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MCB 3007

Living with Microbes

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Justification

Since the beginning of time, we have co-evolved with microbes. Today we are facing problems such as global warming, environmental pollution and emerging diseases, many of which are causing rapid changes in microbial communities and human health. With modern communication tools the public is often inundated with controversial and inaccurate media coverage including those pertinent to human health and the environment. Adding the microbiome into this equation increases the complexity of determining the synergistic relationship among these components. In this course, we aim to help students gain a sense of the essential role of microorganisms in our health and the health of our environment, as well as develop the ability to discern which sources of information are credible. Given the fact that human health and environment are interconnected on a global scale and of paramount significance, this course fits perfectly into the concept of Global Learning teaching at FIU.

Description

The main objective of the course is to generate awareness of the crucial role microbes play in (1) human health, (2) sustaining the environment, and (3) maintaining this interdependent relationship in a way that continues to support life as we know it. Through readings and class presentations students will be able to learn about the necessity of our internal and external microbial communities working in synchrony with our bodies and our environment. Based on information obtained primarily from the Internet, students will be able to express their own opinions but also take evidence-based positions on issues such as global warming, controversial medical treatments, alternative medicine, use of genetically modified food, etc. The course will examine different aspects of environment endangerment caused by human activities as well as the effect of the changed environment on the human organism and health in general. This is envisioned as a course that will be based on three principles: (1) active learning, (2) real life situations, and (3) global learning.

Learning Outcomes/General Objectives of the course

After completing this course, students will be able to:

1. Understand that microbes play a significant role in protecting and balancing both environment and human health
2. Critically evaluate and discern between reliable and questionable media sources
3. Identify inconsistencies between media coverage and original research findings

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Global Learning Outcomes

Global Awareness - Students will be able to show awareness of the global interrelationship between human affairs and disease causing microorganisms, their use in biotechnology, and their role in environment sustainability.

Global Perspective - Students will be able to discern the ways in which microorganisms can be perceived as either beneficial or detrimental from multiple points of view, e.g. industrial, agricultural, social, economic, and environmental.

Global Engagement - Students will be able to analyze a problem regarding a microbiological situation and present a plan for potential abatement of a crisis situation caused by a microbiological issue.

Teaching methodology

The course will utilize active learning and collaborative learning techniques that will stimulate critical thinking. Assignments will include (1) group presentations or individually writing a paper on selected topics, and (2) taking part in class discussions. Guest speakers will be scheduled for some classes. Students will be required to come to class prepared by reading information on a specific topic. It is expected that this will result in opposing opinions. Instructor's lecturing will be kept at minimum and will be given at the beginning of the class as an introduction to a topic. Each class will be organized around students' presentations. Students signing up for the presentation will be asked to propose a specific title or problem statement to cover the topic outlined in the Class schedule (subject to approval by the instructor). After a student presentation, class discussion and answering multiple choice questions using the i-clicker, the class will come to a conclusion determining the correct answer. Alternatively, to proposing their own title/problem statement for presentation, students can select a title offered by the instructor which will require problem solving. An example: "A nine year old boy developed a severe skin allergy. In a four-member family he is the only one showing symptoms. The symptoms are particularly severe in the morning. An environmental inspector tested the air in their home for a potential chemical pollutants and found none. What else could have caused the symptoms?" The presenter is expected to list and explain all other potential causes of allergy.

What is novel in this course?

Two aspects of this course are novel:

1. Learning about the necessity of our internal and external microbial communities working in synchrony with our bodies and our environment, and how the interactions of this bacterial macrocosm intimately affects our health and the sustainability of the world we live in (from a biological perspective).
2. By choosing their own topic for class presentations, students will be involved in shaping the class syllabus. There will be no textbook, instead reading material required for this course will be obtained primarily from the Internet. This will be facilitated by use of FIU LibGuide.

Assignments

Mandatory assignments

- (i) Students will be required to come prepared to class by reading the article(s) or text that will be listed for each class on the course website.

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- (ii) Students will be required to either present or write a paper on the topic of their choosing, subject to approval by the instructor. Each approved topic will have a global perspective.

