UNIVERSITY OF CALGARY

CUMMING SCHOOL OF MEDICINE
GRADUATE COURSE OUTLINE

COURSE TITLE:			
Course	MDCH 610 – Biostatistics I: Essentials of Biostatistics		
Pre/Co-Requisites	Strong foundation of mathematics is essential		
Faculty	Cumming School of Medicine, Graduate Science Education		
Instructor Name(s)	Dr. Jessalyn Holodinsky Dr. Tyler Williamson	**Email**	jkholodi@ucalgary.ca tyler.williamson@ucalgary.ca
Office Location	HSC 2935	**Office Hours**	Digital office hours to be held via Zoom Tuesdays from 1:00 – 2:30
Instructor Email Policy	All efforts will be made to respond to emails within 24 hours. For urgent matters you are encouraged to contact your TA.		
Telephone No.	403.210.8516; email is the preferred method of contact.		
TA Name	TBD	**Email**	
Class Term, Days	September 8 – December 9, asynchronous delivery		
Class Times	This class will take place **online** via Desire2Learn (D2L) in an asynchronous manner meaning that all lectures and tutorials will be recorded and posted on D2L for viewing at any time. This means there is no live attendance requirement for lectures or tutorials. Lectures: Two lectures per week will be made available online for asynchronous viewing. Tutorials: One tutorial per week will be made available online for asynchronous viewing. Office hours will take place **online** via Zoom via synchronous instruction. To best succeed in the course, students are encouraged to participate in the synchronous Zoom sessions. When unable to participate live due to the time difference or unforeseen circumstances, inform the instructor in advance and propose an alternative participation activity TA Office Hours: Each TA will hold live online office hours on a weekly basis. Times for these office hours will be announced during the first week of class. These digital office hours will <u>not</u> be recorded and posted online. Students have the option of attending any or all of these sessions.		
Class Location	Online.		

COURSE INFORMATION/DESCRIPTION OF THE COURSE

This course introduces the foundational and fundamental concepts of biostatistics: summarizing data and statistical inference. Topics include the graphical presentation of data, hypothesis testing, p-values, confidence intervals, the comparisons of means and proportions, sample size estimation and power calculation as well as brief introduction to the topics of linear regression, the analysis of variance, and the analysis of time-to-event data. Examples are given using STATA statistical software and students will be taught how to interpret output from STATA but prior knowledge of STATA is not a prerequisite.

LEARNING RESOURCES/REQUIRED READING

NOTE THAT THERE IS NO REQUIRED TEXT FOR THE COURSE

The following textbooks are optional references for those wishing to have a reference text. All evaluation, assignments and examples will be given in the notes. Those not wishing to purchase a textbook will have no disadvantage, however, additional practice examples may be given from the following texts.

Introduction to the Practice of Statistics (8th Edition), Moore, McCabe & Craig ISBN 1464158933

Biostatistics: The Bare Essentials" (4th Edition), Norman & Streiner (2014) ISBN 1607951789

Computing Resources

Illustrations in the course will be given using the STATA Statistical Software. Students will be required to have access to STATA to complete assignments in this course. This software is available in the Health Sciences Library Information Commons. Students may wish to consider purchasing this software. Purchase is through the UofC Grad Plan. Contact Stata directly:

http://www.stata.com/order/new/edu/gradplans/campus-gradplan/

The perpetual license of Intercooled (IC 16) is recommended ($225 USD).

Other Course Materials

Other recommended supplies include a scientific calculator with a square root, natural logarithm, and exponential function.

