ISCI 2A18 Course Outline 2013/14

Description and objectives

ISCI 2A18 is an 18 credit course open only to students registered in the Integrated Science program. The course aims to

- provide you with a wide-ranging background of core concepts in the areas of mathematics, ecology, statistics, biochemistry, history of the earth, neuroscience, thermodynamics, and science literacy, appropriate to the continuation of study in those areas in upper year courses;
- illustrate the interconnectedness of the scientific disciplines, drawing on the research projects;
- equip you with a wide range of scientific, problem-solving, critical thinking, and collaborative skills;
- nurture a creative, student-oriented, distinctive learning environment in which you can further develop your academic identities, scientific interests, and research skills within our community of students, staff, and faculty.

Program Website:
http://www.science.mcmaster.ca/isci/

Instructors

<table>
<thead>
<tr>
<th>Name</th>
<th>Component</th>
<th>Room</th>
<th>Phone</th>
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</tr>
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<tbody>
<tr>
<td>Colgoni, Andrew</td>
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<tr>
<td>Dudley, Susan</td>
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<tr>
<td>Dumont, Randy</td>
<td>Thermodynamics</td>
<td>ABB 234</td>
<td>23301</td>
<td><a href="mailto:dumontr@mcmaster.ca">dumontr@mcmaster.ca</a></td>
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<tr>
<td>Ellis, Russ</td>
<td>Lab Practicum, Drug Discovery Admin Lead</td>
<td>GSB 115</td>
<td>21503</td>
<td><a href="mailto:ellisr@mcmaster.ca">ellisr@mcmaster.ca</a></td>
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<tr>
<td>Eyles, Carolyn</td>
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<td>24077</td>
<td><a href="mailto:eylesc@mcmaster.ca">eylesc@mcmaster.ca</a></td>
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<td>Gillespie, Deda</td>
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<tr>
<td>Harvey, Chad</td>
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<tr>
<td>Kevlahan, Nicholas</td>
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<tr>
<td>O’Dell, Duncan</td>
<td>EP-Quantum</td>
<td>ABB 320</td>
<td>23189</td>
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<tr>
<td>Robinson, Sarah</td>
<td>General Support</td>
<td>Thode 308</td>
<td>20841</td>
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<td>Symons, Sarah</td>
<td>History of the Earth</td>
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<tr>
<td>van Wersch, Genevieve</td>
<td>Lab Practicum, EP Admin Lead</td>
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<tr>
<td>Wright, Gerry</td>
<td>Drug Discovery</td>
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Avenue to Learn site
http://avenue.mcmaster.ca/
**Timetable**

You must be prepared to be present at all of the times indicated for iSci classes, including iConS, invited speaker seminars, labs & tutorials. The weekly course timetable will be posted on Avenue. *The course calendar on Avenue will supersede all other calendars including MUGSI.* Any schedule changes will be announced on Avenue. *Check the Avenue course site daily.*

There will be eighteen hours of supervised time per week (not including field trips and exams). Attendance is mandatory for all supervised time. The course will be broken up into five research projects plus an enrichment project.

**Syllabus**

**General Skills**

Throughout the course, you will be developing a range of skills including: research skills, team work, leadership, communication skills, information literacy, experimental design, critical thinking, data analysis, numeracy, and math literacy.

**Mathematics**

We will study topics in the theory of functions of several variables, including continuity, differentiation, parametric curves, optimization methods, vector fields, path integration and Green’s theorem.

**Plant-Animal Interactions**

Plants (in one form or another), as primary producers, are the foundation of any ecological system – they make the planet Earth green. Yet, the planet is prolific with plant-eating organisms. So…why is the world ‘green?’ To address this scientific question, we will study the ecological, biochemical and evolutionary interactions, mechanisms and paradigms that relate to this paradox. In the context of understanding plant-animal interactions, this project will highlight the value of experimental design and data collection coupled with an introduction to statistical analysis.

**Drug Discovery**

Macromolecules such as nucleic acids and proteins are essential elements of life. They are responsible for the proper execution of various biochemical and physiological processes within the living organism. The chemical and conformation states of these macromolecules are often precisely tuned for achieving their optimal (normal) functions. We’ll develop an understanding of how externally introduced molecules (drugs) can interfere with essential processes of life through studying the chemical and conformational properties of nucleic acids and proteins.

**History of the Earth**

The main events in the evolution of Earth will be examined in the context of the historical development of major scientific ideas and concepts. We will examine conditions on the early Earth, the evolution of life forms (including dinosaurs), mass extinction events, and the movement of continents on our planet over geologic time. We will focus particularly on the evolution of the North American continent. At the same time we will consider how scientific thought has developed and how scientists have addressed key scientific issues in different historical periods.
Neuroscience
The goal of the neuroscience project is to cover fundamental concepts of neuroscience and to provide a brief overview of the interdisciplinary nature of this field. Basic themes to be addressed include: ionic basis of the resting and action potentials, ion channels, synaptic transmission, transduction, structure/function relationships, and neural processing. A subset of the underlying biophysics, cell biology, and biochemistry concepts will be discussed.

