ISCI 2A18 Course Outline 2017/18

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/

Avenue to Learn site
http://avenue.mcmaster.ca/

Instructors

<table>
<thead>
<tr>
<th>Name</th>
<th>Component</th>
<th>Room</th>
<th>Phone</th>
<th>Email</th>
</tr>
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<tbody>
<tr>
<td>Colgoni, Andrew</td>
<td>Science Literacy</td>
<td>Thode 203</td>
<td>27743</td>
<td><a href="mailto:colgoni@mcmaster.ca">colgoni@mcmaster.ca</a></td>
</tr>
<tr>
<td>Dragomir, George</td>
<td>Mathematics</td>
<td>HH 414</td>
<td>26056</td>
<td><a href="mailto:dragomir@math.mcmaster.ca">dragomir@math.mcmaster.ca</a></td>
</tr>
<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>O’Dell, Duncan</td>
<td>Neuroscience</td>
<td>ABB-320</td>
<td>23189</td>
<td><a href="mailto:dodell@mcmaster.ca">dodell@mcmaster.ca</a></td>
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<tr>
<td>Ellis, Russ</td>
<td>Lab Practicum</td>
<td>GSB 114</td>
<td>21503</td>
<td><a href="mailto:ellisr@mcmaster.ca">ellisr@mcmaster.ca</a></td>
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<tr>
<td>Gillespie, Deda</td>
<td>Neuroscience</td>
<td>PC 310</td>
<td>28671</td>
<td><a href="mailto:gilles@mcmaster.ca">gilles@mcmaster.ca</a></td>
</tr>
<tr>
<td>Harvey, Chad</td>
<td>PAIx, EP</td>
<td>Thode 306B</td>
<td>21565</td>
<td><a href="mailto:harvech@mcmaster.ca">harvech@mcmaster.ca</a></td>
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<tr>
<td>Hassell, John</td>
<td>Drug Discovery</td>
<td>MDCL 5028</td>
<td>27217</td>
<td><a href="mailto:hassell@mcmaster.ca">hassell@mcmaster.ca</a></td>
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<tr>
<td>Maclachlan, John</td>
<td>History of the Earth</td>
<td>GSB 230</td>
<td>24195</td>
<td><a href="mailto:maclacjc@mcmaster.ca">maclacjc@mcmaster.ca</a></td>
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<tr>
<td>Symons, Sarah</td>
<td>HotE, SciLit</td>
<td>Thode 306A</td>
<td>21641</td>
<td><a href="mailto:symonss@mcmaster.ca">symonss@mcmaster.ca</a></td>
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<tr>
<td>van Wersch, Geneviève</td>
<td>Instructional Assistant</td>
<td>GSB 114</td>
<td>21799</td>
<td><a href="mailto:vanwer@mcmaster.ca">vanwer@mcmaster.ca</a></td>
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Administrative support

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<tr>
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<tr>
<td>Misiak, Rebecca</td>
<td>Academic Advisor</td>
<td>GSB 105D</td>
<td>21181</td>
<td><a href="mailto:misiakr@mcmaster.ca">misiakr@mcmaster.ca</a></td>
</tr>
<tr>
<td>Penney-Gibbs, Janice</td>
<td>Administrator</td>
<td>GSB 105F</td>
<td>20841</td>
<td><a href="mailto:penneyj@mcmaster.ca">penneyj@mcmaster.ca</a></td>
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<tr>
<td>MSAF Submissions</td>
<td>(only for use on MSAF form)</td>
<td><a href="mailto:2a18msaf@mcmaster.ca">2a18msaf@mcmaster.ca</a></td>
<td></td>
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Timetable

The weekly course timetable will be posted on Avenue. The course calendar on Avenue will supersede all other calendars including MOSAIC. Any schedule changes will be announced on Avenue.

You must be prepared to be present at all of the times indicated for iSci classes, including iConS, invited speaker seminars, labs & tutorials.

*Check the Avenue course site daily.*

Format

There will be 18 hours of supervised time per week (not including field trips and exams). Attendance is mandatory for all supervised time. The course contains nine components: five research projects, an enrichment project, math, lab practicum, and science literacy.

