Course Syllabus

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About this Course

This course is designed to be as interactive as possible. My role as instructor is to introduce you to theories, principles and tools for data visualization, which will be covered in the readings and the video lectures. Now, it is up to you to study these materials and actively engage in the activities throughout each class and practical. Many concepts may seem relatively easy to comprehend when passively listening to a seminar course, but in actuality, most of these concepts are non trivial to apply. In-class activities and practicals are designed for you to experiment, inquire, and make mistakes in a safe environment. Through this process, you will learn by doing. And you will do so before you are evaluated in the formal assignments.

Course Description & Learning Objectives

Content: This course is all about data visualization, the art and science of turning data into readable graphics and charts. You will learn the science behind effective visual communication of data. You will learn to evaluate the effectiveness of visualization designs, and think critically about each design decision, such as choice of colour and choice of visual encoding. You will also explore how to design and create data visualizations based on data available and tasks to be achieved. This process includes the understanding and application of methods and principles of data and task abstraction, mapping data attributes to graphical attributes, and strategic visual encoding based on known properties of visual perception as well as the task(s) at hand. You will critique existing visualizations (many have excellent elements to them, but many also make poor design choices). And you will demonstrate all your skills through creating your own visualizations in R and R Markdown in individual/pair assignments and in a final group project. This course has no mid-term nor final exam. Active participation to in-class activities is essential to learning and is an integral part of the requirements to succeed in this course.

This course is designed to provide you with the foundations necessary for evaluating and creating visual representations of data. The **learning objectives** are:

1. to understand the principles of designing and creating effective data visualizations

2. to evaluate, critique, and improve upon one's own and others' data visualizations based on how good a job the visualization applies principles for effective communication
3. to correctly apply key techniques and theory used in data visualization science, including data models, graphical perception and techniques for visual encoding and interaction
4. to correctly identify ethical issues related to data analysis and visual communication of data
5. to use R and a variety of modern data visualization packages and tools to create data visualizations.
6. to work effectively individually and collaboratively.

Delivery format: The format for this course is “flipped.” A flipped classroom is one in which you are introduced to content at home then you come prepared to class for interactive hands-on activities, practice and scenario-based experiences that reinforce this content. Flipped learning is a blended learning approach where you are integral, active part in the face-to-face instruction, by bringing ideas, point of discussions and questions to the classroom. Through hands-on activities, the instructors can give you feedback on the applications of concepts that you will have been exposed to at home when studying topics covered in the video lectures, readings, supplementary materials prior to our face-to-face meeting each week.

In essence, **before coming to class**, you will study the topic to be covered in the week's lesson:

- watch short lecture videos
- read mandatory readings
- identify points you don't understand and questions you have from the readings and lecture
- think critically about the lesson's content, through application exercises

Then **during class**, you will consolidate learning together with the instructor and classmates:

- practice through ungraded individual and group activities
- inquire by engaging in discussions, bringing ideas, and asking questions in class

We will also run **tutorials/practicals**, where you will deep dive into use cases to further learning:

- practice fundamental and technical skills on various use cases (bring your laptop computer)
- consult with other students and instructors on your own work (guided activities)

Class Times and Locations

Everyone of you is required to attend classes / tutorials in your respective section. Similarly, team/group work will have to be completed with team-mates from your own section.

Section LEC5101

- ***Lecture*:** Tuesday, 5pm-7pm, **MC 252 (https://map.utoronto.ca/?id=1809#!m/494474?s/)**
- ***Tutorial / Practica*l:** Thursday, 5pm-6pm, **MS 2170 (https://map.utoronto.ca/?id=1809#!m/494491)**

Prerequisites

CSC108H1/ CSC110Y1/ CSC120H1/ CSC148H1; STA238H1/ STA248H1/ STA261H1/ ECO227Y1. The following is an asset, though no background is required: Graphic design / image manipulation; Technical writing; Development; Psychology or human cognition.

