

MAST 331
Mathematical Modelling
Winter 2019

Instructor: Dr. N. Rossokhata, Office: LB 916 (SGW), Phone (514) 848-2424, Ext. 3260/3223
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Lectures: Mondays and Wednesdays, 14:45-16:00, Room H-631 (SGW).

Office Hours: Mondays, 16:15-17:45 and Wednesdays, 16:30–18:00, room LB 915-5.

Text: *Encounters with Chaos and Fractals*, by Denny Gulick, 2nd Edition, McGraw-Hill.

Suggested Textbook: *Chaos: A Mathematical Introduction*, by John Banks, Valentina Dragan, Arthur Jones, Cambridge University Press, 2003.

Course Content:

1. Periodic Points, Families of Functions, Bifurcations (Ch. 1).
2. One-Dimensional Chaos, Transitivity, Conjugacy, Cantor Sets (Ch. 2).
3. Two-dimensional Chaos, Dynamics of Linear and Nonlinear Functions, Henon Map (Ch. 3).
4. Fractals, Capacity Dimension, Lyapunov Dimension, Iterated Function Systems (Ch. 4).
5. Systems of Differential Equations, Linear and Almost Linear Systems, the Pendulum, the Lorenz System (Ch. 5).

Calculators: Only calculators approved by the Department (with a sticker attached as proof of approval) are permitted in the class test and final examination. The preferred calculators are the **Sharp EL 531** and the **Casio FX 300MS**, available at the Concordia Bookstore.

Assignments: Assignments are very important as they indicate the level of difficulty of the problems that students are expected to solve and understand them independently. Students are encouraged to use Maple or other such kind of software to do 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 Exam: 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) 20% for the assignments, 20% for the midterm test, 60% for the final.
or
(b) 10% for assignments and 90% for the final examination.

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.

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*]