Department of Mathematics & Statistics
Concordia University

STAT 468 (MAST 679/MAST 881), Sec. Q

Design of Experiments

Winter 2024

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Mode of delivery: **This course will be offered in person (Tue+Thu, 10:15 – 11:30). However, assignments will be posted on Moodle, and students will have to upload their solutions on Moodle as well.**

Office Hours: **Wednesdays, 16:00-17:30 in person**. Students can also send questions via email. **Note that the system does not allow one to reply to an email sent from Moodle. Thus, emails should be sent from one's own emailer, not Moodle.** Note, however, that if you missed a class it is not reasonable to expect your professor to cover the missed material for you.

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 so as 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 assignment as well as exam problems, and additional reading material for self-study.

Final Grade:

a) Assignments (4 or 5)	20%
b) Mid-term (***Thu 7 March 2024, in class***)	30%
c) Final	50%

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, AND THERE WILL BE NO MAKE-UP MID-TERM.** If you miss the Midterm for medical reasons (doctor's note required), your Final will count for 80%.

Topics: Review (**Ch.1** and **Ch.2**); s*elected 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**); response surface methods and designs (**Ch.11**). *Graduate students self-study*: Other topics on 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).

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.

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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.