Syllabus

**General Skills**

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

**Mathematics**

In the mathematics component we extend integral calculus from the two-dimensional world of single variable functions to higher dimensions, and our focus will be to understand how the fundamental theorem of calculus generalizes to this new setting. For this we first need to learn about functions of several variables and multiple integrals, and then use them to define integrals of vector fields over curves and surfaces. The main results we will cover in this course include the theorems of Green, Stokes and Gauss. Along the way we will witness some important applications of multivariable calculus to natural and social sciences.

**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, evolutionary and biochemical interactions, mechanisms and paradigms that relate to this paradox. In the context of understanding plant-animal interactions, this project will highlight
the practice 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**
This project will cover fundamental concepts of neuroscience and very roughly survey the interdisciplinary nature of this field. Basic themes will include: ionic basis of the resting and action potentials, ion channels, synaptic transmission, transduction, structure/function relationships, and neural processing. We will touch on a subset of underlying concepts from biochemistry, biophysics, and cell biology.

**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. A separate Lab Practicum Manual is posted on Avenue.

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 January, students will prepare a short proposal associated with the enrichment topic of their choosing. Assessment will be determined between each student and their specific enrichment project leader.

Textbooks and equipment
The following items can all be purchased at the Campus Store on campus.

Mathematics (required)
Note: the same course material was used last year in ISCI 1A24 Math

Plant-Animal Interactions (recommended)

Drug Discovery (required)

History of the Earth (recommended)

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

Neuroscience (required)

Neuroscience (on reserve – Thode Library)

iClicker (required) Electronic audience response system
Lab coat and safety goggles (required)
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.
## 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:

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<th>Exams</th>
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<td>Science Literacy</td>
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<tr>
<td><strong>TOTAL</strong></td>
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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 may be re-weighted or an alternate lab component will be assigned. 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 during the ISCI 2A18 course, 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:**
In the event of an absence for medical or personal situations, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”. The timeframe within which the MSAF is valid is 3 days.

The entire MSAF policy is available in the Undergraduate Calendar 2017-18 (Fall/Winter) > General Academic Regulations > Requests for Relief for Missed Academic Term work. Please review the entire policy prior to submitting any requests. Students may use this tool to submit a maximum of ONE request for relief of missed academic work per term.

When using the MSAF, you MUST use 2a18msaf@mcmaster.ca as the contact e-mail for your ISCI 2A18 work. You MUST ALSO contact the relevant component lead or laboratory coordinator (depending on what you missed) within 48 hours by email. If you do not, your MSAF may not be granted. Please refer to the contact list on the first page of this outline for the appropriate email addresses. Your component lead or laboratory coordinator 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, deliverables worth more than 25% of the final grade, nor can it be used for a final examination or its equivalent.

Absences of a longer duration (>3 days), and/or for work worth more than 25% of the final grade, and/or if you have already submitted and MSAF request for the term, must be reported to the Office of the Associate Dean of Science (BSB 129), with documentation, and relief from term work may not necessarily be granted.

MSAF is available in MOSAIC Student Center (in the drop down menu under Academics)
**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 come from a mcmaster.ca e-mail account and must copy in all relevant parties (e.g. other markers, other group members). All e-mail communication addressed to students will be sent to their mcmaster.ca e-mail account.

All assignments must be handed in via Avenue, in the specified file format (usually pdf). Author(s) names, 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.

Instructors 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/Students-AcademicStudies/). 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.

**Use of Turnitin.com**

In some parts of this course, we may be using a web-based service (Turnitin.com) to reveal plagiarism. Students will be expected to submit their work electronically to Turnitin.com and/or in hard copy so that it can be checked for academic dishonesty. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to [www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity).

**Academic Accommodation of Students with Disabilities**

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail [sas@mcmaster.ca](mailto:sas@mcmaster.ca). For further information, consult McMaster University’s Policy for Academic Accommodation of Students with Disabilities [http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf](http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf).

**Academic Accommodation for Religious, Indigenous and Spiritual Observances**

McMaster University (the University) strives to be welcoming and inclusive of all its members and respectful of their differences. Students, staff, and instructors come from a range of
backgrounds, traditions and beliefs. The University recognizes that, on occasion, the timing of a student’s religious, Indigenous, or spiritual observances and that of their academic obligations may conflict. In such cases, the University will provide reasonable academic accommodation for students that is consistent with the Ontario Human Rights Code, through respectful, accessible, and fair processes. More information can be found in http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-Observances.pdf and https://www.science.mcmaster.ca/associatedean/current-students/procedures-forms.html

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.