Evaluation

You will be evaluated according to the **University Assessment and Grading Practices Policy (https://governingcouncil.utoronto.ca/secretariat/policies/grading-practices-policy-university-assessment-and-january-26-2012)** . The table below shows the weight of each assessment.

Break down of assignments

Assessment	Weight	Due date
Quizzes	**10%**	~ every 3 weeks
Homework	**40%**	
• Assignment 1 (10%)		February 9
• Assignment 2 (15%)		March 15
• Assignment 3 (15%)		April 5
Project	**47%**	
• Project: team charter (2%)		March 12

Assessment	Weight	Due date
• Project: pitch (5%)		March 12
• Project: mock-ups (10%)		March 22
• Project: product (15%)		April 12
• Project: demo video (15%)		April 12
Reflections	**3%**	~early, mid, end

Quizzes: Due every three weeks (roughly), completed individually. Quizzes are worth 10% of the grade. Lowest quiz score is dropped.

Homework: Three assignments, to be completed individually (A1, A3), or in a small team of 2 (A2). Homework assignments are designed to assess your knowledge and understanding of the theoretical and technical content covered in the lessons, through application exercises.

Project: In groups of 5-6 students, you will complete a final term project. The project is designed to be open-ended, giving you an opportunity to define the topic, and realize a visualization product of your choice (within constraints). The project deliverables act as important milestones guiding your process: from the project pitch, early in the process, to capturing and refining ideas as mock-ups, to the implementation and realization of the final product. You will also be required to prepare a demo video featuring your final product, and documenting the creation process.

Reflections: Throughout the term, you will answer three self-reflections survey. You are required to respond honestly and sincerely to the questionnaires, but your responses per se will NOT impact your grade if they are sincere, genuine, and answered to with care.

♥ Accessibility, Diversity, Inclusiveness

It is my intent that students from all diverse backgrounds and perspectives be well-served by this course, and that the diversity that the students bring to this class be viewed as a resource, strength, and benefit.

If you have an acute or ongoing disability issue or accommodation need, we will implement appropriate accommodations to support your learning. For this, you must register with Accessibility Services (AS) at the beginning of the academic year. AS staff will assess your situation, develop an accommodation plan with you, and recommend adequate accommodations by issuing a **Letter of Accommodation (https://studentlife.utoronto.ca/service/letter-of-accommodation/)** . Remember that the process of accommodation is private: Accessibility Services will not share details of your needs or condition with the teaching team, and the teaching team will not reveal that you are registered with Accessibility Services.

This formal process is necessary, as we need the professional assessment and advice coming from Accessibility Services to best serve your needs. Note that it is your responsibility to forward your letter to the instructor, and request for accommodations timely as per indicated in the letter issued by AS.

♡ **Register with Accessibility Services (https://studentlife.utoronto.ca/service/accessibility-services-registration-and-documentation-requirements/)**

Course Policies

Accomodations

Accessibility-Related Accommodations

If you are experiencing difficulties that affect your learning due to a disability, or if you believe that you may have a disability; you should register with the University of Toronto's **Accessibility Services (https://studentlife.utoronto.ca/department/accessibility-services/)** . The Accessibility Services staff are available by appointment to assess needs, provide referrals, and arrange appropriate accommodations. The sooner you let them know your needs, the quicker they can assist you in achieving your learning goals in this course. After registering with AS, please contact us to request for specific accommodations to be implemented.

Please note that it is your responsibility to let the instructor know in a timely manner that you need an accommodation.

♡ **Step 1: Register with Accessibility Services (https://studentlife.utoronto.ca/service/accessibility-services-registration-and-documentation-requirements/)**

Step 2: Contact us (mailto:sta313@utoronto.ca?%20subject=[STA313%20-%20ACCOMODATION])

Non-Accessibility-Related Requests for Special Consideration

Life happens, and I acknowledge that a number of exceptional circumstances can be an obstacle to participation to class and academic work. Besides the Letter of Accommodation issued by Accessibility Services (see above), we accept the following documentation to support requests for temporary accommodations (e.g., extension, make-up quiz, re-weighting). Please also familiarize yourself with the ***University's policies on Students Absence*** *(https://www.artsci.utoronto.ca/current/academics/student-absences)* and the *Course Deliverable Extension Policy* below for more details.

