New University logo


Ontario Tech University acknowledges the lands and people of the Mississaugas of Scugog Island First Nation. We are thankful to be welcomed on these lands in friendship. The lands we are situated on are covered under the Williams Treaties and the traditional territory of the Mississaugas, a branch of the greater Anishinaabeg Nation, including Algonquin, Ojibway, Odawa and Pottawatomi. These lands remain home to a number of Indigenous nations and people.

We acknowledge this land out of respect for the Indigenous nations who have cared for Turtle Island, also called North America, from before the arrival of settler peoples until this day. Most importantly, we remember the history of these lands has been tainted by poor treatment and a lack of friendship with the First Nations who call them home.

This history is something we are all affected by as we are all treaty people in Canada. We all have a shared history to reflect on, and each of us is affected by this history in different ways. Our past defines our present, but if we move forward as friends and allies, then it does not have to define our future.

# **Faculty of Health Sciences**

# **HLSC 4700/5118: Intermediate Statistics for Health Sciences**

# **Course outline for Winter, 2024**

## Course Details & Important Dates\*

|  |  |  |  |
| --- | --- | --- | --- |
| Term | Course Type | Day | Time |
| F/W/S | In-Person | Thursday | 11:10 – 2:00 PM |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Location | CRN # | Classes Start | Classes End | Final Exam Period |
| SHA 356 | 75100/73488 | Jan 08, 2024 | April 5, 2024 | N/A |

\* Visit <https://ontariotechu.ca/current-students/academics/important-dates-and-deadlines.php> for other dates

## Instructor Contact Information

|  |  |  |  |
| --- | --- | --- | --- |
| Instructor Name | Office | Phone | Email |
| David Rudoler | SHA 446 | Ext. 3816 | [david.rudoler@ontariotechu.ca](mailto:david.rudoler@ontariotechu.ca) |
| Office Hours: Upon request. Use the following link: <https://calendar.app.google/cdBCrq1W5uqzBwcw7> | | | |

## Course Description

This course will provide students with the necessary skills to plan, conduct and critically appraise the statistical analysis of health-related research projects. Specifically, the course will emphasize the inter-relation between the research question, study design and analysis of projects. Learning methods include online lectures and in-class tutorials. Real-life research projects will be used to illustrate the common statistical methods used in health sciences. The topics covered in the course include: analysis of variance, simple and multiple linear regression, logistic regression, nonparametric tests, and special topics such as power/sample size estimation. Applied work in this course will be completed in common statistical software packages (e.g., R, SAS, SPSS).

## Learning Outcomes

On the successful completion of the course, students will be able to:

1. Develop a research question and select the appropriate statistical method to answer the question
2. Design an analytical plan to analyze health-related data
3. Conduct descriptive and inferential analyses of data collected in a research project
4. Perform basic statistical analyses and interpret results of health-related projects
5. Critically appraise the analysis of health-related data

## Course Design

This course will include pre-recorded lectures and structured in-class lab sessions. *Students are expected to view the pre-recorded lectures and perform the assigned weekly readings in preparation for the in-class sessions.* The lectures will highlight theories, principles, and applications of statistical analyses to health data. The lab sessions will be used to familiarize students with the conduct of diverse statistical analyses. During the lab, students are expected to use R (or their statistics software of choice) to complete exercises using datasets provided.

## Outline of Topics in the Course\*

|  |  |  |
| --- | --- | --- |
| **Week** | **Week of** | **Lecture Topic** |
| 1 | January 11 | * Introduction: Course Information * Study design, data types and variables * Samples and populations, statistics, and parameters |
| 2 | January 18 | * Univariate statistics * Exploratory data analysis, visualization, and presentation of statistical results * Introduction to missing data |
| 3 | January 25 | * Probability and sampling distributions * Central Limit Theorem |
| 4 | February 1 | * Statistical inference (one-sample) * Hypothesis testing and confidence intervals * T-test * Sample size estimation |
| 5 | February 8 | * Statistical inference for two-groups |
| 6 | February 15 | * Analysis of binary data * Chi-square test |
|  | February 22 | **Study Week (No classes)** |
| 7 | February 29 | * **In-class Problem Set 1** * Journal club |
| 8 | March 7 | * One factor ANOVA * Repeated measures ANOVA * Two-factor ANOVA * Post-hoc tests |
| 9 | March 14 | * Linear regression |
| 10 | March 21 | * Multiple linear regression * Regression diagnostics |
| 11 | March 28 | * **In-Class Problem Set 2** * Introduction to generalized linear modelling |
| 12 | April 4 | * **In-Class Poster presentations** |

\*Dates, topics, and readings are approximate and are subject to change.