Assignments for extra credits

- (i) Presentations may be more stressful to some students. In order to encourage presentations (skills learned are extremely valuable), those who opt to present will receive between 1-5 extra points. The presentation can be either an individual or a team assignment (up to three students). In order for the whole class to benefit from a presentation, the presenters will be required to prepare the presentation by working closely with the instructor.
- (ii) Participating in "[Tuesday Times Roundtable](#)". This is FIU's weekly series of moderated conversations on The New York Times articles from the multiple viewpoints. Participating in this program, students will earn 1% points for participation in each session.

Exams

There will be three exams over the course of the semester. Each exam will consist of 50 multiple choice questions. The questions will be based on the books, "10% Human" and (another book TBD), and the text provided on the course website as "recommended reading".

Attendance

Given the seminar style nature of this course it is essential for students to be present in class. Student presentations and in-class interactions are meant to enhance learning and improve ability to discern accurate from inaccurate or incomplete information. Attendance record will be based on i-clicker participation.

Grading policy

The final letter grade will be based on: (i) The average score of three exams (worth 60% of the grade), (ii) presentation or paper on Global-Interdisciplinary aspect of the course (worth 30% of the grade), (iii) attendance points (10%), and (iv) extra credit points earned for presentation (1-5% points).

Readings

10% Human: How Your Body's Microbes Hold the Key to Health and Happiness, by Alanna Collen (\$19.00) another book – TBD. Other information needed for the course will be obtainable primarily from the Internet. Website links will be provided for every topic on the course website.

Course prerequisite

None

Topics to be covered

- (1) General information about microbes (weeks 2-4)
- (2) Environment-Microbe-Human interactions (weeks 5-10)
- (3) Human microbiome (weeks 11-14)

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Course Calendar

Please note that there will be 6 presentations per topic; presentation titles are provided as examples.

Session	Topic	Presentation title	Recommended Readings
1		Introduction – about the course	
2	About the microbes – what are they?	1. Pathogenic microbes – how long they survive in non-host environments	http://www.nhs.uk/chq/Pages/how-long-do-bacteria-and-viruses-live-outside-the-body.aspx
3	What they do?	1. Can cellulose degrading microbes solve the fuel crisis?	https://www.wired.com/2007/09/f-f-plant/
4	Where do we find them?	1. Microbes and Art - Degradation of Paintings	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC41117/
5	Non-pathogenic microbes and human body	1. Is it wrong to not want 10 trillion bacterial cells to live in my body?	http://articles.mercola.com/sites/articles/archive/2012/08/01/p100-topics-for-optimal-gut-flora.aspx
6	Dealing with microbes	1. Why to ferment food? (Examples from different countries)	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4301946/
7	Human activities affecting the environment	1. Can a climate change increase the Cholera outbreaks?	https://www.nature.com/nature/journal/v438/n7066/full/nature04188.html
8	Using microbes to get a product	1. How to make wine? – a historical perspective	https://laughinglemon.ch/food-wine-info/about-swiss-wine/history/
9	Microbes affecting the environment	1. Toxic slime: why are some algae in Florida dangerous?	https://weather.com/science/environment/news/florida-martin-county-algae-toxic-air-particles-marina-rio
10	Using microbes to protect the environment	1. Nitrogen-fixing algae (cyanobacteria) as bio-fertilizer – experience from Asia	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4838734/
11	Immunity vs microbial infection	1. Controversies with vaccines- anti vaccine movement in the USA	http://www.csicop.org/si/show/anti-vaccination_movement
12	Microbes affecting skin and eyes	1. Trachoma - the leading cause of blindness in the third world countries	http://www.who.int/mediacentre/factsheets/fs382/en/
13	Microbes affecting respiratory and digestive system	1. Cholera in post-earthquake Haiti – UN responsibility	http://www.cnn.com/2016/08/18/health/haiti-un-cholera/
14	Microbes affecting cardiovascular and genitourinary system	1. Syphilis in Miami-Dade county	http://www.miamiherald.com/news/health-care/article91980167.html