Absence declaration via ACORN:

> If you miss an academic obligation and wish to seek academic consideration, you may declare an absence using the **Absence Declaration Tool in ACORN** (https://help.acorn.utoronto.ca/blog/ufaqs/how-do-i-declare-an-absence/) . The ACORN Absence Declaration Tool is intended to be used in the following circumstances: a health condition or injury (e.g., illness, serious physical harm, mental health issue, scheduled surgery); a personal or family emergency (e.g., unanticipated and unavoidable familial incident beyond the student's control); bereavement (e.g., the death of a student's immediate family member or close friend). If you get a concussion, break your hand, or suffer some other acute injury, you should register with Accessibility Services as soon as possible (see above).
>
> Please note that it is your responsibility to let the instructor know that you have used the absence declaration so that you can arrange for special consideration specific to the missed academic obligation (e.g., deadline, quiz, studio). Make sure that:
>
> > 1) you specify the course email address **sta313@utoronto.ca** (mailto:sta313@utoronto.ca) when submitting your absence form on ACORN
> > 2) you contact us immediately after declaring your absence on ACORN.
>
> Requests submitted after the last day of the absence period will be rejected. Before making your request, make sure you also familiarize yourself with the Deliverable Extension Policy below.

♡ **Step 1: Declare an absence** (https://help.acorn.utoronto.ca/blog/ufaqs/how-do-i-declare-an-absence/)

Step 2: Contact us (mailto:sta313@utoronto.ca?%20subject=[STA313%20-%20ABSENCE%20-%20ACORN])

U of T Verification of Illness or Injury Form:

If you are ill or suffer from an injury, and cannot provide an absence declaration because you have already declared an absence this term, you should obtain a Verification of Illness Form (download it **here (http://www.illnessverification.utoronto.ca/document/Verification%20of%20Student%20Illness%20(VOI)%20March%207%202018%20-%20AODA.pdf)**). The VOI indicates the impact and severity of the illness, while protecting your privacy about the details of the nature of the illness. You can submit a different form (like a letter from a doctor), as long as it is an original document, and it contains the same information as the VOI.

It is important that you see your practitioner as soon as possible. The form can only be signed if you were seen at the time of your illness or injury, not after the fact. Please refer to the **Frequently Asked Questions (http://www.illnessverification.utoronto.ca/Frequently-Asked-Questions.php)** for more information on this form and policies.

Please note that it is your responsibility to let the instructor know that you need academic consideration specific to the missed academic obligation (e.g., deadline, quiz, studio). Make sure that you contact us in a timely manner for consideration (i.e. as soon as you obtain your VOI). Before making your request, make sure you also familiarize yourself with the Deliverable Extension Policy below.

♡ **Step 1: Fill out the Verification of Illness Form (http://www.illnessverification.utoronto.ca/document/Verification%20of%20Student%20Illness%20(V%20March%207%202018%20-%20AODA.pdf)**

Step 2: Contact us (mailto:sta313@utoronto.ca?%20subject=[STA313%20-%20ABSENCE%20-%20VIF])

College Registrar's letter:

In the case of personal extenuating circumstances that are not related to an absence or disability and which incur challenges in participating to course work (e.g. financial struggle, housing crisis, etc...), we encourage you to contact your College Registrar to seek counselling and advice. Where appropriate, your College Registrar will issue a letter with recommendations of accommodations for instructors to implement, which you can attach to your formal request for accommodation.

Make sure you also familiarize yourself with the Deliverable Extension Policy below.