## Required Texts/Readings

Diez, D., Cetinkaya-Rundel, M., & Barr, C. D. (2019). OpenIntro Statistics (Fourth Edition).  
OpenIntro.

\*Note this book is available for free from the publisher’s website.

Wickham, H., & Grolemund, G. (2016). R for Data Science: Import, Tidy, Transform, Visualize, and  
Model Data. “O’Reilly Media, Inc.”

Additional readings may be assigned or recommended during the course.

## Evaluation Method

\*Note: Due dates are subject to change; advance notice will be provided if any changes are required.

|  |  |  |
| --- | --- | --- |
| **Assessments** | **Weighting** | **Due Date** |
| Weekly exercises (5 x 2% each) | 10% | Weekly starting in Week 1 |
| In-Class Problem Set 1 (15%)  In-Class Problem Set 2 (15%) | 30% | February 29  March 28 |
| Final report proposal and peer review | 10% | **Proposal**: February 8 at 11:59 PM (in Canvas)  **Peer review:** February 15th at 11:59 PM (in Canvas) |
| Final report poster presentation | 20% | April 3 at 11:59 PM (in Canvas) |
| Final report | 30% | April 12 at 11:59 PM (in Canvas) |
|  | 100% |  |

\*All deadlines are Eastern Standard Time (EST) - the local time in Toronto.

Final course grades may be adjusted to conform to program or Faculty grade distribution profiles. Further information on grading can be found under Academic Regulations at: <https://calendar.ontariotechu.ca/>

## Assignments and Tests

**Weekly Exercises (10%)**

Exercises will be assigned and completed during each weekly session and must be completed prior to the subsequent session. Do not worry about getting every exercise "right" but you must attempt to complete them. We will take them up the subsequent week. You will be assessed based on your completion of these activities only. You are encouraged to work together on these exercises.

**Problem Sets (30%)**

All students registered in this course are required to complete two problem sets worth 15% each. The Problem Sets will evaluate knowledge of course content and will be completed in-class.

**Final Report**

**Proposal (5%):** Working solo or in pairs, develop a report on a topic of your choosing. Ideally, the

report will allow you to analyze data that is similar in content to your thesis work (or is your thesis data).

* Complete a proposal that describes your topic of interest, your preliminary research question (in [PICO](https://libguides.ohsu.edu/c.php?g=261503&p=3885206) format if appropriate), your study design, and the data you will use to complete your report. Describe the source of this data, how it was collected, the structure of the data (i.e., cross-sectional, time-series, or panel), and how you will access it.
* Provide a table that describes the variables you will use in your analysis. If you are testing a hypothesis, this table should indicate whether each variable is an outcome, exposure, or control variable/covariate.
* If you are conducting an exploratory analysis, describe the variables of interest and any relationships you will explore.
* The proposal should be approximately 2 double-spaced pages in length.
* If you are unable to find a dataset that is comparable to your thesis project, you can make use of the public access file for the 2015-2016 Canadian Community Health Survey. The data can be downloaded from odesi, which can be accessed through the [Ontario Tech Library Website](https://login.uproxy.library.dc-uoit.ca/login?qurl=http%3a%2f%2fodesi.ca).

**Peer Review (5%):** Each student will complete a peer review of another student’s proposal.

**Final Report (30%):** Working solo or in pairs, develop a report on a topic of your choosing. Ideally, the report will allow you to analyze data that is similar in content to your thesis work (or is your thesis data).

The report should include the following:

* An abstract for your report that is no more than 250 words in length. The abstract should include the following sections: objective, design, methods, results, and impact.
* A brief background section describing your topic of interest and its importance to policy or practice.
* A research question(s) and hypotheses (if applicable).
* A detailed description of your data, including the name and source of the data. Describe the structure of the data you used and the period it covers. Describe your unit of analysis and population of interest. Include the number of observations (unique observations for panel data). Discuss your inclusion/exclusion criteria. Discuss limitations of the data, such as missing variables, missing observations, survey response rate (if applicable).
* Provide a table of summary statistics for your raw data (min., max., mean, standard deviation for continuous variables, frequencies and percentages for discrete variables) that includes a detailed description of the variables included in your analysis.
* Describe your most important variables in detail, including how they were collected and coded. If you are testing a hypothesis, the most important variables are typically your outcome and exposure.
* Describe your statistical analysis in detail. Is your analysis exploratory or confirmatory? What statistical tools did you use to generate your results? What sensitivity analyses did you complete? Summarize your results. Start with an overview of how your sample was constructed. How many observations were excluded and why? How many observations were ultimately included in your analysis?
* Provide a table of descriptive statistics for your study data and variables. You may want to stratify this table into different sub-groups (e.g., by your exposure variable if it's discrete). If appropriate, use inferential statistics to compare variables across sub-groups.
* Present your main findings. Use tables and figures appropriately. Interpret key statistics in the text and explain the results of any sensitivity analyses or robustness checks. Provide tables and figures for the sensitivity analyses as appendices (if necessary).
* Finally, provide a brief discussion of the results. What are the main findings, and what are their implications for policy and/or practice?

The report should be a maximum of 10 double-spaced pages in length (including Tables and Figures), but not including abstract, appendices and references. Along with your final report, please also include the code used to generate your results. If you used SPSS and did not use code to generate your results, please include a description of menu commands that were used to generate your results.

**Poster Presentation (20%)**

Create a poster to present the results of your report. The poster should include your objective, a

description of your design, data, statistical methods, results, and the impact of your findings. This

poster will be presented to the class during the last week (Week 12).

## Technology Requirements and Learning Management System Information

Ontario Tech uses *Canvas™* as its learning management system (LMS). Access to the LMS is limited to students formally registered in courses. That access is for the duration of the semester **and** **for an additional 120 days once the semester is over**. Students are strongly encouraged to download any/all relevant course material during that access period. Any requests for access post this period must be made in writing to the instructor/faculty member responsible for the course.

To support online learning, the university recommends certain technology requirements for laptops, software and internet connectivity which are available at: <https://itsc.ontariotechu.ca/remote-learning.php>.

Students experiencing technical difficulties such that they are unable to meet the technology requirements may contact the IT Service Help Desk at: [servicedesk@dc-uoit.ca](mailto:servicedesk@dc-uoit.ca)

Students experiencing financial difficulties such that they are unable to meet the technology requirements may contact Student Awards and Financial Aid Office at: [connect@ontariotehu.ca](mailto:connect@ontariotehu.ca)

By remaining enrolled in this course, you acknowledge that you have read, understand and agree to observe the Recommended Technology Requirements for accessing university online learning resources, including those minimum requirements that are specific to your faculty and program.

## Sensitive/Offensive Subject Matter

The classroom (both physical and virtual) is intended to provide a safe, open space for the critical and civil exchange of ideas and opinions. Some articles, media and other course materials may contain sensitive content that is offensive and/or disturbing. For example, some articles and lectures may contain information about historical and contemporary discrimination toward specific racial and ethnic groups. The Course Instructor will try to identify such material and communicate warnings to students in advance of the distribution and use of such materials, affording students the choice to either emotionally prepare for, or not to view or interact with, the content.

## Student Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact [studentlife@ontariotechu.ca](mailto:studentlife@ontariotechu.ca) for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable them to provide any resources and help that they can.

## Sexual Violence Support and Education

Ontario Tech is committed to the prevention of sexual violence in all its forms. For any student who has experienced Sexual Violence, Ontario Tech can help. We will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases.

If you think you have been subjected to or witnessed sexual violence:

* Reach out to a Support Worker, a specially trained individual authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolution options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email [studentlife@ontariotechu.ca](mailto:studentlife@ontariotechu.ca)
* Learn more about your options at: <https://studentlife.ontariotechu.ca/sexualviolence/>

## Students with Disabilities

Accommodating students with disabilities at Ontario Tech is a responsibility shared among various partners: the students themselves, SAS staff and faculty members. To ensure that disability-related concerns are properly addressed during this course, students with documented disabilities and who may require assistance to participate in this class are encouraged to speak with me as soon as possible. **Students who suspect they have a disability that may affect their participation in this course are advised to go to Student Accessibility Services (SAS) as soon as possible.** Maintaining communication and working collaboratively with SAS and faculty members will ensure you have the greatest chance of academic success.

**When on campus access is allowed,** students taking courses on North Oshawa campus can visit Student Accessibility Services in Shawenjigewining Hall. Students taking courses on the **downtown Oshawa campus** can visit Student Accessibility Services in Charles Hall, Room 225.

