Course Syllabus

1. Program of Study	Bachelor of Science (Environmental Science)
Faculty/Institute/College	Mahidol University International College, Faculty of Science, Faculty of Environment and Resource Studies (FERS), Mahidol University
2. Course Code	ICEN 211
Course Title	Fundamentals and Applications of Environmental Microbiology
3. Number of Credits	4 (3-2-7)
4. Prerequisite	ICNS153
5. Type of Course	Required
6. Session/Academic Year	3/ 2013-2014 Mon Lec. 10.00 – 12.45 Room EN Lab. 13.00 – 14.50 Room EN (Microbiology laboratory)
7. Course conditions	5-20 students

8. Course Description

Principles, basic concepts and techniques of environmental microbiology including; morphology, physiology, metabolism and growth of organisms in Kingdoms of Monera, Protista and Fungi; methods and factors influencing in microbial control in the environment; types, isolation and determination of microorganisms in the environment including; water, air and soil; roles and relation of microorganisms to the environment; roles of microorganisms related to biodegradation of environmental contaminated substances

9. Course Objectives

After successful completion of this course, students will be able to

9.1 better understand the basic knowledge and techniques in environmental microbiology study

9.2 recognize factors influencing growth of microorganisms in the environment

9.3 understand roles and relation of microorganisms to natural environments

10. Course Outline

Week	Topic	Hours			Instructor
		Lec	Lab	Self study	
(1)	1. Introduction to environmental microbiology 1.1 Concepts and principles of microbiology 1.2 Taxonomy of microorganisms 1.3 Importance of environmental microbiology 1.4 Microorganisms in the environment 1.5 Equipment in microbiology study 1.6 Microbiological techniques - *Biosafety guideline and Microscopic examination of living microorganisms using a hanging-drop preparation or a wet mount* - *Morphology of fungi using a slide culture technique*	3	2	7	Dr.Benjaphorn Prapagdee
(2)	2. Microorganisms in the environment 2.1 Bacteria 2.2 Protozoa *Bacterial smears and Gram stain*	3	2	7	Dr.Chulaporn Kamnerdpetch
(3)	3. Microorganisms in the environment 3.1 Fungi 3.2 Algae - *Morphology of protozoa and algae*	3	2	7	Dr.Chulaporn Kamnerdpetch
(4)	4. Isolation, cultivation and preservation of microorganisms 4.1 Principles of isolation of pure cultures 4.2 Cultivation methods 4.3 Microbe preservation techniques *Isolation techniques*	3	2	7	Dr.Chulaporn Kamnerdpetch

Week	Topic	Hours			Instructor
		Lec	Lab	Self study	
(5)	5. Microbial growth 5.1 Phases of microbial growth 5.2 Factors influencing microbial growth 5.3 Cultural media & microbial cultivation 5.5 Microbial growth determination - *Culture media preparation* - *Bacterial growth determination*	3	2	7	Dr.Benjaphorn Prapagdee
(6)	6. Microbial control in the environment 6.1 Microbial transmission in the environment 6.2 Principles of microbial control 6.3 Physical control methods 6.4 Chemical control methods *Antimicrobial agents susceptibility testing by filter paper disk agar diffusion assay*	3	2	7	Dr.Benjaphorn Prapagdee
	Midterm Examination				
(7-8)	7-8. Water and wastewater microbiology 8.1 Distribution of microorganisms in fresh and saline water 8.2 Roles of microorganisms in fresh, estuarine and saline water 8.3 Microbiological indicators of water quality 8.4 Types and roles of wastewater microorganisms 8.5 Microbiological wastewater treatment *Analysis of microbiological indicators in water and wastewater*	6	4	14	Dr.Chulaporn Kamnerdpetch

