MEDPHYS 4U03 Course Outline

Course: MEDPHYS 4U03 - Radiation Biology
Term: Term 2 - Winter 2017
Instructor: Dr. Carmel Mothersill *email:* mothers@mcmaster.ca
Teaching Assistant: Michelle Le *email:* lem8@mcmaster.ca

Class Schedule

Monday 12:30 - 13:20 room: TSH 122
Tuesday 13:30 - 14:20 room: TSH 122
Thursday 12:30 - 13:30 room: TSH 122

TA Office Hours

Michelle Le, Tandem Accelerator Building room 104/A
Day & Time TBD

Textbook

Hall, E.J. and Giaccia, A.J., Radiobiology for the Radiologist, (Seventh edition), 2012. Lippincott, Williams and Wilkins, Philadelphia, PA.

- Electronic book fully accessible via McMaster University Library catalogue: `http://libaccess.mcmaster.ca/login?url=http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=booktext&NEWS=N&DF=bookdb&AN=01438882/7th_Edition/3&XPATH`

Course Breakdown

40% Assignment
30% Final Exam
15% Student Presentation of assigned chapter
5% Multiple Choice Question & Answer List
10% In-class Participation

Student Presentations

Students will each summarize and present one chapter from the course textbook (*Radiobiology for the Radiologist*, Hall). Allocation of chapters and Presentation Schedule is available on the course's Avenue to Learn

page.

15% of the presentation mark will be determined based upon content and delivery of the students' assigned chapter. 5% of the presentation mark will be awarded based upon the quality and accuracy of five (5) multiple choice questions (MCQs) that are developed by the student and which encompass the chapter content that the student presented.

- MCQs: each student must develop 5 MCQs corresponding to their chapter and pose these questions to the class during or at the end of the presentation. Higher marks will be awarded for thoughtful, accurate and challenging questions. These questions will be compiled and a selection of 20 will be chosen for the final exam.
- Submit your presentation slides and your 5 MCQs (with answers) to Dr Mothersill and to Michelle (TA) via e-mail the day before your presentation.

Research Assignment, Guidelines & Objectives

Worth 40% in total:

- Outline due Friday 10th February (5%)
- Assignment due Friday 24th March (35%)

Title

Construction of a sensitivity distribution curve and evaluation of the radiosensitivity drivers in a system of your choice

Background

Currently radiation protection is based on a linear-no-threshold model which assumes the hit cell/organism receiving the dose does not interact with or influence any other components of the system. Now that more science and especially biology is considered in radiation protection, there is a move to develop a system approach which considers the effect of energy deposition in different components in relation to the response of the system as a whole. However reasonable this may sound it is a big challenge to do. One approach is to consider all the elements of the system and rank them in terms of radiosensitivity. A curve is then constructed which shows the components of the system against their radiosensitivity. Using this, the most sensitive elements can be identified and considered in relation to the whole system (e.g. singled out for special protection.)

The Assignment

1. Choose a system. This can be a habitat such as a lake/lake shore, a forest, tundra, a desert, a coral reef or marine ecosystem etc. Medical Physics students can choose a physiological system in the body e.g. respiratory system, if they wish.
2. Choose a scenario involving radiation exposure e.g. tritium release from a nuclear power station, radiotherapy for a lung tumour, a catastrophic accident such as Chernobyl, Fukushima or the A bombs. Be aware of dose, dose rate, biological effects and legacy effects, all of which will be discussed during the course.
3. Identify the types of isotopes and likely doses in your chosen scenario

4. Using databases and original literature resources which will be discussed during the course, identify the range of species both plant and animal (dont forget bugs!) or tissue/cell types, likely to occur in your system and pull out the data concerning the radiosensitivity to isotopes relevant to your scenario. You will find many gaps and part of the assignment challenge is how to deal with knowledge gaps and uncertainties.

5. Construct a graph ranking species sensitivity (Examples will be worked in class).

6. Discuss your graph and determine from it and from your knowledge of radiation effects, which species/cell types are most likely to drive response. Set a cut off point for your habitat in terms of an exposure to radiation which you consider safe

7. Write a concluding statement this can refer to knowledge gaps and uncertainties as well as to the challenges you encountered during the assignment.

8. Cite your sources in the text and at the end of the report.

Assignment Format

Outline Format: The outline (worth 5%) should consist of one page, identifying the system you have chosen and the scenario with some background about the nature of the incident.

Report Format:

Pages: Maximum 20 pages, minimum 15 pages (including figures, graphs and reference list)
Spacing: Single spacing
Font: Times New Roman, 12 pt.

- Summary
- Introduction (choices of system and why)
- Background about the scenario
- Methods used
- Results
- Discussion
- Conclusion
- References/sources

Plagiarism Warning

The assignment will be checked using plagiarism software. Please be aware of McMaster University plagiarism regulations as stated here: `http://www.mcmaster.ca/academicintegrity/students/typeofad/plagiarism/`

Academic Dishonesty

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of an academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at: `http://www.mcmaster.ca/senate/academic/ac_integrity.htm`

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not ones own or for which other credit has been obtained.
2. Improper collaboration in group work. Copying or using unauthorized aids in tests and examinations.
3. In this course we will be using a software package designed to reveal plagiarism. Students will be required to submit their work electronically and in hard copy so that it can be checked for academic dishonesty.