Thermodynamics
This project will explore the reasons underlying spontaneous changes in the form and composition of physical systems. We’ll ask questions about why some changes occur spontaneously while others are impossible to elicit and apply fundamental concepts such as energy and entropy to discover answers.

Lab Practicum
Students will learn important skills and techniques commonly used in many of the science disciplines. The lab practicum sessions will provide opportunities for hands on learning and exposure to a variety of laboratory equipment and techniques related to each specific Research Project.

Science Literacy
Students will choose a variety of SciLit activities to count towards their SciLit component, including drafting project work, participating in the Synthesis Symposium, and blogging.

Enrichment Project (EP)
Each modular project will identify areas that students can work on as an enrichment module. Quantum Mechanics can be completed as an enrichment module. Descriptions of the enrichment project topics will be included in a separate project pack. Enrichment topics will be shared with students in term 1. In late January, students will prepare a short proposal associated with the enrichment topic of their choosing. Assessment will be determined between each student and the enrichment project leader.
Textbooks and equipment
The following items can all be purchased at the Campus Store on campus.

**Mathematics** (recommended)
  - note that this is the same textbook that was used in ISCI 1A24
Maple Software Student Version 11 or newer.

**Plant-Animal Interactions** (recommended)

**Drug Discovery** (required)

**History of the Earth** (recommended)

**Thermodynamics** (required)
- Dumont, R., *Custom Course Ware*

**Thermodynamics** (recommended)

**Neuroscience** (recommended)
  (one of the following)
  -- note that Lodish et al is used for Cell Biology courses in the McMaster Biology department

**iClicker** (required) Electronic audience response system

**Lab coat and safety goggles** (required)

**Lab notebook** (required) Student Lab Notebook with carbonless duplication (Spiral Bound Chemistry 100, Hayden-McNeil)

**Field notebook** (required) Student field notebook with waterproof paper (Forestry Suppliers)

**Calculator** (required) Casio fx-991 MS Plus ONLY
Assessment

ISCI 2A18 will be assessed across five projects (neuroscience, thermodynamics, drug discovery, plant & animal interactions and history of the Earth), through exams and research project marks. You will also be assessed in mathematics, laboratory practicum, science literacy and an enrichment project.

Each project topic will have an exam that takes place immediately following the project. There will also be one mathematics exam per term. These exams will assess your core knowledge with topic-specific content. Exams may have a synoptic section that will test interdisciplinary conceptual problems and synthesis.

Research Project assessments may include laboratory work, exercises, preparatory tasks, and general “homework” and quizzes. Assessments may also include individual and group reports, posters or presentations. Deliverables specific to each project will be clearly outlined in the Research Project Pack that will be made available to you before the beginning of the project.

Research Projects will contain varied assessed deliverables that demonstrate not only scientific skills, but also additional research, collaborative authorship, project management, peer review, and communication skills. Most work will be compiled and graded as group work. There will be some individual assignments.

This course is worth 18 credits. The table below shows how the ISCI 2A18 course mark will be assembled.

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<tr>
<th>COMPONENT</th>
<th>Exams</th>
<th>Other Assessments</th>
<th>TOTAL</th>
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<tr>
<td></td>
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<td>Activities &amp; weights at instructor’s discretion</td>
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<tr>
<td>Plant-Animal Interactions</td>
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<td>25</td>
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<td>Enrichment</td>
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<td>30</td>
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<tr>
<td>Math</td>
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<td>Science Literacy</td>
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Pass-fail criteria

Passing ISCI 2A18 requires passing (i.e. grade of 50% or higher) seven of the nine component parts (projects, enrichment, mathematics, laboratory practicum and science literacy). Pass criteria for each component can be found in the component outline or project pack.

There may be opportunities to make up project topic content over the summer. It will be left to the discretion of the instructor to determine the content that needs to be made up.
Absences

Absence from iConS, Tutorials or Workshops:
If you are absent from any scheduled ISCI 2A18 session, it is your responsibility to make up missed work. If you are absent from a scheduled ISCI 2A18 session that has an associated piece of assessment (e.g. test, quiz, presentation, etc) without authorization your mark will be recorded as 0 (see Procedure for authorized absence, below).

Absence from Invited Speaker Seminars:
Unless approval for missing an Invited Speaker Seminar is obtained (see Procedure for authorized absence, below) your project mark associated with the Invited Speaker Seminar could be reduced by 20%. Attendance will be taken at all Invited Speaker Seminars.

Absence from Laboratory Practicum:
Students unable to attend a laboratory practicum due to illness should complete a McMaster Student Absence Form (MSAF), (see Procedure for authorized absence, below). If a lab is missed with a MSAF submission the remaining labs in the component will be re-weighted. Any unauthorized absences will result in a mark of 0% for the lab.

NO more than 1 lab practicum per term may be missed. If more than 2 labs are missed, the student will fail the Lab Practicum component of ISCI 2A18.

Students are expected to arrive to their scheduled laboratory time slot when the lab begins. The door will be locked once the lab starts. Students who arrive late to the lab will be turned away and the lab will be subject to a mark of 0.

