DALHOUSIE UNIVERSITY
FACULTY OF MANAGEMENT
School of Information Management

School of Information Management
INFO 5590 Information Management Systems
Fall 2022/2023

Course Type (e.g. F2F, online, blended): Online and/or blended in Halifax[1] (your choice, see Class Format)

Instructor name/title:

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How to contact me: I prefer to communicate by email or Microsoft Teams and check my email and Teams messages very often. If you wish to contact me quickly, I recommend one of these two platforms, and I will almost always respond to you within 48 hours, except on Saturdays. You are welcome to reach out to me about anything related to the course at any time. In the event of a class cancellation or other unforeseen circumstances, I will create an announcement on Brightspace, Teams and class email.

Office hours: By appointment only. You can book an appointment here.

Course website: Brightspace

Tutorials: Mondays from 5:35 pm to 7:25 pm, either in-person or online. See Class Format for more details.

Teaching Assistant(s) name/contact info: To be announced.

COURSE DESCRIPTION

In Information Management Systems we will investigate a wide range of current issues in information technology, information systems and web-based applications with a particular emphasis on how organizations

[1] Halifax is sometimes referred to as Kjipuktuk, in the Mi'kmaq language. Mi'kma'ki, the land of the Mi'kmaq, has been my home for most of my life, and I am grateful to live in a land where people can be so welcoming, despite so much historical hardship. If you are interested in learning more about the history of this land and its peoples, I encourage you to reach out to an elder, or to read a book. I learned a lot by reading *Out of the Depths* by Isabelle Knockwood, who shared her experience at the Indian Residential School at Shubenacadie, Nova Scotia. Dalhousie's library system has three copies. Alternatively, you can purchase a copy here.

can make effective use of technology. We will also explore the principles of user interface design, systems analysis, information needs analysis, information systems requirements, and project planning. Finally, we will examine how modern information and communication technologies (ICTs) have been and are changing the way we communicate, collaborate, share information, innovate, perform, socialize and work, and how these technological changes are affecting the role and functions of information managers in the public and private sectors.

COURSE PRE-REQUISITES

The technology requirements listed in the admission criteria for the MI program. Please see "Prior Education and Experience" here: https://www.dal.ca/academics/programs/graduate/mi/admissions/common-application-questions.html

LEARNING OUTCOMES

Upon completion of the course, students will:

1. Demonstrate an understanding and appreciation of systems analysis;
2. Be capable of critically evaluating information system architectures and infrastructures;
3. Understand the importance of information as an organizational resource and develop an appreciation for issues in managing data/information/knowledge using technology;
4. Demonstrate assessment and improvement of overall user experience with information systems;
5. Demonstrate the ability to experiment with and evaluate new technologies and concepts;
6. Demonstrate the skills needed for planning a technology project;
7. Understand the role technology plays in information management and the role of information professionals in managing people, information and technology;
8. Understand how information systems are used in organizations; and
9. Be conversant regarding contemporary issues in information systems.

TECHNOLOGY REQUIREMENTS

Our class labs are hands-on and technology focused. We will make use of Brightspace and Microsoft Teams to support our classroom activities. We will also use various software corresponding to the three modules:

- Unit 1: Introduction to Information Systems: Technology, Processes and People (Microsoft 365 Suite: Teams, PowerPoint, Word, and Excel)
- Unit 2: Information Systems in Organizations (Hands-on exercises, SAP Hana and Fiori, Excel, JSON, Tableau)
- Unit 3: Technical Concepts in Information Systems (Esri ArcGIS, HTML, Python)

You are only expected to have familiarity with Microsoft 365 applications before starting this course, though we will review some of them again in the first week. All the technologies used in this class are already provided through students' tuition, are free of charge, or are included with your ERPsim course materials.

DESCRIPTION OF CLASS FORMAT

INFO 5590 emphasizes flexibility above all else. The course is offered fully online and is designed to be completed almost entirely asynchronously (as in, at your own pace) if you so choose. All lectures are delivered online and are pre-recorded. All hands-on exercises will have a supporting pre-recorded video designed to help you with the exercise as needed. Your "attendance" will be recorded through the completion of small deliverables related to hands-on exercises, or through assignments that emphasize the lecture content.

In addition to pre-recorded sessions, INFO 5590 will also have a synchronous session on Mondays from 5:35 pm until 7:25 pm which is designed to support the hands-on activities. This session will be offered live in McCain 2019 on Dalhousie's Studly campus, though we will also hold a parallel digital live session at this time. You are **encouraged** to attend the synchronous session either in-person or online, though it is **not required**.

