

Course: EHT 615 Environmental Microbiology - Spring 2009

Term: Spring Semester / Odd Years
Tuesday/Thursday 2:30 PM to 3:50 PM
Only one section

There are 26 meeting dates (including examination dates) in the Spring Semester (e.g., Tuesday/Thursday Cycle or most 2-day cycles). Each module, of the four listed will have 4 to 6 class sessions to present material plus a session for an examination. Taping of lectures is not allowed.

Location: East Campus, Rensselaer – C2.

Instructor: David M. Dziewulski, Ph.D. (Coordinator)
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Office hours: Meetings, immediately after class, can be arranged in advance.
Students are encouraged to use e-mail and telephone to also arrange meetings on Wednesday afternoons or Friday (as needed).

Other

Instructors: Module 2 - Ellen Braun-Howland, Ph.D. ebh02@health.state.ny.us
Module 3 - Roger C. Sokol, Ph.D. rcs06@health.state.ny.us

Prerequisites: College-level Chemistry, Biochemistry, Permission of Instructor

Grading:	Module tests 1 through 4 worth 20% each	80%
	Student Presentation is worth 10%	10%
	Final Examination is worth 10%	10%
	TOTAL	100%

NOTE: [M# = chapter in Textbook Maier, et al.]

On-Line Course [OLC] - Introductory Module – General Microbiology Review and Bacterial Physiology – 6 classes

You must complete the on-line introductory microbiology - <http://www.ualbanycphp.org/learning/>
Background information at
<http://www.ualbanycphp.org/learning/registration/tab.cfm?course=microbio&s=Overview>

- Session 1 – Re-introduction to Microbiology [OLC]
 - Morphology, Structure function of Bacteria [M2; pps 10 - 18]
 - Growth of bacteria in culture [M3; pps 38 - 42]
 - Rough outline of bacterial metabolism [M2; pps 18 - 20]
 - Rough outline of energy processes
 - Virus structure and function; environmental concerns [M2; pps 28 - 33 & M19; pps 469 - 478 emphasis on waterborne viruses]

- Session 2 – Re-introduction to Microbiology
 - Protozoa [M2; pps 25 - 26], Fungi (yeasts) [M2; pps 22 - 24]
 - Complex protozoan life cycle [M22, pps 458-464].
 - Helminths and life cycles [M22, pps 465 - 469].
- Session 3 – Metabolism I
 - Membrane Transport
 - Thirteen Critical Metabolites and their general fates
 - Feedback Mechanisms
 - Intermediary Metabolism – Catabolism I
 - Substrate level phosphorylation.
 - Transport linked to metabolism (phosphotransferase)
 - Introduction to the Electron Transport System/oxidative phosphorylation
- Session 4 – Metabolism Wrap-Up // Start of Soil, Water and Transport
 - Continue intermediary metabolism (Catabolism II and III) and begin uncommon pathways for Intermediary Metabolism / Uncommon Pathways for Energy / Energy Production
 - Interconversion of carbon (impt) and brief biosynthesis.
 - Start Soil [M4] - Zones, composition, liquid phase, microorganisms
 - Contamination of the subsurface with microorganisms
- Session 5 – Complete Soil, Water and Transport [R]
 - Start Water [M6; 103 - 107; 110 - 119 excluding Biofilms/Mats] - Habitats and Environments
 - Concepts of Microbial Transport - [M12]
 - Begin concept of bacterial/microbial community interaction and occurrence .
- Session 6 - Module Examination

CUMULATIVE SESSIONS = 6

Module 2 – Monitoring and Molecular Methods in Environmental Microbiology – 5 classes

Dr. Ellen Braun-Howland

Composed of 4 Sessions plus an Examination Session (=Total of 5) including, but not limited to, the following subject matter:

- Session 1 - Microscopic Detection Methods [M9]
 - Morphometric identification
 - Epifluorescence microscopy
- Session 2 - Public Health Microbiology [M10]
 - Classical culture methods\
 - Coliform monitoring
- Session 3 - Immunological Detection Methods [M12]
 - Review of antibody structure
 - Pathogenic protozoa
 - Immunomagnetic separation methods
 - Begin molecular detection methods
- Session 4 - Molecular Detection Methods [M13]
 - In situ hybridizations
 - PCR
 - Quantitative PCR
 - rtPCR
 - Southern and Northern blots
 - RFLP and "other methods"
- Session 5 - Module Examination

CUMULATIVE SESSIONS = 11

Module 3 – Biodegradation and Bioremediation - 6 classes

Dr. Roger C. Sokol

- Session 1 - Biodegradation - Definitions and Concepts
 - Xenobiotics, mineralization, biodegradation, etc.
 - Role of microorganisms/growth-linked carbon assimilation
 - Co-metabolism/detoxification
 - Environmental factors
 - Natural attenuation
 - Recalcitrant Molecules
- Session 2 - Biotransformation – Factors Affecting Biodegradation
 - Structure and biodegradability
 - Environmental Effects/abiotic factors/temperature
 - Bioavailability/ sorption/ hydrophobicity
 - NAPLs
 - Increasing bioavailability – surfactants/ oxygen/ electron acceptors
- Session 3 – Biodegradation and Bioremediation – Halogenated Compounds
 - Halogenated Organics – Sources/ Distribution
 - Reductive Dehalogenation
 - Microbial communities and Syntrophy
- Session 4- Polychlorinated biphenyls
 - What are they?
 - Fates in the environment
 - Aerobic/anaerobic environments and strategies
- Session 5 – Current Literature Topics
 - Case histories from the literature
- Session 6 – Module Examination

TOTAL SESSIONS = 17

Module 4 – Water, Biocorrosion and Biofouling – Fundamentals and Scenarios – 5 classes

Dr. Dziejulski

- Session 1 – Review Bacterial / Microbial communities and Biofouling
 - Transport to surfaces and Attachment in flowing streams
 - Sequel to attachment Surface (pre-) conditioning
 - Biofilm development [M6 107-110/111]
 - Biofilm composition (reiterate consortia but those unique to these problems)
 - Detection and sampling
 - Possible health & environmental effects and remediation
- Session 2 - Biocorrosion [M14; p. 311 - 317; M15 319 - 323]
 - Fundamentals of corrosion (non-biological)
 - Metabolic component
 - Corrosion component
 - Different metals and alloys
- Session 3 – Biocorrosion/Biofouling 2 - Scenarios and case histories Distribution systems
 - Surface waters
 - Sub-surface environments
- Session 4 – Distribution systems and Public Health
 - Biofilms in Drinking water systems (LeChevallier)
 - Role of water in the occurrence of legionellosis
 - Other culprits in distribution systems - MAC, *Sphingotrophomonas*, pseudomonads
- Session 5 – Module Examination

TOTAL SESSIONS = 22

Student Presentations Part I

Student Presentations Part II

Student Presentations Part III

Open Date OR Guest Lecturer on Cyanobacteria - Mr. James Hyde, NYSDOH (2009)

FINAL EXAMINATION -TBD annually

PRIMARY TEXT

Maier, R.M., I. L. Pepper and C. P. Gerba., Environmental Microbiology, 2nd Edition, Academic Press, San Diego, CA (2009).

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