COURSE OBJECTIVES/LEARNING OUTCOMES

By the end of the semester, students will be able to:

1. Describe the difference between a population and a sample
2. Describe the various types of data
3. Explain the central limit theorem and describe its importance in biostatistics

4. Calculate confidence intervals and p-values and interpret and describe the uses of each
5. Perform and interpret the results of various hypothesis tests including the t-test, proportion test, various non-parametric tests, and ANOVA
6. Describe the factors that influence power and sample size and calculate power and sample size for various types of data
7. Communicate basic statistics effectively

List of Course Topics:

Types of Data: Discrete, Continuous, Nominal, Ordinal, Interval, Ratio

Graphical Display: Bar Chart, Histogram, Box Plot, Dot Plot

Descriptive Statistics: Mean, Median, Mode, Variance, Standard Deviation, Standard Error, Percentile, Interquartile Range, Skewness, Kurtosis, Proportion

Reference Distributions: Gaussian (Normal) Distribution, Student's t Distribution

Sampling Distribution: Central Limit Theorem, Confidence Intervals

Hypothesis Testing and Statistical Significance: Logic, Errors, P-value, One-sample Tests, Two-sample Tests (paired and independent)

Sample Size and Statistical Power: Type I Error (alpha), Type II Error (beta), Sample Size Calculations for Comparing Two Groups

Non-parametric Tests: Wilcoxon Signed-Rank Test, Mann-Whitney U Test

Chi-squared Test and Confounding: Measures of Association, Mantel-Haenszel, Fisher's Exact Test

Measures of Risk and Benefit: Absolute Risk Reduction, Relative Risk, Relative Risk Reduction, Odds Ratio, Number Needed to Treat

Comparison of Several Groups: Analysis of Variance, Between-Subject Variability, Within-Subject Variability, F-ratio, Multiple Comparisons

Regression Analysis: Scattergram, Pearson Correlation Coefficient, Simple Linear Regression, F-ratio, R^2

Multivariate Analysis of Continuous Data: Analysis of Covariance, Change Scores

Multivariate Analysis of Binary Data: Logistic Regression, Log-binomial Models

Univariate Analysis of Time-to-Event Data: Event-Free Survival Analysis

Multivariate Analysis of Time-to-Event Data: Cox Proportional Hazards Regression

Communication

Brightspace (By D2L) is located on the University of Calgary server and will be used extensively for communication with Students. A link to the zoom class will be provided on D2L. It is the student's responsibility to ensure that they receive all posted communications and documents and that they receive e-mails send by instructors of fellow students through D2L. Only your @ucalgary.ca e-mail address maybe linked to D2L. Please ensure that you are regularly checking your @ucalgary.ca account

Learning Technology Requirements

In order to successfully engage in learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security and malware updates;
- A current and updated web browser;
- Webcam (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Broadband internet connection

Most current laptops will have a built-in webcam, speaker and microphone.

Please see the following for a detailed explanation of the minimal required technology for online learning https://elearn.ucalgary.ca/technology-requirements-for-students/

A laptop, desktop, tablet or mobile device is required for D2L access. If you need help accessing or using D2L, please visit the Desire2Learn resource page for students: http://elearn.ucalgary.ca/d2l-student/.

CUT POINTS FOR GRADES			
This course adheres to the grading system outlined in the University of Calgary, Faculty of Graduate Studies Calendar. Grades of A+ and A are not distinguished in the calculation of GPAs. Percentage/letter grade conversion used for this course is as follows			
Grade	**Grade Point Value**	**Percentage Conversion**	**Graduate Description**
A+	4.00	95-100	Outstanding
A	4.00	85-94	Excellent – superior performance showing comprehensive understanding of the subject matter
A-	3.70	80-84	Very Good Performance
B+	3.30	75-79	Good Performance
B	3.00	70-74	Satisfactory Performance
B-	2.70	65-69	Minimum Pass for Students in the Faculty of Graduate Studies
C+	2.30	55-64	

C	2.00	50-54	All grades below 'B-" are indicative of failure at the graduate level and cannot be counted toward Faculty of Graduate Studies course requirements

