



UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
SCIENCE 301: RESEARCH DESIGN AND STATISTICAL ANALYSIS
COURSE OUTLINE

1. **Course: SCIENCE 301 - RESEARCH DESIGN AND STATISTICAL ANALYSIS**

Lecture Section: L01 TR 11:00-12:15 ES 443 WINTER 2018

Tutorials: F 09:00, 12:00, 13:00, 15:00 SS 018

Instructors: Dr. Hua Shen MS 526 403-220-6309 hua.shen@ucalgary.ca

Desire 2 Learn (D2L) course name: SCIE 301 – (Winter 2018) – Research Design and Statistical Analysis

USC Specialized Programs Office EEEL 426 403-220-8600 sciemail@ucalgary.ca

2. **Prerequisite(S):** 24 units (4.0 full-course equivalents) and admission to the Natural Sciences Program. See [Section 3.5.C](#) in the Faculty of Science section of the online Calendar.

3. **Grading:** The University policy on grading and related matters is described in sections [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

5 In-Class Quizzes (4% each)	20%	
Midterm Examination	20%	In class on March 1, 2018
3 Assignments (10% each)	30%	
Final Examination	30%	To be scheduled by the Registrar

Grading Scale							
A+	> 92 %	B+	79 - 82%	C+	67 - 70%	D+	54 - 58%
A	87 - 91%	B	75 - 78%	C	63 - 66%	D	50 - 53%
A-	83 - 86%	B-	71 - 74%	C-	59 - 62%	F	0 - 50%

To pass the course as a whole, a student must obtain a passing grade (50%) on both the midterm and the final examinations.

Each piece of work submitted by a student will be assigned a percentage score. A student's average percentage score for the various components listed above will be weighted as indicated above to calculate the overall percentage for the course, which will be used to determine the course letter grade. The following grading scheme identifies the maximum thresholds for letter grades that will be applied in this course: thresholds may be lowered to establish the final grade distribution.

Letter Grade	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Min. Percent Required	92	87	83	79	75	71	67	63	59	54	50

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is a student's responsibility to familiarize herself/himself with these regulations. See also [Section E.6](#) of the University Calendar

5. **Scheduled out-of-class activities:** Dates and times of approved class activities held outside of class hours. There are no out-of-class activities associated with this course. There will be a final examination to be scheduled by the Registrar.

6. **Course Materials:** There is no required textbook for this course, lectures notes will be provided by the instructor. The recommended textbook is *M. Whitlock and D. Schluter. The Analysis of Biological Data. Greenwood Village, Colorado: Roberts and Company Publishers, 2009.*

7. **Examination Policy:** All quizzes and exams will be closed-book evaluations. Formula sheets and tables will be provided when needed in the quizzes and exams. A basic scientific calculator may be required. No other electronic devices are permitted. Students should also read the [Calendar, Section G](#) on Examinations.
8. **Writing across the curriculum statement:** In this course, the quality of the student's writing on assigned papers will be a factor in the evaluation of those papers. See also [Section E.2](#) of the University Calendar.
9. **Human studies statement:** Students in the course are not expected to participate as subjects or researchers. See also [Section E.5](#) of the University Calendar.
10. **Use of living and dead organisms:** Students will not be expected to handle organisms during this course.
11. **OTHER IMPORTANT INFORMATION FOR STUDENTS:**
 - (a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties.
 - (b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
 - (c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf. Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Program Director, Dr. W. Benoit by email wbenoit@ucalgary.ca.
 - (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call **220-5333** for assistance. Use any campus phone, emergency phone or the yellow phones located near the entrance of most parking lots.
 - (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPPA). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>
 - (f) **Student Union Information:** VP Academic Phone: 403 220-3911 Email: suvpaca@ucalgary.ca
SU Faculty Rep. Phone: 403 220-3913 Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca, science3@ucalgary.ca
Student Ombuds Office: 403 220-6420 Email: ombuds@ucalgary.ca; <http://ucalgary.ca/provost/students/ombuds>
 - (f) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, ***your cell phone should be turned off unless instructed otherwise***. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed during class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
 - (g) **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference - please participate in USRI Surveys.

SCIE 301 Course Learning Outcomes

This course is designed to improve the quality of scientific research and equip students with skills and knowledge needed to carry out quantitative studies. It is organized around the elements of research design and data analysis that cut across different disciplines in natural sciences. By the end of this course, students should be able to

1. Identify an area of research, formulate the scientific research questions and design appropriate and feasible research procedures for investigation
2. Compare and contrast different research methods and sampling techniques, select the optimal approach for specific research question and provide power calculation to decide the sample size
3. Select methods of measurement based on the sources and guide data collection and organization to accurately address the research question
4. Develop skills using the statistical software R to manage, prepare and summarize the data using descriptive statistics and graphs
5. Construct hypotheses based on the research questions, test them using statistical inferences and software given the samples, draw valid conclusions and interpret the results
6. Publicize research procedures and findings in reports, presentations, posters or papers to support programs to decision makers and other clients
7. Understand and critically evaluate your own findings and other scientific papers by the commonly used research designs and statistical techniques in natural sciences

Program Approval: Approved by the Program Director (W. Benoit)

Date: January 8, 2018

TENTATIVE LECTURE SCHEDULE FOR THE COURSE

Week	Topics and Activities
1. Jan 8 – 12	Introduction and Descriptive Statistics
2. Jan 15 – 19	Accuracy and Precision
3. Jan 22 – 26	Sampling Distribution <i>In-Class Quiz 1 on Tuesday January 23 (about 30 min)</i>
4. Jan 29 – Feb 2	Hypothesis Testing
5. Feb 5 – 9	Hypothesis Testing (continued) <i>In-Class Quiz 2 on Tuesday February 6 (about 30 min)</i>
6. Feb 12 – 16	Correlation and Regression
7. Feb 19 – 23	<i>Mid-Term Break (No Lectures)</i>
8. Feb 26 – Mar 2	Multiple Linear Regression <i>In-Class Midterm Examination on Thursday March 1 (about 75 min)</i>
9. Mar 5 – Mar 9	Multiple Linear Regression (continued)
10. Mar 12 – 16	ANOVA <i>In-Class Quiz 3 on Tuesday March 13 (about 30 min)</i>
11. Mar 19 – 23	Power of a Test and Sample Size <i>In-Class Quiz 4 on Thursday Mar 22 (about 30 min)</i>
12. Mar 26 – 30	Research Design
13. Apr 2 – 6	Research Design (continued) and Course Review <i>In-Class Quiz 5 on Thursday April 5 (about 30 min)</i>
14. Apr 9 – 13	<i>Group Project Presentation</i>
Apr 16 – 26	<i>Final Exam (2 hours, will be scheduled by the Registrar)</i>