Finally, there will be two hands-on exercises that can only be completed synchronously. These exercises will be held on the following dates:

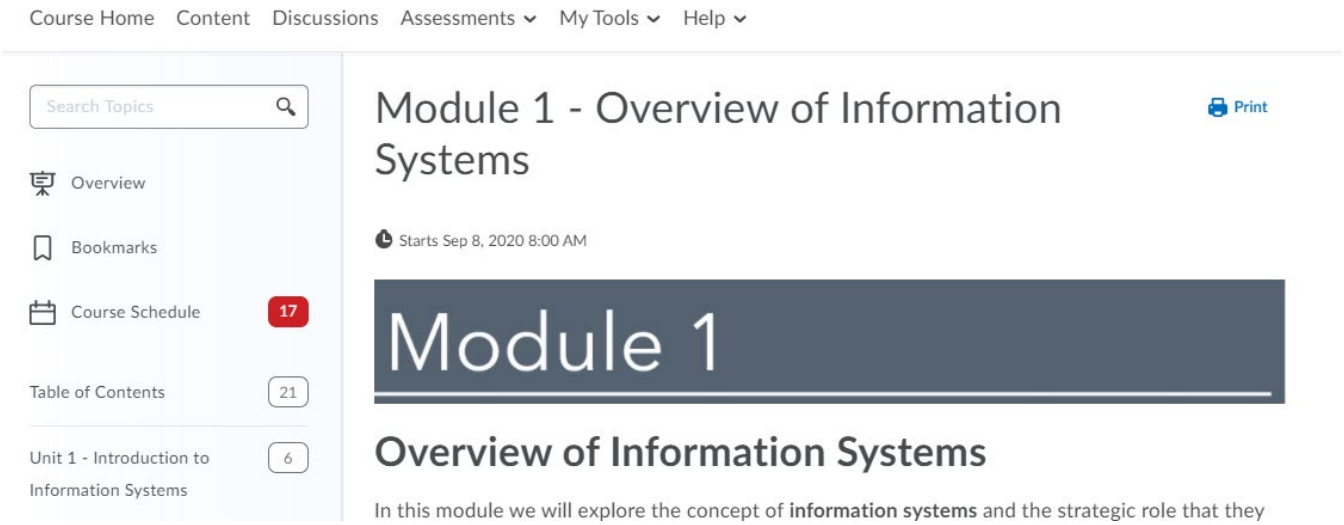
- October 3rd, 2022 at 5:35 pm Atlantic
- October 10th, 2022 at 5:35 pm Atlantic

These two sessions will not be supported asynchronously, so if you choose to complete these for your lab requirement, be sure to attend these sessions either in-person (if able) or online.

LEARNING MANAGEMENT SYSTEM SITE INFORMATION

The learning management system used by this course is Brightspace, Dalhousie's institutional platform. You can access Brightspace by visiting https://dal.brightspace.com/ and logging in with your Dalhousie Web ID and password. Starting September 7th, you should see the INFO 5590 widget under "My Courses" on your home landing page.

We will use Brightspace to provide all learning materials including course readings, lecture videos, and related course information. You can access the course materials using the Content tab. From there, you can select the weekly contents using the tab to the left of the screen. From there, you can access each course unit and module, which will present the relevant content on the main pain, as per the picture below.



INSTRUCTIONAL METHODS

All class lectures and nearly all lab tutorials are provided online asynchronously and can be accessed through your Brightspace account. The weekly content will be released at 8:00 am on each Monday at the beginning of

the week. We will hold a regular synchronous session which will be supported both in-person and online on Mondays from 2:35 pm until 4:25 pm. Attendance of the synchronous sessions is optional, as almost all materials will be provided asynchronously, though attendance at a synchronous session is encouraged. Two hands-on exercises will be conducted synchronously during regular class time on October 3rd from 5:35 pm to 7:25 pm Atlantic and October 10th from 5:35 pm to 7:25 pm Atlantic.

In Dalhousie's MI program, students come from many diverse backgrounds and may not have deep experience with technology. You are not expected to be a technical expert and need not be an expert to perform well in this course. The goal of this course is to introduce students to the skills required to be effectively use and manage information technologies that are used in most organizations (whether they be non-profit, government, or private) and to give them exposure to a broad range of concepts that may be useful to them throughout their career. Students who do well in this course nonetheless consistently demonstrate an openness to synthesising hands-on experience with managerial considerations that are relevant to their interests or career context in the information management profession.

