University of Manitoba
Faculty of Environment, Earth and Resources
Department of Environment and Geography

ENVR 3180 Methods in Ecotoxicology (3 Credit hours) A01
Term 2, 2015-2016

Instructor: Mark Hanson, Ph.D.
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Office Hours: 9:00-11:00 a.m., Wednesday, or preferably by appointment.

Course Times:
Class: Monday, Wednesday and Fridays, 11:30am-12:20pm, Rm 243 Wallace
Laboratory: Friday, 2:30-5:15pm, Rm 318 J.H. Ellis Building

TA:
Your TA is Dana Moore and he can be reached at <anticipatemoore@gmail.com> to book an appointment.

Prerequisites:
Introductory Toxicology: Faculty of Environment, Biological Sciences or Agriculture 2180 and a 2nd year course in the Faculty of Environment, Earth and Resources, Science or Agriculture that has a science laboratory component.

Course Materials:
Required
Laboratory manuals and other readings will be distributed in class or via UM Learn.

Outline:
This is a laboratory-based course grounded in the science behind the development, validation, conduction and application of bioassays, biomarkers, bioindicators and biomonitors in ecotoxicology.

Objectives:
The student will be expected to be able to:

- Conduct standard bioassays, including:
  - Duckweed (*Lemna gibba*)
  - Invertebrate (*Chironomus riparius*)
  - Microcosm studies (multi-species model ecosystems)
- Use standard statistical techniques to model and interpret their results
- Present data in the format of a scientific journal
- Understand how to critique laboratory bioassays and the data they generate; both their own and in the peer reviewed literature
- Understand how to conduct preliminary ecological risk assessments

Subject materials to be presented:

- Current bioassays methodologies
- The rationale behind the development of bioassays
- The difference between biomarkers and bioindicators
- What constitutes data high quality
- Extrapolating laboratory data to field-level situations
- The process of validating a bioassay, a biomarker, a bioindicator or a biomonitor
- The statistical and mathematical basis for modeling and interpreting the response observed in an organism exposed to a contaminant

Grading Scheme:

Laboratory Reports	40% (8 reports worth 5% each)
Statistics Assignment	10%
Lecture Midterm	20%
Lecture Final Exam	30%
Total	**100%**

Comments:

Policy regarding late assignments: Every student is required to submit all of the laboratory reports. Failure to submit a report will result in a mark of zero on that report; reports submitted late will not be accepted without special permission.

Midterm Tests: Failure to write the scheduled Midterm Examination without a valid medical certificate or compassionate reason (e.g., death of an immediate family member) will normally result in a mark of zero on that examination. The course instructor reserves the right to reschedule a deferred test for those students who have a valid reason for not writing. Make-up tests will not necessarily follow the same format as the original exam.

Final Examination: All students must write the 3 hour final examination. Failure to write the final examination without a valid medical certificate or compassionate reason (e.g., death of an immediate family member) will result in a mark of zero on the final examination. The student's home faculty can only give deferral of a final examination – the instructor cannot reschedule a final examination.

Computer Lab: All students will need to use the statistical software SigmaPlot and other programs to complete their assignments and laboratories. The programs are available in the computer lab in 321 Wallace and you will be given a password to access the machines when they are not scheduled for regular teaching.

Evaluative Feedback: Will be provided in the form of a midterm exam and laboratory reports prior to the voluntary withdrawal deadline date for this course.

Final Grade: A total mark of less than 50% in the course will result in a grade of **F**. Marks between 50% and 100% will be graded from **D** to **A+** according to the Department of Environment and Geography grading scheme below:

Letter Grade	**Percentage**
A+	90-100
A	80-89
B+	75-79
B	70-74
C+	65-69

C	60-64
D	50-59
F	<49.9

Academic Dishonesty: Students should acquaint themselves with the University's policy on plagiarism and cheating and examination impersonation (see University of Manitoba General Calendar). The copying of another student's assignment (or an instructor's answer sheet from a previous year) or the submission of the same material for two or more courses is plagiarism. Plagiarism and other forms of cheating are prohibited. The full definition of plagiarism and the possible penalties associated with it are outlined in the General Calendar. If your submitted assignment contains material you have copied from another source (eg. from a textbook, web page, or from the published literature) you must give proper credit to that source.

Schedule and order of material to be covered:

Date	**Instructor**	**Lecture Material**	**Labs**
Jan. 6th	Hanson	Introduction-What are bioassays?	
Jan. 8th	Hanson	What are bioassays?	**No lab**
Jan. 11th	Hanson	Statistics of bioassays I	
Jan. 13th	Hanson	Statistics of bioassays II	
Jan. 15th	Hanson	Statistics of bioassays III	Statistics*
Jan. 18th	Hanson	Ecological risk assessment	
Jan. 20th	Hanson	Acute/chronic and Structure/function	
Jan. 22nd	Hanson	Microbial testing	Seedling Bioassay*
Jan. 25th	Hanson	What bioassays don't tell you I	
Jan. 27th	Hanson	Earthworm testing	
Jan. 29th	Hanson	What bioassays don't tell you II	Earthworm Bioassay*
Feb. 1st	Hanson	Algal tests	
Feb. 3rd	Hanson	*Lemna* and macrophyte methods	
Feb. 5th	Hanson	Terrestrial plant tests	Mycorrhizal Testing*
Feb. 8th	Hanson	Invertebrate testing	
Feb. 10th	Hanson	Models and simulations	
Feb. 12th		**Midterm Exam**	**No Lab**
Feb. 15th		*Reading Week*	
Feb. 17th		*Reading Week*	
Feb. 19th		*Reading Week*	
Feb. 22nd	Hanson	Periphyton	
Feb. 24th	Hanson	Parasites and bioassays	
Feb. 26th	Hanson	Field-level testing	Computer Modeling*
Feb. 29th	Hanson	Microcosms I	
March 2nd	Hanson	Microcosms II	
March 4th	Hanson	Amphibian testing	Duckweed Bioassay*
March 7th	Hanson	Biomonitoring	
March 9th	Hanson	Chironomidae testing	
March 11th	Hanson	EEM	*C. riparius* Bioassay*
March 14th	Hanson	Biomarkers I	
March 16th	Hanson	Biomarkers II	

March 18th	Hanson	Histopathology	Bloodworms-Snails*
March 21st	Hanson	Fish testing I	
March 23rd	Hanson	Fish testing II	
March 25th	Hanson	*Good Friday*	**No Lab**
March 28th	Hanson	Avian toxicology	
March 30th	Hanson	Wildlife toxicology	
April 1st	Hanson	Toxicogenomics	Critiquing Papers*
April 4th	Hanson	Bioassays & emerging contaminants	
April 6th	Hanson	Strange bioassay tales	
April 8th	Hanson	Review	**No Lab**

Labs with an asterisk have a report component.

April 11th-April 25th Final exam set by Students Records Office

The voluntary withdrawal deadline date for this course is March 18th 2016.