♡ **Step 1: Consult with your College Registrar (https://www.artsci.utoronto.ca/current/academic-advising-and-support/college-registrars-offices)**

Step 2: Contact us (mailto:sta313@utoronto.ca?%20subject=[STA313%20-%20ACCOMODATION%20-%20REGISTRAR])

Deliverable Extension Policy

With the benefit of advance notice regarding deliverable due dates, you are expected to make the necessary adjustments to your study schedules to make yourself available to successfully complete your coursework. You are expected to schedule your time with consideration given to the possibility that you may become ill or other extraordinary circumstances may arise. Deliverable extensions are provided only when students are unable to meet the original deadline because of serious extenuating circumstances. If an extension is granted, it will generally be proportionate to the delay caused by the problem that prevented you from completing the assignment on time (e.g. a one-week illness or severe injury having significant impact on academic performance may result in a granted extension of up to a week, whereas a one-day absence due to illness will not be considered as a valid motive for deliverable extension).

Quizzes & In-Class Activities. No extension will be granted for completing quizzes and in-class activities. If you find yourself in a serious medical or emergency situation, please file a special consideration request, with an explanation for why you missed the in-class activity or quiz. If you joined from the waitlist and missed these assignments, please refer to the **Joining from Waitlist (https://q.utoronto.ca/courses/315061/pages/joining-from-waitlist?wrap=1)** document.

Group coursework. Extensions for group deliverables will be very rare, and will only apply to individual students, for up to 48h, since other students are not permitted to receive extensions. In the instance that a group member has been granted an extension for completing group coursework, the group will still be required to make a submission by the original group assignment due date. This submission should demonstrate sufficient progress on the assignment by the group as a whole, and will be the primary document that the graders consider for marking. The group will then be invited to submit an improved version integrating minor changes and additions as a result of accommodating the member(s) who were granted an extension. This second document will be considered by the graders before finalizing the grade for the group assignment.

Late Policy

All assignments are to be submitted on the due date. On-time submissions are graded as normal.

- Late quizzes are not accepted and there are no make ups for missed quizzes.
- For other assignments, **late submissions will incur a penalty**:
  - Submissions < 24 hours late incur a penalty of 10% of available points.
  - Submissions < 48 hours late incur a penalty of 30% of available points.
  - Submissions more than 48 hours late will receive no credit, and we will not provide written feedback.

📌 *Marking Concerns*

Any requests to have your work remarked must contain a written justification for consideration to the course instructors using the email address below. Remarking requests should be **made within one week of receiving your graded work**. Re-evaluation appeals are at the discretion of the instructors. Note that adjustments in marks will be rare and could equally result in a lowering or raising the mark. If a re-revaluation is completed by the instructors, the student must accept the resulting mark as the new mark, whether it goes up or down or remains the same. When appealing a re-evaluation decision, the student accepts this condition.

Report a marking concern (mailto:sta313@utoronto.ca?%20subject=[STA313%20-%20REMARK%20REQUEST])

📌 *Getting Help*

This term you will have the option to use Piazza for class discussion. If you decide not to use Piazza it will not disadvantage you in any way, and will not affect official University outcomes (e.g., grades and learning opportunities). If you choose not to opt-into Piazza then you can ask questions or discuss course material with the instructor or TAs during office hours.

Be sure to read **Piazza's Privacy Policy (https://piazza.com/legal/privacy)** and **Terms of Use (https://piazza.com/legal/terms)** carefully. Take time to understand and be comfortable with what they say. They provide for substantial sharing and disclosure of your personal information held by Piazza, which

affects your privacy. If you decide to participate in Piazza, only provide content that you are comfortable sharing under the terms of the Privacy Policy and Terms of Use.

Note that instructors will leave room for each of you to actively contribute to the Piazza forum. **We will wait for at least 24 business hours before responding to a student's question on Piazza**, therefore creating an opportunity for one or more classmates to contribute an answer.

To sign up for and/or post your question to the discussion forum, click on the following button.