Disability-related and accommodation support is available for students with mental health, physical, mobility, sensory, medical, cognitive, or learning challenges. Office hours are 8:30am-4:30pm, Monday, Tuesday, Thursday, and Friday, Wednesday’s 10:00 am to 4:30. Please note they are closed each day between noon and 1:00 pm. For more information on services provided, you can visit the SAS website at <https://studentlife.ontariotechu.ca/services/accessibility/index.php>. Students may contact Student Accessibility Services by calling 905-721-3266, or email [studentaccessibility@ontariotechu.ca](mailto:studentaccessibility@ontariotechu.ca).

Students who require the use of the Test Centre to write tests, midterms, or quizzes MUST register online using the SAS test/exam sign-up module, found here <https://disabilityservices.ontariotechu.ca/uoitclockwork/custom/misc/home.aspx>. Students must sign up for tests, midterms, or quizzes **AT LEAST seven (7) working days before the date of the test.**

Students must register for final exams no later than 3 weeks prior to the start of the final examination period. The final examination period is given at <https://ontariotechu.ca/current-students/academics/important-dates-and-deadlines.php>*.*

## Professional Suitability

The *Professional Suitability* policy can be found at <https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/academic-conduct-and-professional-suitability-policy.php> and the related procedures are hosted at <https://usgc.ontariotechu.ca/policy/policy-library/policies/academic-misconduct-and-professional-unsuitability.php>

## Academic Integrity

Students and faculty at Ontario Tech University share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with and abide by Ontario Tech University’s regulations on Academic Conduct which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one’s own work to copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, among other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a resubmission of work to a failing grade to permanent expulsion from the university. A lack of familiarity with these regulations on academic conduct does not constitute a defense against its application. This information can be found at <https://usgc.ontariotechu.ca/policy/policy-library/policies/academic/academic-integrity-policy.php>

Extra support services are available to all Ontario Tech University students in academic development, study skills, counseling, and peer mentorship. More information on student support services can be found at <https://studentlife.ontariotechu.ca/services/academic-support/index.php>

## Turnitin

Ontario Tech University and faculty members reserve the right to use electronic means to detect and help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review by Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. The instructor may require students to submit their assignments electronically to Turnitin.com or the instructor may submit questionable text on behalf of a student. The terms that apply to Ontario Tech University’s use of the Turnitin.com service are described on the Turnitin.com website.

Students who do not wish to have their work submitted to Turnitin.com must provide with their assignment at the time of submission to the instructor a signed Turnitin.com Assignment Cover sheet: <https://tlc.ontariotechu.ca/educational-tech/assignment-cover-sheet_updatedmay2021-1.pdf>

## Freedom of Information and Protection of Privacy Act

The following is an important notice regarding the process for submitting course assignments, quizzes, and other evaluative material in your courses in the Faculty of Health Sciences.

Ontario Tech University is governed by the Freedom of Information and Protection of Privacy Act (“FIPPA”). In addition to providing a mechanism for requesting records held by the university, this legislation also requires that the University not disclose the personal information of its students without their consent.

FIPPA’s definition of “personal information” includes, among other things, documents that contain both your name and your Banner (student) ID. For example, this could include graded test papers or assignments. To ensure that your rights to privacy are protected, the Faculty of Health Sciences encourages you to use only your Banner ID on assignments or test papers being submitted for grading. This policy is intended to prevent the inadvertent disclosure of your information where graded papers are returned to groups of students at the same time. If you still wish to write both your name and your Banner ID on your tests and assignments, please be advised that Ontario Tech University will interpret this as an implied consent to the disclosure of your personal information in the normal course of returning graded materials to students.

If you have any questions or concerns relating to the new policy or the issue of implied consent addressed above, please contact [accessandprivacy@ontariotechu.ca](mailto:accessandprivacy@ontariotechu.ca)

Notice of Collection and Use of Personal Information

Throughout this course, personal information may be collected through the use of certain technologies under the authority of the *University of Ontario Institute of Technology Act, SO 2002, c. 8, Sch. O.* and will be collected, protected, used, disclosed and retained in compliance with Ontario’s *Freedom of Information and Protection of Privacy Act R.S.O. 1990, c. F.31.*

This course will use the following technologies that may collect, use, disclose and retain personal information (including images) for the purposes described below:

* Respondus Monitor and Proctortrack to maintain academic integrity for examinations;
* Google Meet and Kaltura Virtual Classroom to facilitate remote instruction and interactive learning;
* Peer-shared applications, services or technologies that may be reviewed, assessed, or used as part of coursework.

