McMaster University | School of Interdisciplinary Science

COURSE OUTLINE
ISCI 2A18
2019-2020

INSTRUCTORS:

Name	Component & Projects	Email	Room
Tomljenovic-Berube, Ana	Drug Discovery	tomljeam@mcmaster.ca	TAB 104/G
Dragomir, George	Mathematics	dragomir@math.mcmaster.ca	HH 204
Hitchcock, Adam	Thermodynamics	aph@mcmaster.ca	ABB-422
Ellis, Russ	Lab Practicum	ellisr@mcmaster.ca	GSB 114
Eyles, Carolyn	History of the Earth	eylesc@mcmaster.ca	Thode 308a
Gillespie, Deda	Neuroscience	gilles@mcmaster.ca	PC 310
Harvey, Chad	Plant-Animal Interactions, EP	harvech@mcmaster.ca	Thode 306B
O'Dell, Duncan	Neuroscience	dodell@mcmaster.ca	ABB-320
Symons, Sarah	History of the Earth, SciLit	symonss@mcmaster.ca	Thode 306A
Jones, Devon	Instructional Assistant	jonesde2@mcmaster.ca	GSB 114

ADMINISTRATIVE SUPPORT:

Misiak, Rebecca	Academic Advisor	misiakr@mcmaster.ca	GSB 105D
Robinson, Sarah	Administrator	sjrobin@mcmaster.ca	GSB 105F
MSAF Submissions	(only for use on MSAF forms)	2a18msaf@mcmaster.ca	

COURSE DESCRIPTION

ISCI 2A18 is an 18 credit course open only to students registered in the Honours 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, Earth history, history of science, 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, research, and professional development 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/

LEARNING OBJECTIVES

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. The learning objectives for each component are:

Plant-Animal Interactions (PAIx)

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 mechanisms and paradigms that relate to this paradox. In the context of understanding plant-animal interactions, this project will highlight the practice of research - from experimental design and data collection through introductory data analysis (statistics), manuscript writing and the oral defence.

Neuroscience (Neuro)

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.

Drug Discovery (DD)

This project will explore the process of drug discovery by reviewing the fundamental roles that DNA and proteins play in regulating biological systems, and by investigating how we as scientists manipulate these macromolecules though medicine to combat disease. We will review how biochemistry, the study of chemical processes in biological systems, as well as cellular and molecular biology inform drug design, development and delivery. In studying target-ligand relationships using in silico, in vitro, and in vivo models, students will learn about the complexity of the drug development process from chemical, physiological and regulatory perspectives.

History of the Earth (HotE)

The main events in the evolution of the 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.

Thermodynamics (Thermo)

This project will explore the reasons and required conditions for changes in the physical form and chemical composition of systems. We'll ask questions about why some changes occur spontaneously while others are impossible. Fundamental concepts such as energy, entropy and free energy will be used to discover answers. Applications in chemistry and biochemistry will be explored.

Mathematics

The math portion of ISCI 2A18 extends integral calculus from the two-dimensional world of single variable functions to higher dimensions; the main focus is understanding how the Fundamental Theorem of Calculus generalizes to this new setting. It covers multiple integrals, parametric curves and surfaces, line and surface integrals, conservative fields, and the integral theorems of Green, Stokes and Gauss. While the emphasis is placed on the geometric and physical interpretation of these concepts and results, other important applications of multivariable calculus to natural and social sciences are also discussed. As part of the integration with the other ISCI 2A18 components, we touch on additional topics such as Fourier series, partial differential equations, and multivariate probabilities and statistics.

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, as well as Technique Labs. Individual lab protocols are posted on Avenue.

Science Literacy (SciLit)

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

Enrichment Project (EP)

Each modular project will identify areas that students can work on 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.

CLASS ACTIVITIES

The weekly course timetable will be posted on Avenue. ***The course calendar (a Google Calendar) on Avenue will supersede all other calendars including MOSAIC.*** Any schedule changes will be announced on Avenue.

Check the Avenue course site daily.

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

Format

There will be eighteen hours of supervised time per week (not including some 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. The types of activities are:

iConS: (Integrated Concept Seminars): Class activities led by an instructional team member. These will focus on core disciplinary knowledge, scientific techniques and interdisciplinary topics. They will usually contain activities and discussion. Your understanding of content presented in iConS will be assessed via exams, continuous assessment, and/or project work.

SciLit: The focus of the Science Literacy component will be developing research and communication skills needed for current and future course work. You will create a portfolio of work and experiences that address your own needs and interests in the practice of science communication.

Labs: Each week, approximately six hours will be spent in laboratories and workshops, including field excursions, computer labs and research project labs.