Assessment Components: The University policy on grading related matters is outlined in the 2019-2020 Calendar.			
Assessment Methods	**Description**	**Weight %**	**Due Date <u>and</u> Time**
Homework Assignments	Approximately weekly (excluding test and reading weeks) homework assignments will be posted. New homework assignments will be posted one week before they are due. Homework assignments will then be (generally) graded and returned on the following Thursday. There will be a total of 9 equally weighted homework assignments. Assignments should be neatly written or typed and should be numbered to correspond to the questions on the assignment. Assignments are to be submitted via D2L Dropbox. Answer keys will be automatically released via D2L at 1pm on the due date, accordingly late assignments will not be accepted. Truly exceptional circumstances will be considered on a case-by-case basis and should be directed to the Teaching Assistants who will seek final approval from the Instructor before the due date.	25%	**(Assignments are due at 1pm)** A1 Due – Sept 15 A2 Due – Sept 22 A3 Due – Sept 29 A4 Due – Oct 6 A5 Due – Oct 20 A6 Due – Oct 27 A7 Due – Nov 3 A8 Due – Nov 19 A9 Due – Nov 26
First Test	This will be a 2.5-hour exam on **October 13**. Material up to this point will be eligible for inclusion on the exam. The test will include an evaluation of the factual, conceptual, and interpretive components of biostatistics, as well as hand and calculator analyses of data. A passing grade on the first test is NOT required to pass course as a whole. This exam will be delivered online per University Calendar Academic Regulations Section G.1. The exam will be delivered via D2L. The student must complete the exam in one sitting. There will be a 24-hour window in which the student can begin the exam. This 24-	20%	

	hour period will begin on October 13 at 00:01 Mountain Time.		
Second Test	This will be a 2.5-hour exam on **November 19**. Material up to this point will be eligible for inclusion on the test. The test will include an evaluation of the factual, conceptual, and interpretive components of biostatistics, as well as hand and calculator analyses of data. A passing grade on the second test is NOT required to pass course as a whole. This exam will be delivered online per University Calendar Academic Regulations Section G.1. The exam will be delivered via D2L. The student must complete the exam in one sitting. There will be a 24-hour window in which the student can begin the exam. This 24-hour period will begin on November 19 at 00:01 Mountain Time.	20%	
TopHat	Each video lecture will be accompanied by a series of questions based on examples given in the lecture materials. These questions are meant to encourage students to follow along with the video lectures on a weekly basis and to help gauge their own progress with the course content in real time. Questions will be answered and graded via TopHat. As lectures may be viewed by students at different times submissions will be accepted until 11:59pm Mountain Time on Friday of the week the lecture is posted. Example: questions coinciding with the two lectures posted during the week of September 7 will be due September 11 at 11:59pm mountain time. These questions are worth a total of 10% of the final grade. 5% will be based on participation and 5% on correctness.	10%	Weekly at 11:59pm on Fridays
"Essentials of Biostatistics Micro-Conference" Poster Presentation	Students will work in groups to prepare a conference style presentation to present at the "Essentials of Biostatistics Micro-Conference" to be held virtually on **December 1 from 1:00 – 3:30 Mountain Time.** Students located in Mountain Time Zone are expected to attend and present live during this time.	25%	Abstract – Oct 29 11:59pm Presentation – Dec 1 1:00pm

Accommodations will be made for students located in other time zones on a case by case basis. Presentations will be judged by invited guest judges and feedback provided to the students.

Dataset requirements are as follows. Each dataset must include 6-10 variables with a minimum of 2 continuous and a minimum of 2 categorical variables. The dataset must consist of a minimum of 50 records, and all personal identifiers must be removed.

A 250-word abstract of the proposed work will be due on **October 29 at 11:59pm Mountain Time**. The abstract will be submitted via D2L Dropbox. The abstract should be written as a "work in progress" style abstract including sections with the following titles: Introduction, Objective, and Methods (including a description of the dataset). Additional information about abstract format and the presentation can be found on D2L.

The conference abstract is worth 5% of the final grade and the conference presentation is worth 20% of the final grade.

ASSESSMENT AND EVALUATION INFORMATION

ATTENDANCE AND PARTICIPATION EXPECTATIONS: The viewing of all online lectures and attendance at tutorials is considered mandatory. However, students exhibiting symptoms of COVID-19 or who have been in close contact with a known case of COVID-19 must isolate per public health guidelines and not attend class for the duration of their isolation period. Accommodations for absences related to COVID-19, other medical issues, or other emergencies will be made by the instructor on a case by case basis.

