

### COURSE INFORMATION

|                        |  |                 |                   |
|------------------------|--|-----------------|-------------------|
| Course title:          | Advanced predictive business analytics |                 |                   |
| Course code:           | BABS 508                               | Credits:        | 1.5               |
| Session, term, period: | 2022W2                                 | Class location: | HA 337            |
| Section(s):            | BA1                                    | Class times:    | Mon. / Wed. 4-6pm |
| Course duration:       | Mar. 6 to Apr. 2, 2023                 | Pre-requisites: | BABS 507          |
| Division:              | Operations and Logistics               | Co-requisites:  | N/A               |
| Program:               | MBAN                                   |                 |                   |

### INSTRUCTOR INFORMATION

|             |                            |                  |                       |
|-------------|----------------------------|------------------|-----------------------|
| Instructor: | Martha Essak, M.Sc.        |                  |                       |
| Phone:      | 778-819-8368               | Office location: | HA 351                |
| Email:      | martha.essak@sauder.ubc.ca | Office hours:    | Thurs. 1-2pm (online) |

### COURSE DESCRIPTION

BABS 508 provides students with a theoretical understanding of the basis of regression techniques, as well as practice with the application of generalized linear models. These techniques are widely used in a variety of fields including business, economics, finance and operations research. The skills taught in this course are essential for any business analyst.

In this course, students will learn multiple linear regression, logistic regression and Poisson regression, extending these models to include categorical variables. In general, these models relate response variables to potential predictor / explanatory variables, and can be used to estimate parameters, make predictions or statistically control for certain variables. Students will become familiar with when and how to construct different models, how to assess the assumptions and goodness of fit, how to interpret results, and how to present these results in text and graphical form. In this course, students will also learn principal component analysis (PCA), which can reduce the number of variables/dimensionality of the data. Students will use the program R for statistical computing for the statistical analysis of real data.

### COURSE FORMAT

Class time will consist of lectures, discussions and activities. Students will complete readings, quizzes, homework assignments, and the project outside of class time.

### LEARNING OBJECTIVES

By the end of this course, students will be able to:

1. Visualize data and calculate summary statistics
2. Develop linear models that are appropriate to the type of data, and fit them using the statistical software R
3. Assess if the assumptions of the analysis are met using statistical tests and visualization methods
4. Conduct statistical inference on these parameter estimates using hypothesis testing and confidence intervals; interpret the parameter estimates
5. Perform predictions based on models
6. Assess goodness of fit and compare different models using model diagnostics
7. Use variable selection to assess which variables should be included
8. Present the results of analyses in the form of a report

## ASSESSMENTS

### Summary

| <u>Component</u>                  | <u>Weight</u> |
|-----------------------------------|---------------|
| Assignments                       | 40%           |
| Final project                     | 40%           |
| Quizzes                           | 8%            |
| In-class exercises                | 8%            |
| Professionalism and participation | 4%            |
| Total                             | <u>100%</u>   |

### Details of Assessments

#### Homework Assignments

Students will work **individually** to solve the problems in the homework assignments. Late submissions will not be accepted and will receive a zero. Homework assignments should be handed in electronically via the UBC Canvas system. Assignments will be graded on correctness and clarity.

#### Project

Students will work **in pairs** on a project (in report form) that uses the techniques learned throughout the course. **You may not work with classmates or obtain outside help.** Please consult with the instructor if you need help or clarification.

#### Quizzes

Students will work **individually** on the quizzes, which are designed to be completed after you have finished the readings about that material.

#### In-class exercises

Students will work **in pairs** to complete exercises during class time. To avoid the time pressure, students may use additional time after class to complete the exercise, then submit prior to the deadline.

#### Professionalism and participation

Professionalism and participation will be assessed based on: punctuality, preparation for class, participation in class activities (including iClicker), contribution to class discussions, and interaction with peers and the instructor.

## LEARNING MATERIALS

Required:

You can access the following books for free at [library.ubc.ca](http://library.ubc.ca)

#### **Understanding Regression Analysis: An Introductory Guide**

By Larry D. Schroeder, David L. Sjoquist & Paula E. Stephan (2018)

#### **Generalized Linear Models with Examples in R**

by Peter Dunn & Gordon Smyth. (Springer, 2018)

Applied Multivariate Statistical Analysis: Principal Components Analysis (PCA)

<https://newonlinecourses.science.psu.edu/stat505/lesson/11>

Estimated cost of required materials: \$0

Additional materials recommended but not required: N/A

### COURSE-SPECIFIC POLICIES AND RESOURCES

#### *Missed or late assignments, and regrading of assessments*

Late submissions will not be accepted and will receive a grade of zero.

#### *Academic Concessions*

If extenuating circumstances arise, please contact the RHL Graduate School program office as early as reasonably possible, and submit an [Academic Concession Request & Declaration Form](#). If an academic concession is granted during the course, the student will be provided options by RHL, or by the instructor in consultation with RHL, per [UBC's policy on Academic Concession](#).

#### *Other Course Policies and Resources*

[Include the following policies and resources as appropriate.]

- Policies on assessment due prior to students joining the course (i.e., during the add/drop period).

#### *Code Plagiarism*

Code plagiarism falls under the UBC policy for [Academic Misconduct](#). Students must correctly cite any code that has been authored by someone else or by the student themselves for other assignments.

Cases of "reuse" may include, but are not limited to:

- the reproduction (copying and pasting) of code with none or minimal reformatting (e.g., changing the name of the variables)
- the translation of an algorithm or a script from a language to another
- the generation of code by automatic code-generations software

An "adequate acknowledgement" requires a detailed identification of the (parts of the) code reused and a full citation of the original source code that has been reused.

