



Course Syllabus: Public Health Microbiology II - EnSE 314

Division	Biological and Environmental Sciences & Engineering Division
Course Number	EnSE 314
Course Title	Public Health Microbiology II
Academic Semester	Spring
Academic Year	2018/2019
Semester Start Date	01/27/2019
Semester End Date	05/23/2019
Class Schedule (Days & Time)	09:00 AM - 10:30 AM Mon Thu

Instructor(s)				
Name	Email	Phone	Office Location	Office Hours
Peiyong Hong	Peiyong.Hong@kaust.edu.sa	+966128082218	4275, 4, Al-Jazri (bldg. 4)	Weekdays 9 AM to 5 PM. Please send email to peiyong.hong@kaust.edu.sa to check on my availability. Office location: Building 4 Level 4 Room 4275

Teaching Assistant(s)	
Name	Email

Course Information	
Comprehensive Course Description	<p>Week 1-2: Introduction to the water bodies and their contamination sources, Types of waterborne pathogens and their infectivity dosages, reduction rates of biotic contaminants in conventional water treatment systems, Regulations for potable drinking water. Regulations for recreational water, Methods to detect indicator microorganisms in recreational water (freshwater and marine), Legionella, microbial regrowth, disinfection and inactivation</p> <p>Week 3-4: Alternative indicators. Molecular-based fecal source tracking approaches, lacZ, uidA genes. Aquaculture and opportunistic pathogens. Zoonotic diseases. Cyanotoxins. Water quality. Methods to detect indicator microorganisms in drinking water and freshwater, Limitations of current methods.</p> <p>Week 5-6: Introduction to the wastewater and water reuse, wastewater reuse guidelines and quality requirement, protozoa or host-associated pathogens, viruses, fate and persistence, inactivation rates and methods to determine, emerging bacterial contaminants (e.g. antibiotic resistance genes and mobile genetic elements).</p> <p>Week 7-9: Introduction to Quantitative Microbial Risk Assessment (QMRA). Illustrate the framework of QMRA. Previous lectures have been about hazard identification and methods to quantify the abundances/concentration of microbial agents. Exposure assessment. Conducting human and animal epidemiological studies. Consolidating the infectivity dosage of microbial agents and determination of dose-response. Risk characterization and assessments.</p> <p>Week 10-end: Lab project, Final group presentation, Discussion (Q&A for final examination)</p>

Course Description from Program Guide	An introduction to the diversity of microbial agents that can impact the public health and environmental systems. The course is structured to detail the microbial hazards found in waters, soils and air. Molecular biology techniques and the current regulatory methods for investigating pathogens and the surrogate indicators will be discussed. Treatment and engineering strategies are discussed. The latter part of the course serves to provide an introduction to Quantitative Microbial Risk Assessment (QMRA). The concepts related to exposure assessment and risk characterization will be included. Practical lab classes will be incorporated as soon as student laboratories are available.
Goals and Objectives	The course focuses on the microbial contaminants in water and wastewater, and how the presence or abundance of these contaminants would relate to water quality and public health. Students will be introduced to the water and wastewater treatment processes, and the various concepts associated with the evaluation of these treatment technologies. Students will then be introduced to the regulations and/or standards suggested by World Health Organization, US-Environmental Protection Agency and various local agencies. Standard methods used to determine the microbial contaminants, and the limitations associated with each standard method will be discussed. New promising alternative methods that can be used to complement the standard methods will also be taught. Lastly, after learning about the regulations and various treatment technologies, students will learn to utilize quantitative microbial risk assessment (QMRA) to provide systematic evaluation of the potential health risks arising from a known concentration of microbial contaminants. Students will be asked to incorporate the QMRA concept to decide which technology to use for wastewater or water treatment, given a known amount of microbial contaminants.
Required Knowledge	None
Reference Texts	Textbook, scientific papers and references relevant for each theme will be listed in the lecture notes.
Method of evaluation	10.00% - Attendance and Participation 20.00% - Midterm exam 40.00% - Research Project 30.00% - Final exam
Nature of the assignments	Research project will require either a report or presentation
Course Policies	No plagiarism, no unaccounted absence from lectures
Additional Information	

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Mon 01/28/2019 Thu 01/31/2019	Introduction, bacterial pathogens
2	Mon 02/04/2019 Thu 02/07/2019	Bacterial pathogens
3	Mon 02/11/2019 Thu 02/14/2019	Standard methods
4	Mon 02/18/2019 Thu 02/21/2019	Drinking water microbiology
5	Mon 02/25/2019 Thu 02/28/2019	Drinking water microbiology
6	Mon 03/04/2019 Thu 03/07/2019	Recreational water quality
7	Mon 03/11/2019 Thu 03/14/2019	Recreational water quality
8	Mon 03/18/2019 Thu 03/21/2019	Mid-term exams; Water reuse, fate and persistence
9	Mon 03/25/2019 Thu 03/28/2019	Spring Break
10	Mon 04/01/2019 Thu 04/04/2019	Viral pathogens and related concepts
11	Mon 04/08/2019 Thu 04/11/2019	Quantitative microbial risk assessment
12	Mon 04/15/2019 Thu 04/18/2019	Quantitative microbial risk assessment
13	Mon 04/22/2019 Thu 04/25/2019	Lab practical
14	Mon 04/29/2019 Thu 05/02/2019	Lab practical
15	Mon 05/06/2019 Thu 05/09/2019	Lab practical
16	Mon 05/13/2019 Thu 05/16/2019	Study period
17	Mon 05/20/2019 Thu 05/23/2019	Final Exam Week

Note

The instructor reserves the right to make changes to this syllabus as necessary.