Post my question on Piazza (https://piazza.com/class/l6qwt7vgo6y2iv)

Questions about course material or organization sent by e-mail will *not* be answered. Email communication should only be used for emergencies or personal matters (see Contact policy below). If you choose not to opt-into Piazza then you can ask questions or discuss course material with the instructor or TAs during office hours.

📌 *Contact Policy*

Questions about course material or organization, such as,

- Is it appropriate to use this analysis or visualization method?
- What library would you recommend for visualizing maps?
- What is the due date?

can be posted on the Piazza discussion forums. Questions can be posted anonymously (so that the author is anonymous to other students but not to the instructors), if desired.

If your communication is private and about a request for accommodation, then you need to use the form to this effect (see **Excused Absence & Missed Academic Work Policy**). If your communication is private and about a concern or question with your grade, then you need to use the form to this effect (see **Marking Concern Policy**)

In any other cases, and if your communication is private, then you are welcome to contact your instructor by private email.

- Always use the course email **sta313@utoronto.ca** to ensure that your message reaches out the instructor and/or TA's.
- Always use your UofT email address (i.e. @utoronto.ca).
- Always include your full name, and UTORId in your communication by email.

- Allow up to 72 business hours for a reply.

Emails sent to addresses other than the course email will *not* be answered. Emails sent from addresses other than a UofT official email address will not be answered.

Contact us (https://q.utoronto.ca/courses/342008/pages/contact)

📌 Academic Integrity

You are responsible for knowing the content of the **University of Toronto's Code of Behaviour on Academic Matters (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm)** .

As a general rule, we encourage you to discuss course material with each other and ask others for advice. However, it is not permitted to share complete solutions or to directly share code for anything that is to be handed in. When an assignment is required to be completed as a team, you may share solutions and code with other members of your team, but not with another team in the class. For example, "For question 2.1 what R function did you use?" is a fair question; "Please show me your R code for question 2.1" is not.

If you have any questions about what is or is not permitted in this course, please do not hesitate to post your question on Piazza and/or contact the instructors.

📌 Use of Generative AI

In this course, you may use generative artificial intelligence (AI) tools, including ChatGPT and GitHub Copilot, as learning aids and to help complete assignments. You will not be permitted to use generative AI in quizzes. While some generative AI tools are currently available for free in Canada, please be warned that these tools have not been vetted by the University of Toronto and might not meet University guidelines or requirements for privacy, intellectual property, security, accessibility, and records retention. Generative AI may produce content which is incorrect or misleading, or inconsistent with the expectations of this course. These tools may even provide citations to sources that don't exist—and submitting work with false citations is an academic offense. These tools may be subject to service interruptions, software modifications, and pricing changes during the semester.

Generative AI is not required to complete any aspect of this course, and we caution you to not rely entirely on these tools to complete your coursework. Instead, we recommend treating generative AI as a

supplementary tool only for exploration or drafting content. Ultimately, you (and not any AI tool) are responsible for your own learning in this course, and for all the work you submit for credit. It is your responsibility to critically evaluate the content generated, and to regularly assess your own learning independent of generative AI tools. Overreliance on generative AI may give you a false sense of how much you've actually learned, which can lead to poor performance on the midterm test or final exam, in later courses, or in future work or studies after graduation.

📌 *Photographs, Audio & Video Recordings, and Copyright*

Reproduction and/or sharing of course materials is prohibited. Course materials include lecture slides, video recordings, course notes, assignments, data and documents provided by the instructors. All such reproduction or dissemination is an infringement of copyright and is prohibited. Tape-recording, photographing, screen capturing, video-recording or otherwise reproducing lecture presentations, course notes or other similar materials provided by instructors is also prohibited. See the University of Toronto **Academic Integrity (https://www.academicintegrity.utoronto.ca/smart-strategies/recording-lectures/)** .

Your Responsibilities

📌 *Engage in the Course Material*

The course is designed to actively engage you in the course material. We hope you'll find the science of visualization interesting, challenging, and fun. In order for classroom sessions and tutorials to be effective, prepare by learning about the week's lesson through completing the mandatory lecture videos and readings, and engage in the activities during synchronous class.