LEARNING MATERIALS

In this course, we will use the ERPsim software and e-book, which can be found at https://erpsim.hec.ca. The ERPsim package (software + e-book) costs $55 + HST and **must be purchased by all students** in order to complete the labs.

Additional weekly readings are provided on Brightspace at the beginning of the semester. Occasionally, additional readings will be posted to Brightspace in advance of each week's class. Note that though readings are mandatory, you will not be evaluated on whether you complete them each week, though will be evaluated on your use of this content in your course assignments.

METHODS OF EVALUATION

Detailed instructions regarding each assignment will be provided. Assessment of all assignments is directly related to attention to the instructions, clarity of expression and presentation, and evidence of significant analysis and reflection.

See also the SIM Grading Policy.

COMPONENT	DETAILS	DUE DATE	VALUE
Weekly lab deliverables	In this class we will explore a series of technologies during the labs. Choose 8 of the 12 labs and complete the challenge questions provided at the end of the lab documents. You can choose to submit additional labs, though only the score of your best 8 will be counted.	One week following its release on Monday at 11:59 pm, or as otherwise stated in Brightspace.	20%
Group Assignment – Emerging	Select an emerging technology that is interesting to you and members of your group. Groups will make a 5-10 minute video presentation and one-page handout	Oct 3rd	10%

Technology Presentation	designed to introduce your classmates to an emerging technology.		
Individual Assignment 1 – Improving Organizational Processes	This assignment will test your ability to understand how organizations can use information systems to change or improve their work processes. Based on the case given, analyze how information systems are employed in the organization and how they might be improved.	Oct 25th	20%
Individual Assignment 2 – Data Visualization	This assignment will test your ability to analyze an organization's operations using information resources. You will be given a case and data that pertains to it. Using the data visualization technologies explored in class, answer a series of questions about the data provided.	Nov 14th	20%
Group Project – Request for Proposals	Identify an existing information system of your choice and develop a Request for Proposal (RFP) for a new information system that improves it. You are expected to describe the elements, requirements and value of the new system in detail.	Dec 12th	30%

INTEGRATION OF MI Competencies

PROGRAM COMPETENCY	COURSE LEARNING OUTCOMES	COURSE ASSESSMENT
Adaptation	1, 2, 5, 7, 8	WL, GA, IA1, GP
Collaboration	2, 4, 7, 8	GA, GP
Commitment to equity, diversity, inclusion, accessibility, and decolonization	2, 4, 9	GA, IA1
Communication	1, 3, 4, 5, 6, 7, 8	GA, IA1, IA2, GP
Digital and technological literacy	1, 2, 3, 4, 5, 6, 7, 8, 9	WL, GA, IA1, IA2, GP
Evidence-based practices	1, 2, 4, 7, 8	IA1, IA2
Leadership	4, 5, 6, 9	GA, GP
Learning	1, 2, 7, 9	WL, GP

Management	1, 2, 3, 5, 6, 7, 8	GA, IA1, IA2, GP
User-centred design	2, 4, 5	WL, IA2

CLASS POLICIES

Attendance
Class attendance is required in all MI courses and is included in the participation mark. Attendance records will be kept by the instructor.

Citation Style
SIM courses use APA as the default standard citation style. Unless the instructor provides alternative written instructions, please use the APA citation style in your assignments to briefly identify (cite) other people's ideas and information and to indicate the sources of these citations in the References list at the end of the assignment. For more information on APA style, consult Dalhousie Library website at https://libraries.dal.ca/help/style-guides.html or the APA's Frequently Asked Questions about APA

Late penalties for assignments
A penalty for late assignments will be assessed, unless prior permission has been given by the instructor to submit an assignment late, which normally will be for extended illness, medical, or family emergencies only (see below). Late submissions will be assessed a penalty of five percent per day, including weekends. Assignments will not normally be accepted seven days or more after the due date; in such cases the student will receive a grade of zero.

Missed or Late Academic Requirements due to Student Absence
Dalhousie University recognizes that students may experience short-term physical or mental health conditions, or other extenuating circumstances that may affect their ability to attend required classes, tests, exams or submit other coursework.