Students are responsible for ensuring that any work submitted does not constitute plagiarism. Students who are in any doubt as to what constitutes plagiarism should consult their instructor before handing in any assignments.

### POLICIES APPLICABLE TO COURSES IN THE ROBERT H. LEE GRADUATE SCHOOL

#### *Attendance*

Excepting extenuating circumstances, students are expected to attend 100% of their scheduled class hours. Absent students limit their own academic potential, and that of their classmates, and cause unnecessary disruption to the learning environment. Students missing more than 20% of the total scheduled class hours for a course (including classes held during the add/drop period) without having received an academic concession will be withdrawn from that course. Withdrawals, depending on timing, could result in a "W" or an "F" standing on the transcript.

#### *COVID-19 Policies for Attendance & Academic Concessions:*

If a student feels unwell, they should stay home and send a courtesy email to each impacted instructor and cc their program manager. The student should also submit an [Academic Concession Request & Declaration Form](#).

If a student suspects possible COVID-19 infection, they should use the BC Ministry of Health's [self-assessment tool](#), to help determine whether further assessment or testing for COVID-19 is recommended.

### *Punctuality*

Students are expected to arrive for classes and activities on time and fully prepared to engage. Late arrivals may be refused entry at the discretion of the instructor or activity lead. Students arriving later than halfway through a scheduled class will be treated as absent for that class.

### *Electronic Devices*

Devices such as laptops, tablets, and cell phones are not permitted to be used in class unless directed by the instructor for in-class activities. Students who do not follow the School's policy in this regard may be required to leave the room for the remainder of the class, so that they do not distract others. Research shows that students' use of laptops in class has negative implications for the learning environment, including reducing their own grades and the grades of those sitting around them.

### *Citation Style*

Please use the American Psychological Association (APA) reference style to cite your sources.

Details of the above policies and other RHL Policies are available at:

<http://www.calendar.ubc.ca/vancouver/index.cfm?tree=12,199,506,1625>

## UNIVERSITY POLICIES AND RESOURCES

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website at <https://senate.ubc.ca/policies-resources-support-student-success>.

### *Respect for Equity, Diversity, and Inclusion*

The UBC Sauder School of Business strives to promote an intellectual community that is enhanced by diversity along various dimensions including status as a First Nation, Metis, Inuit, or Indigenous person, race, ethnicity, gender identity, sexual orientation, religion, political beliefs, social class, and/or disability. It is critical that students from diverse backgrounds and perspectives be valued in and well-served by their courses. Furthermore, the diversity that students bring to the classroom should be viewed as a resource, benefit, and source of strength for your learning experience. It is expected that all students and members of our community conduct themselves with empathy and respect for others.

### *Academic Integrity*

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

### COPYRIGHT

All materials of this course (course handouts, lecture slides, assessments, course readings, etc.) are the intellectual property of the instructor or licensed to be used in this course by the copyright owner. Redistribution of these materials by any means without permission of the copyright holder(s) constitutes a breach of copyright and may lead to academic discipline and could be subject to legal action. Any lecture recordings are for the sole use of the instructor and students enrolled in the class. In no case may the lecture recording or part of the recording be used by students for any other purpose, either personal or commercial. Further, audio or video recording of classes are not permitted without the prior consent of the instructor. Students may not share class Zoom links or invite others who are not registered to view sessions.

### ACKNOWLEDGEMENT

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the x<sup>w</sup>məθk<sup>w</sup>əyəm (Musqueam) people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

COURSE SCHEDULE

| Class | Date       | Topic   | Readings or Activities                                | Assessments due                                      |
|-------|------------|---|---|--|
| 1     | Mar. 6     | Multiple Linear regression with categorical variables   | Ch 4-5 (Schroeder et al.)                             | Quiz #1 due Tuesday Mar. 7 at 11:59pm                |
| 2     | Mar. 8     | Multiple Linear regression with categorical variables   |   |  |
| 3     | Mar. 13    | Intro to GLMs and Logistic Regression                   | Ch. 4, 5, 7, 9 (Dunn and Smyth)                       | Quiz #2 due Tuesday Mar. 14 at 11:59pm               |
| 4     | Mar. 15    | Logistic Regression                                     |   | <b>Assignment 01 due Thursday Mar. 16 at 11:59pm</b> |
| 5     | Mar. 20    | Logistic Regression with multiple explanatory variables | Ch. 7-9 (Dunn and Smyth)                              | No quiz this week!                                   |
| 6     | Mar. 22    | Logistic Regression with multiple explanatory variables |   | <b>Assignment 02 due Thursday Mar. 23 at 11:59pm</b> |
| 7     | Mar. 27    | Poisson Regression                                      | Ch. 10 (Dunn and Smyth)                               | Quiz #3 due Tuesday Mar. 28 at 11:59pm               |
| 8     | Mar. 29    | Poisson Regression                                      |   | <b>Assignment 03 due Thursday Mar. 30 at 11:59pm</b> |
| 9     | Apr. 3     | Principal Component Analysis                            | Online Readings (see link under "Learning materials") | Quiz #4 due Tuesday Apr. 4 at 11:59pm                |
| 10    | Apr. 5     | Principal Component Analysis                            |   | <b>Assignment 04 due Thursday Apr. 6 at 11:59pm</b>  |
|       | Apr. 11-15 | <i>Exam week</i>  |   | <b>Final project deadline TBA</b>                    |