**Department of Mathematics & Statistics**
**Concordia University**

> **MAST 324**
> Introduction to Optimization
> *Winter 2020*

**Course Instructor:**   Dr. N. Rossokhata, Office: LB 910 (SGW), Phone: 848-2424, Ext. 8018
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**Lectures:**   Tuesdays and Thursdays, 8:45–10:00 AM.

**Office Hours:**   Tuesdays and Thursdays, 10:30–11:30 AM.

**Text:**   *Operations Research: Applications and Algorithms*, by Wayne L. Winston, Brooks/Cole, 4th Edition.

**Calculators:**   Only calculators approved by the Department are permitted in the class test and final examination. The calculators are the **Sharp EL 531** and the **Casio FX 300MS**, available at the Concordia Bookstore.

**Assignments:**   Students are expected to submit assignments weekly during the last class of the following week. **Late assignments will not be accepted.** Some questions (but not all) will be marked. Solutions, together with this outline, will be posted electronically on the course's Moodle website, which is accessible through your portal.

**Mid-Term Test:**   There will be one mid-term test in week 7-8.
**PLEASE NOTE:** It is the Department's policy that tests missed for any reason, including illness, cannot be made up. If you miss a test, the Final Exam will count for 90% of your final grade.

**Final Examination:**   At the end of course, there will be a 3-hour closed book final examination.
**PLEASE NOTE:** Students are responsible for finding out the date and time of the final exam once the schedule is posted by the Examination Office. Any conflicts or problems with the scheduling of the final exam must be reported directly to the Examination Office, **not** to your instructor. It is the Department's policy and the Examination 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 the higher of (a) or (b):
(a) 10% Assignments, 20% Midterm test, 70% Final Exam.
(b) 10% Assignments, 90% 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.

**Topics to be covered:**

| Section | Topics |
| --- | --- |
| 3.1 | What Is a Linear Programming Problem? |
| 3.2 | The Graphical Solution of Two-Variable linear Programming Problems |
| 3.3 | Special Cases |
| 3.4 | A Diet problem |
| 3.5 | A Work Scheduling Problem |
| 3.8 | Blending Problem |
| 4.1 | How to Convert an LP to Standard Form |
| 4.2 | Preview of the Simplex Algorithm |
| 4.3 | Direction of Unboundedness |
| 4.4 | Why Does an LP have an Optimal bfs? |
| 4.5 | Simplex Algorithm |
| 4.6 | Using Simplex Algorithm to Solve Minimization Problems |
| 4.7 | Alternative Optimal Solutions |
| 4.8 | Unbounded LPs |
| 4.11 | Degeneracy and Convergence of the Simplex Algorithm |
| 4.12 | The Big M Method |
| 4.13 | The Two-Phase Simplex Method |
| 4.14 | Unrestricted in Sign Variables |
| 6.1 | A Graphical Introduction to Sensitivity Analysis |
| 6.2 | Some Important Formulas |
|  | Review |
|  | **Class Test (weeks 1 – 6)** |
| 6.3 | Sensitivity Analysis |
| 6.5 | Finding the Dual of an LP |
| 6.6 | Economic Interpretation of the Dual problem |
| 6.7 | The Dual Theorem and its Consequences |
| 6.8 | Shadow Prices |
| 6.9 | Duality and Sensitivity Analysis |
| 6.11 | The Dual Simplex Method |
| 7.1 | Formulating Transportation Problems |
| 7.2 | Finding Basic Feasible Solutions for Transportation problems |

| 7.3 | The Transportation Simplex Method |
| 7.4 | Sensitivity Analysis for Transportation Problem |
| | **Review** |

**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: concordia.ca/students/academic-integrity." *[Undergraduate Calendar, Sec 17.10.2]*