Dalhousie students are asked to take responsibility for their own short-term absences (3 days or less) by contacting their instructor by phone or email prior to the academic requirement deadline or scheduled time **AND** by submitting a completed Student Declaration of Absence form to their instructor in case of missed or late academic requirements. Only 2 separate Student Declaration of Absence forms may be submitted per course during a term.

Classroom recording
While pre-recorded videos are provided to you for the lecture content, you may wish to record a live session. You are welcome to do so if you think it will benefit you.

SIM GRADING POLICY

A+	90-100	Demonstrates original work of distinction.
A	85-89	Demonstrates high-level command of the subject matter and an ability for critical analysis.
A-	80-84	Demonstrates above-average command of the subject matter.
B+	77-79	Demonstrates average command of the subject matter.
B	73-76	Demonstrates acceptable command of the subject matter.
B-	70-72	Demonstrates minimally acceptable command of the subject matter.
F	<70	Unacceptable for credit towards a Master's degree.

ACCOMMODATION POLICY FOR STUDENTS

The Student Accessibility Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students on the Halifax campus who request accommodation as a result of: a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (NS, NB, PEI, NFLD).
If there are aspects of the design, instruction, and/or experiences within this course that result in barriers to your inclusion please contact the Student Accessibility Centre. Please visit www.dal.ca/access for more information and to obtain the Request for Accommodation form.

A note taker may be required as part of a student's accommodation. Visit https://www.dal.ca/campus_life/academic-support/accessibility/accommodations-/classroom-accommodation.html for more details.

Please note that your classroom may contain accessible furniture and equipment. It is important that these items remain in the classroom, undisturbed, so that students who require their use will be able to fully participate.

ACADEMIC INTEGRITY

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect. As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

The commitment of the Faculty of Management is to graduate future leaders of business, government and civil society who manage with integrity and get things done. This is non-negotiable in our community and it starts with your first class at Dalhousie University. So when you submit any work for evaluation in this course or any other, please ensure that you are familiar with your obligations under the Faculty of Management's Academic Integrity Policies and that you understand where to go for help and advice in living up to our standards. You should be familiar with the Faculty of Management Professor and Student Contract on Academic Integrity, and it is your responsibility to ask questions if there is anything you do not understand.

Dalhousie offers many ways to learn about academic writing and presentations so that all members of the University community may acknowledge the intellectual property of others. Knowing how to find, evaluate, select, synthesize and cite information for use in assignments is called being "information literate." Information literacy is taught by Dalhousie University Librarians in classes and through Dalhousie Libraries' online Citing & Writing tutorials.

Do not plagiarize any materials for this course. For further guidance on what constitutes plagiarism, how to avoid it, and proper methods for attributing sources, please consult the University Secretariat's Academic Integrity page.

Please note that Dalhousie subscribes to plagiarism detection software that checks for originality in submitted papers. Any paper submitted by a student at Dalhousie University may be checked for originality to confirm that the student has not plagiarized from other sources. Plagiarism is considered a very serious academic offence that may lead to loss of credit, suspension or expulsion from the University, or even the revocation of a degree. It is essential that there be correct attribution of authorities from which facts and opinions have been derived. At Dalhousie, there are University Regulations which deal with plagiarism and, prior to submitting any paper in a course; students should read the Policy on Academic Dishonesty contained in the Calendar.

Furthermore, the University's Senate has affirmed the right of any instructor to require that student assignments be submitted in both written and computer readable format, e.g.: a text file or as an email attachment, and to submit any paper to a check such as that performed by the plagiarism detection software.

As a student in this class, you are to keep an electronic copy of any paper you submit, and the course instructor may require you to submit that electronic copy on demand. Use of third-party originality checking software does not preclude instructor use of alternate means to identify lapses in originality and attribution. The result of such assessment may be used as evidence in any disciplinary action taken by the Senate.

Finally:
If you suspect cheating by colleagues or lapses in standards by a professor, you may use the confidential email: ManagementIntegrity@dal.ca which is read only by the Assistant Academic Integrity Officer.

Faculty of Management clarification on plagiarism versus collaboration:

There are many forms of plagiarism, for instance, copying on exams and assignments. There is a clear line between group work on assignments when explicitly authorised by the professor and copying solutions from others. It is permissible to work on assignments with your friends but only when the professor gives you permission in the specific context of the assignment. University rules clearly stipulate that all assignments should be undertaken individually unless specifically authorised.