📌 *Announcements and Resources*

Lectures videos and slides, readings, and assignments will be posted on Quercus. It is your responsibility to check the Quercus course website regularly for updates. Announcements will be posted on Quercus & sent as emails through Quercus (provided that you configured your Quercus to receive an email notification when announcements are posted). It is your responsibility to check Quercus & your email regularly for incidental communication and updates about the course.

Course Summary:

Date	Details	Due
Fri Nov 25, 2022	Anonymous Peer-Review Form (individual) for Assignment 2 (optional) (https://q.utoronto.ca/courses/342008/assignments/1197088)	due by 11:59pm
Fri Jan 26, 2024	Tell Us About Yourself / Self-Reflection Survey #1 (https://q.utoronto.ca/courses/342008/assignments/1243337)	due by 11:59pm
Fri Feb 2, 2024	Quiz #1. Lessons 1-2-3 (https://q.utoronto.ca/courses/342008/assignments/1197103)	due by 11:59pm
Fri Feb 9, 2024	Assignment 1: Visualization Design (https://q.utoronto.ca/courses/342008/assignments/1197093)	due by 11:59pm
Mon Feb 12, 2024	Assignment 1: Visualization Design (https://q.utoronto.ca/courses/342008/assignments/1197093) (3 students)	due by 11:59pm
Sat Feb 17, 2024	Quiz #2 - Lessons 4-5 (https://q.utoronto.ca/courses/342008/assignments/1197104)	due by 11:59pm
Mon Mar 4, 2024	Self-Reflection Survey #2 (Mid-term) (https://q.utoronto.ca/courses/342008/assignments/1260335)	due by 11:59pm
Fri Mar 8, 2024	Project Formation (https://q.utoronto.ca/courses/342008/assignments/1197099)	due by 11:59pm
	Quiz #3 - Lessons 6-7 (https://q.utoronto.ca/courses/342008/assignments/1197105)	due by 11:59pm
Tue Mar 12, 2024	Project Pitch (https://q.utoronto.ca/courses/342008/assignments/1197101)	due by 8am
	Team Charter (https://q.utoronto.ca/courses/342008/assignments/1232763)	due by 8am

Date	Details	Due
Wed Mar 13, 2024	Anonymous Peer-Review Form (individual) for Project Pitch (https://q.utoronto.ca/courses/342008/assignments/1197091)	due by 11:59pm
Fri Mar 15, 2024	Assignment 2: Data Analysis and Presentation with R Markdown (https://q.utoronto.ca/courses/342008/assignments/1197094)	due by 11:59pm
Fri Mar 22, 2024	Project Mock Designs (https://q.utoronto.ca/courses/342008/assignments/1197100)	due by 11:59pm
Sat Mar 23, 2024	Anonymous Peer-Review Form (individual) for Project Mock Designs (https://q.utoronto.ca/courses/342008/assignments/1197090)	due by 11:59pm
Fri Apr 5, 2024	Assignment 3: Design Critique (https://q.utoronto.ca/courses/342008/assignments/1197095)	due by 11:59pm
Fri Apr 12, 2024	Project Demo Video & Reflections (https://q.utoronto.ca/courses/342008/assignments/1197098)	due by 11:59pm
	Project Product (https://q.utoronto.ca/courses/342008/assignments/1197102)	due by 11:59pm
	Quiz #4 - Lessons 8-9 Make-up Assignment (https://q.utoronto.ca/courses/342008/assignments/1197107)	due by 11:59pm
Sat Apr 13, 2024	Anonymous Peer-Review Form (individual) for Project Product & Demo (https://q.utoronto.ca/courses/342008/assignments/1197089)	due by 11:59pm
Thu Apr 18, 2024	Quiz #4 - Lessons 8-9 (https://q.utoronto.ca/courses/342008/assignments/1197106)	due by 11:59pm