Week	Topic	Hours			Instructor
		Lec	Lab	Self study	
(9)	9. Soil microbiology 7.1 Distribution of microorganisms in soil 7.2 Types of microorganisms in soil 7.3 Roles of microorganism in soil *Sampling and enumeration of microorganisms in soil*	3	2	7	Dr.Chulaporn Kamnerdpetch
(10)	10. Aeromicrobiology 10.1 Distribution of microorganisms in air 10.2 Types of microorganisms in air 10.3 Roles of microorganism in air *Sampling and enumeration of microorganisms in air*	3	2	7	Dr.Chulaporn Kamnerdpetch
(11)	11. Microbial degradation of environmental contaminated substances 11.1 Types, Fate & transport of toxic compounds 11.2 Metabolic pathways of microbial degradation 11.3 Petroleum HCs biodegradation 11.4 Bioremediation *Isolation of aromatic compound - degrading bacteria from soil*	3	2	7	Dr.Benjaphorn Prapagdee
(12)	**Final Examination**				
	Total	33	22	77	

11. Teaching Methods

Lectures, classroom discussion, practice in environmental microbiology laboratory

12. Teaching Media

Power point, transparencies, slides, audiovisual and hand-out

13. Measurement and evaluation of student achievement

13.1 The ability to better understand the basic knowledge and techniques in environmental microbiology study

13.2 The ability to recognize factors influencing growth of microorganisms in the environment

13.3 The ability to understand roles and relation of microorganisms to natural environments

Student's achievement will be graded according to the college and university standard using the symbols: A, B+, B, C+, C, D+, D and F.

	Ratio of mark
Lecture attendance and classroom participation	10%
Lab report	20%
Midterm examination	38%
Final examination	32%

14. Course Evaluation

14.1 Students' achievement as indicated in number 13 above.

14.2 Students' satisfaction towards teaching and learning of the course using questionnaires.

15. References

Baker S., Nicklin J., Khan N., and Killington R. 2006. Instant Notes: Microbiology. 3rd ed., Taylor & Francis Group, New York, USA.

Bauman R. 2007. Microbiology With Diseases By Taxonomy. 2nd ed., Pearson Benjamin Cummings, San Francisco, USA.

Bitton G. 2005. Wastewater Microbiology. 3rd ed., A John Wiley & Sons, New Jersey, USA.

Cappucino JG. and Sherman N. 2008. Microbiology A Laboratory Manual. 8th ed., Pearson Benjamin Cummings, San Francisco, USA.

Csuros M., and Csuros C. 1999. Microbiological Examination of Water and Wastewater. Lewis Publishers, London, UK.

Harley JP., 2005. Laboratory Exercises in Microbiology. 6th ed., McGraw Hill Book Company, New York, USA.

Hurst CJ., Crawford RL., Knudsen GR., McInerney MJ., and Stetzenbach LD. 2002. Manual of Environmental Microbiology. 2nd ed., ASM Press, Washington D.C., USA

Jjemba PK. 2004. Environmental Microbiology: Principles and Applications. Science Publishers, Enfield, USA.

Johnson TR., and Case CL. 2010. Laboratory Experiments in Microbiology. 9th ed., Benjamin Cummings, San Francisco, USA.

Maier RM., Pepper IL, and Gerba CP. 2004. Environmental Microbiology. Academic Press, San Francisco, USA.

Seidman LA. 2008. Basic Laboratory Calculation For Biotechnology. Pearson Benjamin Cummings, San Francisco, USA.

Sharma PD. 2005. Environmental Microbiology. Alpha Science International Ltd., Harrow, UK.

Sylvia DM., Fuhrmann JJ., Hartel PG., and Zuberer DA. 2005. Principles and Applications of Soil Microbiology. 2nd ed., Pearson Prentice Hall, New Jersey, USA.

Tortora GJ., Funke BR., and Case CL. 2007. Microbiology: An Introduction. 9th ed., Pearson Benjamin Cummings, San Francisco, USA.

16. Instructors

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- Assoc.Dr. Benjaphorn Prapagdee; Faculty of Environment and Resource Studies
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17. Course Coordinator

Dr. Chulaporn Kamnerdpetch

18. Course Scientist

Mrs. Chirawee Sangtong