Workshops: An activity or exercise that you do in any discipline area that does not appear in the lab manual and does not involve lab notes. Workshops may include in class work on computers or problem sets. Workshops do NOT include any work done on computers that would be considered experimental (e.g. simulations). There may be assignments associated with workshops.

OFFICE HOURS

Instructors and Teaching Assistants will hold office hours and communicate via Avenue when and where these take place.

REQUIRED TEXTS & MATERIALS

The following items can all be purchased at the Campus Store.

Mathematics (required – read note below)
Multi-Term Enhanced Web Assignment for Stewart's Calculus: Early Transcendentals 8th edition (EWA). ISBN-10: 1285858255, ISBN-13: 9781285858258
Note: The access code purchased last year for ISCI 1A24 Math is **multi-term** and should work this year as well.

Plant-Animal Interactions (recommended)

Howe, H.F., L.C. Westley. *Ecological Relationships of Plants and Animals*. Oxford University Press. ISBN: 9780195063141
Schaefer, H. M., G. D. Ruxton. *Plant-Animal Communication.* Oxford University Press. ISBN: 9780199563593

Neuroscience (required)
Nicholls, J. *From Neuron to Brain, 5th Ed.* Sinauer. ISBN: 978-0-87893-609-0

Neuroscience (on reserve – Thode Library)
Nelson, Phillip. *Biological Physics: Energy, Information, Life.* ISBN: 0716743728

Drug Discovery (recommended)
Patrick, Graham, *An Introduction to Medicinal Chemistry, 6th Ed.* Oxford University Press. ISBN-13: 978-0198749691, ISBN-10: 0198749694

History of the Earth (recommended)
Stanley, S. *Earth System History*. Freeman. ISBN: 978-1-4292-55264

Thermodynamics (required – electronic access from Thode Library is sufficient)
Sherwood, D., Dalby, P. *Modern thermodynamics for chemists and biochemists*, 2nd edition, Oxford University Press, 2018. ISBN-13: 9780198782957

Thode access: http://libaccess.mcmaster.ca/login?url=http://dx.doi.org/10.1093/oso/9780198782957.001.0001

Thermodynamics (other recommended resources)
Dumont, R., *Thermodynamics: An Emergent Reality, Part 1 (2018, Custom courseware)*
Engel, T and Reid, P. *Physical Chemistry 2nd Ed*. Pearson Education Canada. 2009. ISBN: 978-0321812001

Other Required Materials

i>Clicker (required) Electronic audience response system. ISBN: 9780716779391
Lab coat and safety goggles (required)
Calculator (required) Casio fx-991 MS Plus ONLY

COURSE SCHEDULE

Dates	**Activities**
September 3 - October 11	RP: Plant Animal Interaction
September 16 – November 22	RP: Neuroscience
October 12 – 20	Mid-term Recess
October 21 - November 29	RP: Drug Discovery
December 6 – 19	Exams
January 6 – February 14	RP: History of the Earth
January 13 – March 27	RP: Thermodynamics
February 15 – 23	Mid-term Recess
February 24 – March 27	RP: Enrichment Project
March 30 – April 7	iSci Symposium
April 13 – 28	Exams

Math, SciLit, and the Lab Practicum will run throughout both terms.

ASSESSMENT

ISCI 2A18 will be assessed across five projects (plant & animal interactions, neuroscience, drug discovery, history of the Earth, and thermodynamics), 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.

		ACTIVITY		
		Exams	**Other Assessments** Activities & weights at instructor's discretion	**TOTAL**
COMPONENT	Plant-Animal Interactions	10	25	**35**
	Drug Discovery	10	25	**35**
	Thermodynamics	10	25	**35**
	Neuroscience	10	25	**35**
	History of the Earth	10	25	**35**
	Enrichment	No exams	30	**30**
	Math	14	21	**35**
	Laboratory Practicum	No exams	40	**40**
	Science Literacy	No exams	20	**20**
	TOTAL			**300**

PASS-FAIL CRITERIA BY COMPONENT

Passing ISCI 2A18 requires passing (i.e. grade of 50% or higher) ***ALL 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 failed component content over the summer by enrolling in specified courses (unit value may be higher than the iSci component). It will be left to the discretion of the instructor and iSci Program Coordinator to determine the content that needs to be made up.

ABSENCES & MISSED WORK

If you are absent from the university for a minor medical or personal reason, lasting up to 3 calendar days, you may report your absence, once per term, without documentation, using the McMaster Student Absence Form (MSAF). MSAF is available in MOSAIC Student Center (in the drop down menu under Academics). 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 an 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. **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 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. An MSAF is a request for *individual* consideration: understand that an instructor may respond with an *individual* solution. **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.**

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 above).

