Department of Mathematics & Statistics
Concordia University

STAT 468 (MAST 679/MAST 881), Sec. Q
Design of Experiments
Winter 2026

Instructor: Dr. D. Sen
Email: debaraj.sen@concordia.ca

Class Schedule: Tuesdays and Thursdays, 10:15-11:30.

Reading Week: No classes from March 2 to March 8, 2026.

Office Hours: Tuesdays, 13:30-15:00.

Prerequisite: STAT 360 previously or concurrently.

Text: *Design and Analysis of Experiments*, 10th Edition, by Douglas C. Montgomery (John Wiley, 2020).

Reference: *Linear Models* by S.R. Searle (John Wiley, 1971).

Objective: Design of experiments deals with efficient allocation of 'treatments' to experimental units to reduce experimental error variability in the response of interest and to provide valid, efficient, repeatable inference about the former. This course is an introduction to the basic principles, constructions and analysis of the commonly used, linear model-based, experimental designs. We shall first review the distributions and commonly used statistical test procedures for drawing statistical inference as well as model-validation of the standard designs. There will be theoretical as well as numerical problems in the assignments and exams.

Graduate students will be assigned additional assignments as well as exam problems, and additional reading material for self-study.

Assignments: There will be 5 assignments. Assignments are compulsory. Students are expected to submit electronic assignments as a PDF file through Moodle. **Late assignments will not be accepted.** Assignments contribute 15% to your final grade. Working regularly on the assignments is essential for success in this course.

Calculators: Only calculators approved by the Department (with a sticker attached as proof of approval) are permitted for the class test and final examination. For a list of Approved calculators see http://www.concordia.ca/artsci/math-stats/services.html #calculators.

Midterm Test: There will be one **midterm test,** based on the material of Weeks 1-6, which will contribute up to 25% to your final grade (see the **Grading Scheme** below). The midterm test will be held on **Thursday February 26, 2026, in class.** This exam, as well as the final, will be closed book exams.

NOTE: It is the Department's policy that tests missed for any reason, **including illness,** cannot be made up. Students who are unable to write the midterm test for a valid reason must write to their instructor to request a 85% final exam. Such a request will not be granted unless it is made in writing (by email), the reason is valid and is supported by documentation or other evidence. Valid reasons for missing a midterm test include: conflicts with other exams or religious observances (must be reported to the instructor in advance); illness (Short-Term Absence form required); bereavement. Students who miss the midterm test but do not request a 85% final, as described above, will forfeit the marks for the midterm test.

Final Exam: The final examination will be three hours long and will cover all the material in the course. To obtain a good grade, the student **MUST** show that she/he has a THOROUGH understanding of the subject and is good at problem-solving.

NOTE: Students are responsible for finding out the date and time of the final exams once the schedule is posted by the Examinations Office. Conflicts or problems with the scheduling of the final exam must be reported directly to **the Examinations Office**, **not to your instructor**. It is the Department's policy and the Examinations Office's policy that **students are to be available until the end of the final exam period. Conflicts due to travel plans will not be accommodated.**

Final Grade: The final grade will be based on the higher of (a) or (b) below:

a) 15% for the assignments,
25% for the midterm test,
60% for the final exam.

b) 15% for the assignments,
15% for the midterm test,
70% for the final exam.

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

IMPORTANT: **PLEASE NOTE THAT THERE IS NO '100% FINAL EXAM' OPTION IN THIS COURSE.**

Topics: **Review** (**Ch.1** and **Ch.2**); *selected sections from the following chapters*: experiments with a single factor: the analysis of variance (**Ch.3**); randomized blocks, Latin Squares and related designs (**Ch.4**); introduction to factorial designs (**Ch.5**); the 2^k factorial design (**Ch.6**); blocking and confounding in the 2^k factorial design (**Ch.7**); Two-level fractional factorial designs, (**Ch. 8**); Additional design and analysis topics for factorial and fractional factorial designs (**Ch. 9**).

For data-analysis problems we will use the software **R** that will be demonstrated during one or two classes. A freely downloadable version can be found at http://www.r-project.org. A useful reference is the book, *A first course in statistical programming with R*, 2nd Edition, by W. John Braun and Duncan J. Murdoch (Cambridge University Press).

Student Services
You may wish to access the many services available to you as a Concordia student. An overview of these resources can be found here: https://www.concordia.ca/students/services.html

Academic Integrity and the Academic Code of Conduct
This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: https://www.concordia.ca/conduct/academic-integrity.html" *[Undergraduate Calendar, Sec 17.10.2]*

Behaviour
All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the Code of Rights and Responsibilities which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in university activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

Intellectual Property
Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the Academic Code of Conduct and/or the Code of Rights and Responsibilities. As specified in the Policy on Intellectual Property, the

University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

Extraordinary circumstances

In the event of extraordinary circumstances and pursuant to the Academic Regulations the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the change.