For more information relating to these technologies, we encourage you to visit: <https://tlc.ontariotechu.ca/educational-tech/index.php>.

Questions regarding personal information may be directed to:  Ontario Tech University Access and Privacy Office, 2000 Simcoe Street North, Oshawa, ON L1G 0C5, email: [accessandprivacy@ontariotechu.ca](mailto:accessandprivacy@ontariotechu.ca).

By remaining enrolled in this course, you acknowledge that you have read, understand, and agree to the terms and conditions under which the technology provider(s) may collect, use, disclose and retain your personal information. You agree to the university using the technologies and using your personal information for the purposes described in this course outline.

## Human Rights and Respect

Ontario Tech University is committed to providing a campus environment in which all University Members are treated with dignity and to fostering a climate of understanding and mutual respect. The University will not tolerate, ignore or condone Discrimination or Harassment by or against anyone. Examples of Harassing behavior include, but are not limited to; bullying, taunting or mocking someone’s race or creed, ridiculing an individual’s disability, or targeting individuals with unwanted sexual or negative stereotypical comments about one’s sex, gender, sexual orientation, gender identity and/or gender expression. Pursuant to Ontario Tech’s Respectful Campus Policy, students are reminded of their role in ensuring a campus environment that is equitable and inclusive. Requirements to refrain from harassment and discrimination apply broadly to the classroom, including in lectures, labs and practicums, as well as through the use of sanctioned and unsanctioned technological tools that facilitate remote learning, e.g. class and other chat functions, video conferencing, electronic mail and texts, and social media content amongst or about University students, faculty and staff.

## Freedom of Expression

Pursuant to Ontario Tech’s Freedom of Expression Policy, all students are encouraged to express ideas and perspectives freely and respectfully in university space and in the online university environment, subject to certain limitations. Students are reminded that the limits on Freedom of Expression include speech or behaviour that: is illegal or interferes with the university’s legal obligations; defames an individual or group; constitutes a threat, harassment or discrimination; is a breach of fiduciary, contractual, privacy or confidentiality obligations or commitments; and unduly disrupts and interferes with the functioning of the university. In the context of working online, different forms of communication are used. Where permitted, students using “chat” functions or other online forms of communication are encouraged to ensure that their communication complies with the Freedom of Expression Policy.

## Copyright Notice

All teaching materials provided by the instructor throughout the course, including, but not limited to, in whole or in part, recorded lectures, slides, videos, diagrams, case studies, assignments, quizzes, and examinations are subject to the Copyright Act, R.S.C., 1985, c. C-42. Teaching materials are owned by the faculty member, instructor or other third party who creates such works. The copyright owner(s) reserves all intellectual property rights in and to the teaching materials, including the sole right to copy, reproduce, distribute, and modify the teaching materials. Consistent with the university's Intellectual Property Policy, teaching materials are intended only for the educational use of Ontario Tech University students registered in the course that is the subject of this course outline. Any distribution or publishing of this material (e.g. uploading material to a third-party website) is strictly prohibited under the law unless the student has obtained the copyright owner's prior written consent. Any violation of copyright law or the Intellectual Property Policy, if proven, may be subject to sanction as academic misconduct, and/or under the Student Conduct Policy.

## Student Course Feedback Surveys

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech University’s programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Canvas, Weekly News, and signage around the campus.

## University Response to COVID-19

The government response to the COVID-19 pandemic is continually evolving. As new information becomes available from federal and provincial public health authorities, the Province of Ontario and the Regional Municipality of Durham, Ontario Tech University will remain nimble and prepared to respond to government orders, directives, guidelines and changes in legislation to ensure the health and safety of all members of its campus community. In accordance with public health recommendations, the university may need to adjust the delivery of course instruction and the availability and delivery mode of campus services and co-curricular opportunities. Ontario Tech University appreciates the understanding and flexibility of our students, faculty and staff as we continue to navigate the pandemic and work together to demonstrate our strong commitment to academic, research and service excellence during these challenging and unprecedented times.

The Accessibility for Ontarians with Disabilities Act (AODA) standards have been considered in the development of this model course template and it adheres to the principles outlined in the University’s Accessibility Policy.