Absence from Invited Speaker Seminars: Unless approval for missing an Invited Speaker Seminar is obtained (see procedure for authorized absence above) 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 due to illness or other personal situation should complete a McMaster Student Absence Form (MSAF). Please refer to procedure for authorized absence above.

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 (i.e. no MSAF submission) will result in a mark of 0 for that lab.

No more than 1 lab practicum per term may be missed, irrespective of MSAF submission. If more than 1 lab per project type (PAIx, Neuro, DD, Thermo, HotE, Technique) or more than 2 labs in total are missed during the ISCI 2A18 course, the student will fail the Lab Practicum component of ISCI 2A18. Accommodation for missed lab quizzes or tests is at the discretion of the Lab Practicum lead, providing an MSAF has been properly submitted. Failure to do so for either of these latter two components will result in a grade of zero.

Students are expected to arrive to their scheduled laboratory time slot at least 5 minutes before 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 and count as a missed lab.

Missed deadlines

Any late submissions will result in a penalty of **20% per day *unless*** faculty members are notified of any problems **in advance and approve** of a late submission. It is left to the discretion of the instructor to determine if accommodations will be made. 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 as zero. Authorized absence will result in rescheduled exams or compensation from other assessment activities.

CHECKING YOUR GRADES and RE-MARK POLICY

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 final exam to discuss any Avenue mark issues.

The policy for viewing and requesting a formal review of final exams will be available on Avenue.

COMMUNICATION BETWEEN STUDENTS AND THE INSTRUCTIONAL TEAM

Any e-mails addressed to faculty 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) name(s) and group designations, if applicable, must be clearly marked on the first page of the work handed in. Submitted files must be named in a way to easily identify the assignment and the author and/or group designation.

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 marked materials within two weeks of hand-in.

PLAGIARISM DETECTION

In this course, we will be using a web-based service (Turnitin.com) to reveal plagiarism. Students will be expected to submit their work electronically to Turnitin.com and 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

https://www.mcmaster.ca/academicintegrity/turnitin/students/index.html

POLICY ABOUT ONLINE ACCESS OR ONLINE COURSE WORK REQUIREMENTS

In this course we will be using e-mail, Avenue, and PebblePad. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

STUDENT RESPONSIBILITIES

To get the most out of the course, you must be prepared to:

- attend all sessions, make up all missed work, 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);
- work as an effective, efficient, and responsive team member on group assignments;
- follow all the guidelines as outlined in the Introduction section of the Laboratory Manual;
- check the course Avenue site, and your McMaster e-mail daily for updates; and,
- follow all university policies and guidelines, and in all ways be a responsible university member.

SENATE STUDENT POLICIES

Students can view full policies here (http://www.mcmaster.ca/policy/Students-AcademicStudies/).

Senate Policy Statements are also available from the Senate Secretariat Office, Room 104, and Gilmour Hall.

Academic Integrity

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 in quizzes, tests and examinations

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

Student Code of Conduct

https://www.mcmaster.ca/policy/Students-AcademicStudies/Code_of_Student_Rights_and_Responsibilities.pdf

You acknowledge that your behavior in all aspects of this course should meet the standards of the McMaster University Student Code of Conduct. You understand that any inappropriate behavior directed against any of your colleagues, teaching assistants, or the instructional team will not be tolerated. Disruptive behavior during any session (e.g. lecture, seminar, lab, tutorial) such as talking, sleeping or non-class 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 including e-spaces such as the Avenue to Learn course discussion board are to be considered inclusive and safe.

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 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.

McMaster Accommodation for Religious, Indigenous and Spiritual Observances Form (RISO):

At the beginning of EACH term, visit the website of the Office of the Associate Dean (Academic) https://www.science.mcmaster.ca/associatedean/current-students/procedures-forms.html if you need accommodations for religious, Indigenous and/or spiritual observances. Follow the procedure explained there under “Accommodation for Religious, Indigenous and Spiritual Observances Form (RISO)”.

Inclusivity and Accommodations:

McMaster University aims to foster a supportive, inclusive learning environment that will encourage both individual and collective growth. Students are required to register with Student Accessibility Services (SAS) first (https://sas.mcmaster.ca/). Any student who then wishes to invoke an accommodation for any aspect(s) of this course must contact the instructor at the beginning of the semester to discuss how the accommodations detailed in their SAS letter will be fulfilled in this course.

The instructors and the university reserve the right to alter this outline if necessary.

Extreme circumstance

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). 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. Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.