Specific examples of plagiarism include, but are not limited to, the following:

- Copying a computer file from another student, and using it as a template for your own solution
- Copying text written by another student
- Submitting the work of someone else, including that of a tutor as your own

An example of acceptable collaboration includes the following:

- When authorised by the professor, discussing the issues and underlying factors of a case with fellow students, and then each of the students writing up their submissions individually, from start to finish.

UNIVERSITY STATEMENTS

This course is governed by the academic rules and regulations set forth in the University Calendar and the Senate.

ACCESSIBILITY
The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. We work collaboratively with Dalhousie and King's students, faculty, and staff to create an inclusive educational environment for students. The Centre is responsible for administering the university-wide Student Accommodation Policy working across all programs and faculties.

STUDENT CODE OF CONDUCT
Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

DIVERSITY AND INCLUSION
Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2).

INTERNATIONALIZATION

At Dalhousie, “thinking and acting globally” enhances the quality and impact of education, supporting learning that is “interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders.”

RECOGNITION OF MI’KMAQ TERRITORY

Dalhousie University is located in Mi’kma’ki, the ancestral and unceded territory of the Mi’kmaq. We are all Treaty people. For more information about the purpose of territorial acknowledgements, or information about alternative territorial acknowledgements if your class is offered outside of Nova Scotia, please visit https://native-land.ca/.

The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit the office in the McCain Building (room 3037) or contact the programs at elders@dal.ca or 902-494-6803 (leave a message).

FAIR DEALING POLICY

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie.

COURSE SCHEDULE

Date of Class	Topics	Required Readings and Material (Beyond Lecture and Tutorial Videos)
Week of Sep 6th	Introduction to Information Systems	No synchronous class, though an introductory video will be provided. No additional readings this week. Lab: No lab this week.
Week of Sep 12th	Information Technology: Hardware, Data, and Software	[2A] Lyle, D. (2018). Introduction to information systems. In Robert et al. (Eds.) *Information Technologies in Organizations*. HEC Montreal. Carlton, A. (2020, June 24). Top tech trends: COVID considerations. *American Libraries Magazine*. https://americanlibrariesmagazine.org/blogs/the-scoop/top-tech-trends-covid-considerations/ Lab: Introduction to Information Technology 1: Microsoft 365, online collaboration, and “The Cloud”
Week of Sep 19th	Social Dimensions of Information Systems and the Home Office	Dwivedi, Y. K., Hughes, D. L., Coombs, C., Constantiou, I., Duan, Y., Edwards, J. S., ... & Upadhyay, N. (2020). Impact of COVID-19 pandemic on information management research and practice: Transforming education, work and life. *International Journal of Information Management, 55*, 102211. Conrad, C., Deng, Q., Caron, I., Shkurska, O., Skerrett, P., & Sundararajan, B. (2022). How student perceptions about online learning difficulty influenced their satisfaction during Canada's Covid‐19 response. British Journal of Educational

		Technology, 53(3), 534-557. https://bera-journals.onlinelibrary.wiley.com/doi/full/10.1111/bjet.13206 Conrad, C., Moylan, R., & O. Diaz, G. (2022). University life has gone digital: Influences of institutional mobile social network use during the Covid-19 emergency. *Library Hi Tech.* Lab: Introduction to Information Technology 2: How to Create an Effective Online Presentation
Week of Sep 26th	Information Technology and the User Experience	Norman, D. A. (2013). The psychopathology of everyday things. *The Design of Everyday Things: Revised and Expanded Edition*. Basic Books. Johnson, J (2013). We seek and use visual structure. *Designing with the mind in mind: A simple guide to understanding user interface design rules*. Elsevier. Strategyzer's Value Proposition Canvas Explained (7 Mar 2017). YouTube. https://www.youtube.com/watch?v=ReM1uqmVfP0 Lab: Introduction to Information Technology 3: Microsoft Excel for Information Managers
Week of Oct 3rd	Organizations as Processes	[3A] Robert, J., Brière, Y, Talbot, J., Babin, G. and Wybo, M. (2018). Business process modeling. *Information Technologies in Organizations*. HEC Montreal. Standing Committee on National Finance (2018, July 31). *The phoenix pay problem: Working towards a solution*. Carroll, N., & Conboy, K. (2020). Normalising the "new normal": Changing tech-driven work practices under pandemic time pressure. *International Journal of Information Management, 55*, 102186. Lab: Information Systems in Organizations 1: Introduction to Business Processes
Week of Oct 10th	Information Systems Architecture and Digital Transformation	[3B] Titah, R., Ortiz de Guinea, A., Bourdeau, S. and Brière, T. (2018). Business process transformation. In Robert et al. (Eds.) *Information Technologies in Organizations*. HEC Montreal. Library and Archives Canada (n.d.). *Vision 2030: A strategic plan to 2030*. https://library-archives.canada.ca/eng/corporate/about-us/strategies-initiatives/vision2030/pages/Vision-2030-Strategic-Plan.aspx Lab: Information Systems in Organizations 2: Introduction to Enterprise Resource Planning

