☐ Yes	☒ No
TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:	☐ Yes	☒ No

Course designer(s):	**Terry Starr, Stephen Thomas**		
Department Head:	**Allan Arndt**	Date approved:	**June 4, 2013**
Campus-Wide Consultation (CWC)		Date of meeting:	**June 14, 2013**
Curriculum Committee chair:	**David Fenske**	Date approved:	**September 20, 2013**
Dean/Associate VP:	**Lucy Lee**	Date approved:	**September 20, 2013**
Undergraduate Education Committee (UEC) approval		Date of meeting:	**October 25, 2013**

LEARNING OUTCOMES:

Upon successful completion of this course, students will be able to:

- Demonstrate a solid understanding of environmental sustainability issues.
- Describe the differences between water and soil habitat and their influences on microbial activities.
- Distinguish the role and importance of chemical structure of molecules and the effects of environmental factors on biodegradation by microorganisms.
- Explain the roles of these factors on specific examples of naturally occurring compounds and various hydrocarbons and pesticides.
- Analyze the roles of microorganisms in groundwater and soil ecosystems, especially in terms of their effects on the evolution of the biogeochemistry and biochemical properties of these systems.
- Relate the microbiology of groundwater to the observed changes in naturally occurring compounds introduced into groundwater.
- Describe the basic principles of bioremediation activities as they are used in contaminated soil and groundwater.
- Devise appropriate generalized systems to perform bioremediation in contaminated systems.
- Apply information gained from this course and from other sources to critically evaluate bioremediation processes and applications in environmental sustainability.
- Design and complete a laboratory project relevant to bioremediation and environmental sustainability.
- Explain the importance of genetic engineering to the future of environmental sustainability.

METHODS: *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lectures, laboratories, field trips

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

☒ Examination(s) ☐ Portfolio assessment ☒ Interview(s)

☒ Other (specify):
This course may be challenged. The student must challenge both lecture and lab components of the course by writing an examination for each. The student will be provided with a copy of the syllabus and information on how to obtain a copy of the current text and lab manual. The student will also be given information about exam style and expected standards. The student can sit the examination for the lecture portion of the course at a time convenient to both student and instructor. However, since it is not reasonable to expect a lab instructor to set up a lab exam for one student, our practice has been to permit the student to write the exam for the laboratory portion of the course at the same time it is written by a regular class.

☐ PLAR cannot be awarded for this course for the following reason(s):

TEXTBOOKS, REFERENCES, MATERIALS:

[Textbook selection varies by instructor. An example of texts for this course might be:]

Maier RM et al., 2008, Environmental Microbiology, Elsevier
Various Web resources
Laboratory resources:

SUPPLIES / MATERIALS:

Lab coat

STUDENT EVALUATION:

[An example of student evaluation for this course might be:]

Assignments and quizzes:	10%
Midterm:	25%
Final exam:	35%
Laboratory quizzes:	10%
Laboratory reports/project:	20%

COURSE CONTENT:

[Course content varies by instructor. An example of course content might be:]

- **Review of basic microbiological concepts**
  Introduction to environmental microbiology; Microorganisms; Bacterial growth
- **Microbial environments**
  Soil environments; Aquatic environments; Extreme environments
- **Detection, enumeration, and identification**
  Environmental sample collection and processing; Microscopic techniques; Cultural methods; Physiological methods; Immunological methods; Nucleic acid-based methods of analysis
- **Microbial communication, activities, and interactions with environment and nutrient cycling**
  Biogeochemical cycling; Consequences of biogeochemical cycles gone wild; Microbial communication: Bacteria/bacteria and Bacteria/host; Bacterial communities in natural ecosystems; Global change and microbial infectious disease; Microbial transport
- **Remediation of organic and metal pollutants**
  Microorganisms and organic pollutants; Microorganisms and metal pollutants; Genetics of bioremediation and its application to biotechnology
- **Water, soil, and food-borne pathogens**
  Environmentally transmitted pathogens; Indicator microorganisms
- **Waste treatment and disinfection**
  Wastewater treatment and biosolids reuse; Drinking water treatment; Disinfection, Subsurface microbial processes
- **Environmental Sustainability**
  Introduction to environmental sustainability issues including but not limited to protection of agricultural soil, Development of renewable energy resources, and water quality.
- **Urban microbiology**
  Microorganisms and bioterrorism; Risk assessment, Specific examples e.g., the Walkerton incident.
- **Laboratory content:**
  Examination of soil microorganisms via microscopic and cultural assays/filamentous fungi
  Degradation of hydrocarbons/bioremediation/[pseudomonas enrichments
  Coliforms (MPN and Membrane Filtration) (Confirmed test) (Completed test)
  Microbial transformations and response to contaminants/ Nitrification and denitrification
  Aerobiology: Sampling of airborne microorganisms
  Soil enzymes/dehydrogenase activity
  Bioremediation projects (including molecular biology of hydrocarbon degradation)
  There will also be two field trips during the semester (TBD)