GUIDELINES FOR SUBMITTING ASSIGNMENTS: Assignments are due on the specified date by **1pm** Mountain Time and are to be submitted via D2L Dropbox.

FINAL EXAMINATIONS: There is no registrar scheduled final examination for this course.

EXPECTATIONS FOR WRITING: Assignments should be neatly written or typed and should be numbered to correspond to the questions on the assignment.

LATE AND/OR MISSING ASSIGNMENTS: Answer keys will be automatically released via D2L at 1pm on the due date. Accordingly, late assignments will not be accepted. Truly exceptional circumstances will be

considered on a case-by-case basis and should be directed to the Teaching Assistants who will seek final approval from the Instructor before the assignment is due.

Is a passing grade on a particular component essential to pass the course as a whole? No

COURSE TIMETABLE			
Course Schedule Date*	**Topic & Reading**	**Instructor**	**Assignments/Due Dates & Times**
September 8	Course Overview	Jessalyn Holodinsky	
September 10	Summarizing Data	Tyler Williamson	
September 15	Probability and Distributions	Jessalyn Holodinsky	Assignment 1 due at 1pm
September 17	Central Limit Theorem	Jessalyn Holodinsky	
September 22	Confidence Intervals	TA	Assignment 2 due at 1 pm
September 24	Hypothesis Testing	Jessalyn Holodinsky	
September 29	Hypothesis Testing	Tyler Williamson	Assignment 3 due at 1pm
October 1	Confidence Intervals	Jessalyn Holodinsky	
October 6	Sample Size	TA	Assignment 4 due at 1 pm
October 8	One sample t-test	Jessalyn Holodinsky	
October 13	First Test	-	
October 15	Two sample t-test	Jessalyn Holodinsky	
October 20	Non-parametric tests	Tyler Williamson	Assignment 5 due at 1 pm
October 22	ANOVA	Jessalyn Holodinsky	
October 27	Chi-square test	TA	Assignment 6 due at 1 pm
October 29	Two-proportion test	Jessalyn Holodinsky	Poster Summary due at 1 pm
November 3	McNemar's test	Tyler Williamson	Assignment 7 due at 1 pm
November 5	Linear Regression	Jessalyn Holodinsky	
November 10&12	Reading Days – NO CLASSES	-	
November 17	Linear Regression	TA	
November 19	Second Test	-	Assignment 8 due at 1 pm
November 24	Logistic Regression	Jessalyn Holodinsky	
November 26	Time-to-event analysis	Tyler Williamson	Assignment 9 due at 1pm

December 1	Essentials of Biostatistics Micro-Conference	-	Conference Presentation during tutorial time
December 3	Special Topics	Guest Lecturer	
December 8	Special Topics	Guest Lecturer	

*Lectures will be made available for online asynchronous viewing at the beginning of each week. Lectures can be viewed at any time. The dates provided here are suggested viewing dates for those who would like to follow a more regimented schedule. Assignment due dates are firm.

Guidelines for Zoom Sessions

Zoom is a video conferencing program that will allow us to meet at specific times for a 'live' video conference, so that we can have the opportunity to meet each other virtually and discuss relevant course topics as a learning community.

To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor's permission.

The use of video conferencing programs relies on participants to act ethically, honestly and with integrity; and in accordance with the principles of fairness, good faith, and respect (as the Code of Conduct). When entering Zoom or other video conferencing sessions, you play a role in helping create an effective, safe and respectful learning environment. Please be mindful of how your behaviour in these sessions may affect others. Participants are required to use names officially associated with their UCID (legal or preferred names listed in the Student Centre) when engaging in these activities. Instructors/moderators can remove those whose names do not appear on class rosters. Non-compliance may be investigated under relevant University of Calgary conduct policies. If participants have difficulties complying with this requirement, they should email the instructor of the class explaining why, so the instructor may consider whether to grant an exception, and on what terms. For more information on how to get the most out of your zoom sessions visit: https://elearn.ucalgary.ca/guidelines-for-zoom/.

