University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

Aquatic Toxicology

3 credits

(also listed as TOX 625)

MEES 743
SPRING 2019

Course Objectives / Overview

This course will provide students with a broad perspective on the subject of aquatic toxicology. It is a comprehensive course in which a definitive description of basic concepts and principles, laboratory testing and field situations, as well as examples of typical data and their interpretation and use by industry and water resource managers, will be discussed. The fate and toxicological action of environmental pollutants will be examined in aquatic ecosystems, whole organisms and at the cellular, biochemical and molecular levels. Current and emerging issues will be used as case studies throughout the course to illustrate specific ecosystems (e.g. Chesapeake Bay), pollution events (e.g. Deepwater Horizon Oil Spill), particular organisms (e.g. coral reefs) or a specific class of contaminants. Classes will consist of lectures by the instructor together with some guest speakers in addition to group discussions.

Expected Learning Outcomes

Following completion of this course students will;

(1) Have experience applying basic concepts in environmental science, including environmental chemistry, biology and physiology, ecosystem health, management and regulatory issues, as they relate to pollution of aquatic ecosystems.
(2) Be able to identify a current topic of concern and summarize current data/papers in an oral presentation including directing an open discussion with the rest of the class.
(3) Write a proposal on their topic of concern, highlighting why it should be funded etc.

Course Assessment / Grading

Students will be expected to actively participate in each week's class discussions. Students will be expected to research, present, discuss and identify an area for future funding and present their findings to the entire class at the end of the semester. Throughout the class students will be provided with assigned readings that they will need to respond to questions about them (written paragraph responses or short essays). A midterm exam (short answers and essays) will also be given during class.

Grading, out of 100 points:

20 pts Mid-term exam
10 pts Individual homework assignments
5 pts Participation and discussion during class
10 pts Final presentation
10 pts Led discussion on presentation
25 pt Final exam

INSTRUCTOR DETAILS:

Faculty Details:
Dr. Carys Mitchelmore
mitchelmore@umces.edu
410-326-7283

CLASS MEETING DETAILS:

Date: Monday/Wednesday
Time: 12-1.30pm
Originating Site: UMCES, CBL
IVN bridge number: (800414)
Phone call in number: (***)
Room phone number:
CBL, Ed Houde Teaching suite

COURSE TYPE:

Check all that apply

☐ Foundation
☐ Professional Development
☐ Issue Study Group
☐ Seminar
☒ Elective

Prerequisites
Insert here or state N/A

Teaching Assistant
TBD or N/A

20 pts Final term paper; proposal

Tentative Weekly Course Schedule - This is a general outline. Specific topic / case studies may change.

Section A **Introduction & Background of Aquatic Toxicology**

Week 1 1) *Introduction, History, Background, legislation and sources of contamination / water pollution.*

Section B **Environmental chemistry, transport and fate**

Week 2 1) *General concepts, routes of transport*

Week 3 2) *Factors affecting distribution and fate*

Section C **Toxicokinetics; Bioavailabilty and Bioaccumulation**

Week 3 1) *General concepts*

Week 3 2) *Specific case examples*

Section D **Biotransformation; Metabolism and Detoxification**

Week 4 1) *General Information*

2a) *Heavy metals*

2b) *Organics*

Section E **Organismal, Cellular, Biochemical and Molecular mechanisms of response**

Week 5 1) *Cellular and molecular responses*

2) *Biochemical responses*

Week 6 3) *Organismal responses*

Section F **Biomarkers and toxicity tests**

Week 6 1a) *Biomarkers of stress; organismal / tissue / cell*

Week 7 1b) *Biomarkers of stress; biochemical / molecular*

Week 7 Midterm exam **(also assign presentations and proposal topics due at end of semester)**

Week 8 SPRING BREAK

Week 9 2a) *Toxicity assessment: toxicity tests, endpoints, acute vs. sublethal (delayed response etc), laboratory and field studies*

2b) Case studies of toxicity tests / regulation and management

Section G **New Emerging Issues of concern**

Week 10 1) *Climate Change – with case examples*

2) *Land Use change and water management with case examples*

Week 11 3) *New emerging issues – contaminants, nanoparticles and plastics*

4) *Energy exploitation including fracking*

Section H **Specific endpoint and case study examples**

Week 12 1) *Sensitive species; reptiles and amphibians*

2) *Coral reefs and Arctic Habitats*

Week 13 3) *Chesapeake Bay Pollution Issues*

4) *Invasive species and control*

Week 14 5) Endocrine disruption

6) Oil spills and response including 2010 Deepwater Horizon incident

Week 15 7) Genotoxicity and DNA damage

Section I **Student presentations**

Weeks 15/16 Presentations
Week 17 Final Exam

Required textbooks, reading and/or software or computer needs

No textbooks are required.
Throughout the course additional reading from supplementary information from textbooks and journal articles will be included. During the course of the study students will be required to find their own pertinent literature regarding their specific topic.

Course Communication and Resources

We will use the MOODLE system and emails. Before each class lecture materials will be provided on the moodle site. If you do not have moodle access please let us know and we will set you up. Your username will be the email address you send us and a temporary password will be assigned to you.

Campus Policies

The University of Maryland Center for Environmental Science has drafted and approved of various academic and research-related policies by which all students and faculty must abide.

Please visit http://www.umces.edu/consolidated-usm-and-umces-policies-and-procedures for a full list of campus-wide academic policies.

Course-Specific Policies and Expectations

You will be required to attend every class unless you provide written notice ahead of the class if you have other commitments (field work, conferences etc.). You are expected to regularly check the moodle site and read all documents posted. If you miss a class because you are sick please let us know as soon as possible and we can help you catch up on course material at a later date. All work must be your own and plagiarism will not be tolerated.