Week of Oct 17th	Introduction to Business Data	[4A] Robert, J. and Ortiz de Guinea, A. (2018). Introduction to business data. *Information Technologies in Organizations*. HEC Montreal. Breeding, M. (2022, May 2). 2022 Library systems report. *American Libraries Magazine*. https://americanlibrariesmagazine.org/2022/05/02/2022-library-systems-report/ Lab: Information Systems in Organizations 3: How to use Excel to Manage Data, Measure KPIs and Build Reports
Week of Oct 24th	Data Analytics and Performance Measures	[5A] Robert, J. and Ortiz de Guinea, A. (2018). Introduction to business intelligence. In Robert et al. (Eds.) *Information Technologies in Organizations*. HEC Montreal. Giamo, C. (2017, May 12). Florence Nightingale was born 197 years ago, and her infographics were better than most of the internet's. *Atlas Obscura*. https://www.atlasobscura.com/articles/florence-nightingale-infographic Privy Council of Canada (2019, April 11). *Report to the clerk of the privacy council: A data strategy roadmap for the federal public service*. https://www.canada.ca/en/privy-council/corporate/clerk/publications/data-strategy.html Lab: Information Systems in Organizations 4: Dashboards and Analytics with Tableau
Week of Oct 31st	Information Systems, Web, and Databases	[6A] Robert, J. and Ortiz de Guinea, A. (2018). Queries in a database. In Robert et al. (Eds.) *Information Technologies in Organizations*. HEC Montreal. Zapier. *Introduction to APIs*. https://zapier.com/learn/apis/ Lab: Information Systems in Organizations 5: Introduction to Enterprise Databases and Web Protocols
Week of Nov 7th - FALL STUDY BREAK – NO CLASS		
Week of Nov 14th	Sourcing and Managing Information Technology Projects	[7A] Cameron, A.-F. (2018). IT development projects. In Robert et al. (Eds.) *Information Technologies in Organizations*. HEC Montreal. [7B] Tams, S. (2018). Software selection. In Robert et al. (Eds.) *Information Technologies in Organizations*. HEC Montreal. Shared Services BC (April 2016). *Preparing RFPs: A ministry guide to the request for proposals (RFP) process*. https://www2.gov.bc.ca/assets/gov/government/services-for-government-and-broader-public-sector/buy-goods-services-and-construction/how-to-buy-services/ministry_rfp_guide.pdf

		Fortune Magazine (2016, July 11) Why drobox uses its own IT infrastructure. https://www.youtube.com/watch?v=HHZcnarVReg Lab: Information Systems in Organizations 6: Manage an Information Technology Project
Week of Nov 21st	Geospatial Information Systems	Crampton, J. W. and Krygier, J. (2006). An introduction to critical cartography. *ACME: An International E-Journal for Critical Geographies, 4*(1), 11-33. Lab: Technical Concepts in Information Systems 1: Introduction to Geospatial Information Systems
Week of Nov 28th	Information Security and Privacy	Carlton, A. (2021, January 24). Libraries and invasive technology. *American Libraries Magazine*. https://americanlibrariesmagazine.org/blogs/the-scoop/libraries-and-invasive-technology/ Fahey, R. A., & Hino, A. (2020). COVID-19, digital privacy, and the social limits on data-focused public health responses. *International Journal of Information Management, 55*, 102181. Lab: Technical Concepts in Information Systems 2: Understanding HTML and Web Security Notifications
Week of Dec 5th	Artificial Intelligence, Changes to Work Processes	Bloomberg (2018, June 25). This Canadian genius created modern AI. https://www.youtube.com/watch?v=l9RWTMNnvi4 Coombs, C. (2020). Will COVID-19 be the tipping point for the intelligent automation of work? A review of the debate and implications for research. *International Journal of Information Management, 55*, 102182. Lab: Technical Concepts in Information Systems 3: Computer Programming for Information Managers