If you are unable to attend a Zoom session, please contact your instructor to arrange an alternative activity (where available). Please be prepared, as best as you are able, to join class in a quiet space that will allow you to be fully present and engaged in Zoom sessions. Students will be advised by their instructor when they are expected to turn on their webcam (such as for group work, presentations, etc).

The instructor may record online Zoom class sessions for the purposes of supporting student learning in this class – such as making the recording available for review of the session or for students who miss a session. Students will be advised before the instructor initiates a recording of a Zoom session. These recordings will be used to support student learning only.

Conduct During Lectures

The classroom should be respected as a safe place to share ideas without judgement - a community in which we can all learn from one another. Students are expected to frame their comments and questions to lecturers in respectful and appropriate language, always maintaining sensitivity towards the topic. Students, employees, and academic staff are also expected to demonstrate behaviour in class that promotes and maintains a positive and productive learning environment.

As members of the University community, students, employees and academic staff are expected to demonstrate conduct that is consistent with the University of Calgary Calendar, the Code of Conduct and Non-Academic Misconduct policy and procedures, which can be found at https://www.ucalgary.ca/policies/forms/title.

INTERNET AND ELECTRONIC COMMUNICATION DEVICE INFORMATION
Cell phones must be turned off in class unless otherwise arranged with the instructor. The use of laptop and mobile devices is acceptable when used in a manner appropriate to the course and classroom activities. Students are to refrain from accessing websites that may be distracting for fellow learners (e.g. personal emails, Facebook, YouTube). Students are responsible for being aware of the University's Internet and email use policy, which can be found at https://www.ucalgary.ca/policies/files/policies/electronic-communicationspolicy.pdf.

MEDIA AND RECORDING IN LEARNING ENVIRONMENTS
Media recording for lesson capture The instructor may use media recordings to capture the delivery of a lecture. These recordings are intended to be used for lecture capture only and will not be used for any other purpose. Although the recording device will be fixed on the Instructor, in the event that incidental student participation is recorded, the instructor will ensure that any identifiable content (video or audio) is masked, or will seek consent to include the identifiable student content to making the content available on University approved platforms. **Media recording for assessment of student learning** The instructor may use media recordings as part of the assessment of students. This may include but is not limited to classroom discussions, presentations, clinical practice, or skills testing that occur during the course. These recordings will be used for student assessment purposes only and will not be shared or used for any other purpose. **Media recording for self-assessment of teaching practices** The instructor may use media recordings as a tool for self-assessment of their teaching practices. Although the recording device will be fixed on the instructor, it is possible that student participation in the course may be inadvertently captured. These recordings will be used for instructor self-assessment only and will not be used for any other purpose.

| **Student Recording of Lectures** |
| Audio or video recording of lectures is prohibited except where explicit permission has been received from the instructor. |

UNIVERSITY OF CALGARY POLICIES AND SUPPORTS

ACADEMIC ACCOMMODATIONS
Students seeking an accommodation based on disability or medical concerns should contact Student Accessibility Services; SAS will process the request and issue letters of accommodation to instructors. For additional information on support services and accommodations for students with disabilities, visit www.ucalgary.ca/access/. Students who require an accommodation in relation to their coursework based on a protected ground other than disability should communicate this need in writing to their Instructor. The full policy on Student Accommodations is available at http://www.ucalgary.ca/policies/files/policies/student-accommodation-policy.pdf

IMPORTANT INFORMATION
Any research in which students are invited to participate will be explained in class and approved by the appropriate University Research Ethics Board

INSTRUCTOR INTELLECTUAL PROPERTY
Course materials created by professor(s) (including course outlines, presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the professor(s). These materials may NOT be reproduced, redistributed or copied without the explicit consent of the professor. The posting of course materials to third party websites such as note-sharing sites without permission is prohibited. Sharing of extracts of these course materials with other students enrolled in the course at the same time may be allowed under fair dealing