Procedure for authorized absence:
If you are absent from the university for a minor medical reason, lasting fewer than 5 days, you may report your absence, once per term, without documentation, using the McMaster Student Absence Form (MSAF). Absences for a longer duration or for other reasons must be reported to your Faculty office, with documentation, and relief from term work may not necessarily be granted. When using the MSAF, report your absence to Sarah Robinson at sjrobin@mcmaster.ca. You must then contact the component lead (depending on what you missed) immediately (normally within 2 working days) by email. Please refer to the contact list on the first page of this outline for appropriate email addresses. Your component lead will indicate what relief may be granted for the work you have missed, and relevant details such as revised deadlines, or time and location of a make-up exam/quiz/test. Please note that the MSAF may not be used for final project deliverables, nor can it be used for a final examination or its equivalent.

Missed deadlines
Any late submissions will result in a penalty of 20% per day unless faculty are notified of any problems well in advance. This holds for both group and individual assignments.

Missed exams and other assessment activities
Exams or other assessment activities missed for reasons of unauthorized absence will be graded 0%. Authorized absence will result in rescheduled exams or compensation from other assessment activities.
Checking your Grades

You will have one week from the date that an assignment (or test or mid-term exam) is returned to you to appeal your mark. If you wish to appeal a grade, you must submit to the component lead (or laboratory coordinator for labs) a written note justifying why you wish to have the assignment remarked, with the assignment attached. If your component lead or laboratory coordinator considers the written justification to be insufficient (e.g. simply wanting a higher grade is insufficient), the assignment will not be re-graded. If the justification is considered sufficient, the entire assignment will be re-graded. You must therefore understand that your mark can increase or decrease.

Your marks will be recorded on Avenue. It is your responsibility to check that all grades entered into Avenue are recorded properly. You must notify your component leaders and laboratory coordinator about any errors with regards to how your mark was entered. You have until 48 hours prior to the end of term to discuss any Avenue mark issues.

Student Conduct

You acknowledge that your behaviour in all aspects of this course should meet the standards of the McMaster University Student Code of Conduct. You understand that any inappropriate behaviour directed against any of your colleagues, teaching assistants, or the instructional team will not be tolerated. Disruptive behaviour during any iSci session (e.g. iConS, Invited Speaker Seminars, labs, tutorials) such as talking, sleeping or non-iSci computing while an individual presents information, or constantly being late, will also not be tolerated. Abuse, ridicule, slander, inappropriate language, and discrimination towards instructors, teaching staff, teaching assistants and other students will not be tolerated in any capacity. Shared spaces such as iStudy are to be considered inclusive and safe.

Student Responsibilities

The level of student participation in this course is much higher than traditionally-taught courses. To get the most out of the course, you must be prepared to:

- attend all sessions, make up all missed work for all absences, and provide documentation for authorized absences;
- interact frequently with faculty, students, TAs, and other support staff;
- plan and manage your own time;
- complete preparatory tasks (such as reading, writing assignments, and initial research) in advance of sessions;
- develop and use reflective learning skills (for example identifying learning objectives, planning and carrying out research tasks, acting on academic feedback);
- follow all guidelines as outlined in the ISCI 2A18 Laboratory Practicum Booklet;
- work as an effective, efficient, and responsive team member on group assignments;
- check the course Avenue site and your McMaster e-mail daily for updates;
- review, understand and abide by the ISCI 2A18 Student Responsibilities Contract; and
- follow all university policies and guidelines, and in all ways be a responsible university member.

Communication between students and faculty

Any e-mails addressed to faculty or staff must have a brief, relevant subject line, must include your student number, must come from a mcmaster.ca e-mail account or via Avenue, and must copy in all relevant parties (e.g. other markers, other group members). We suggest you put your student number in your e-mail signature. All e-mail communication addressed to students will be sent to their mcmaster.ca e-mail account or via Avenue.
All assignments must be handed in via Avenue, in the specified file format (usually pdf). Author(s) names, student numbers, and group designations if applicable, must be clearly marked on the first page of the work handed in. Work that is late, handed in to the wrong person, inadequately identified, or in the wrong format, risks losing marks. Faculty will endeavour to return marks within two weeks of hand-in.

Senate Student Policies
You should note the Senate’s Student Policies (http://www.mcmaster.ca/policy/student.htm). Senate Policy Statements are also available from the Senate Secretariat Office, Room 104, Gilmour Hall. In particular you should read the Academic Integrity Policy, specifically Appendix 3: http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf 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.

The following illustrate only four of many forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained;

- copying or using unauthorized aids in laboratory exercises

- improper collaboration in group work; and

- copying or using unauthorized aids tests and examinations.

All students are reminded of the importance of academic integrity, and the serious consequences of academic dishonesty.

Copyright Policy
In this course you will have access to material that is subject to copyright laws. This includes (but is not limited to) textbooks, solution manuals and all resources developed by the instructors such as lab manuals, demonstration videos, quizzes, assignments, tests, class notes and class slides. Under no circumstance are you allowed to share or redistribute this material in any printed or electronic form without the explicit written consent of the copyright holder. This includes posting any course material on Internet bulletin boards, course repositories, social networks, etc.

The instructors and the university reserve the right to alter this outline if necessary.
The instructors and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.