COPYRIGHT LEGISLATION
All students are required to read the University of Calgary policy on Acceptable Use of Material Protected by Copyright (www.ucalgary.ca/policies/files/policies/acceptable-use-of-material-protected-by-copyright.pdf) and requirements of the copyright act (https://laws-lois.justice.gc.ca/eng/acts/C-42/index.html) to ensure they are aware of the consequences of unauthorised sharing of course materials (including instructor notes, electronic versions of textbooks etc.). Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy

ACADEMIC INTEGRITY
The Cumming School of Medicine expects intellectual honesty from its students. Course participants should be aware of University policies relating to Principles of Conduct, Plagiarism and Academic Integrity. These are found in the printed Faculty of Graduate Studies Calendar, or online under Academic Regulations in the Faculty of Graduate Studies Calendar, available at **Faculty of Graduate Studies Academic Regulations**

ACADEMIC MISCONDUCT
For information on academic misconduct and its consequences, please see the University of Calgary Calendar at http://www.ucalgary.ca/pubs/calendar/current/k.html

EMERGENCY EVACUATION AND ASSEMBLY POINTS
Assembly points for emergencies have been identified across campus. The primary assembly points for South Campus (Health Science Centre (HSC); Health & Research Innovation Centre (HRIC); Heritage Medical Research Building (HMRB) and Teaching, Research and Wellness (TRW)) are:
- HSC and HMRB: HRIC Atrium (alternate assembly point is Parking Lot 6)
- HRIC: HMRB Atrium (alternate assembly point is Parking Lot 6)
- TRW: McCaig Tower (alternate assembly point is HMRB – Atrium)

APPEALS
If there is a concern with the course, academic matter or a grade, first communicate with the instructor. If these concerns cannot be resolved, students can proceed with an academic appeal, as per Section N of the Faculty of Graduate Studies Calendar. Students must follow the official process and should contact the Student Ombuds Office (http://www.ucalgary.ca/provost/students/ombuds) for assistance with this and with any other academic concerns, including academic and non-academic misconduct

THE FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY (FOIP) ACT
This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIP) and students should identify themselves on written assignments (exams and term work.) by their name and ID number on the front page and ID on each subsequent page. Assignments given by you to your course instructor will remain confidential unless otherwise stated before submission. The assignment cannot be returned to anyone else without your expressed permission to the instructor. Grades will be made available on an individual basis and students will not have access to other students' grades without expressed consent. Similarly, any information about yourself that you share with your course instructor will not be given to anyone else without your permission

WELLNESS AND MENTAL HEALTH RESOURCES
The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the excellent mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre), https://www.ucalgary.ca/wellnesscentre/services/mental-health-services and the Campus Mental Health Strategy website https://www.ucalgary.ca/mentalhealth/"

SUPPORTS FOR STUDENT LEARNING, SUCCESS, AND SAFETY

Student Ombudsman: The Student Ombuds' Office supports and provides a safe, neutral space for students. For more information, please visit www.ucalgary.ca/ombuds/ or email ombuds@ucalgary.ca

Student Union: The SU Vice-President Academic can be reached at (403) 220-3911 or suvpaca@ucalgary.ca; Information about the SU, including elected Faculty Representatives can be found here: https://www.su.ucalgary.ca

Graduate Student's Association: The GSA Vice-President Academic can be reached at (403) 220- 5997 or gsa.vpa@ucalgary.ca; Information about the GSA can be found here: https://gsa.ucalgary.ca

SAFEWALK
Campus security will escort individuals, day or night, anywhere on campus (including McMahon Stadium, Health Sciences Centre, Student Family Housing, the Alberta Children's Hospital and the University LRT station). Call 403-220-5333 or visit http://www.ucalgary.ca/security/safewalk. Use any campus phone, emergency phone or the yellow phone located at most parking lot pay booths. Please ensure your personal safety by taking advantage of this service.