

DETERMINISTIC OR MODELS (NON-SPECIALIST LEVEL) WINTER 2021

CO 327

CLASS SCHEDULE

Section	Location	Time	Instructor(s)
CO 327 041	None	midnight - midnight	Joseph Cheriyan jcheriya@uwaterloo.ca

INSTRUCTOR / TA INFORMATION

Please use the Piazza page of the course for discussion and queries:

(In general, please avoid E-mail for course matters, and instead, please post on Piazza. In case of emergencies, send E-mail to the instructor.)

TA: Salomon Bendayan (grad student, C&O department)

COURSE DESCRIPTION

Calendar Description for CO 327

An applications-oriented course that illustrates how various mathematical models and methods of optimization can be used to solve problems arising in business, industry, and science. [Offered: W,S]

Prereq: One of CO 227, 250, 255, 352. Antireq: CO 370

LEARNING OUTCOMES

By the end of this course students should be able to:

Formulate and solve LP (linear programming) models, Network Flow models, and IP (integer programming) models.

Apply Sensitivity Analysis of LPs, both by hand and using software.

Apply the cutting plane method and the branch-and-bound method for solving integer programs (such as the IP for the TSP).

Use software (e.g., Gurobi) for solving LPs and IPs of moderate size.

Apply Game Theory (if the topic is covered).

TENTATIVE COURSE SCHEDULE

Linear Programming Review	2 weeks
Linear Programming Formulations	2 weeks
Sensitivity Analysis	3-4 weeks
Network Flows	1-2 weeks
Integer Programming	2-3 weeks
TSP (Traveling Salesman Problem) and Cutting Planes	1-2 weeks
Game Theory (time permitting)	1-2 weeks

TEXTS / MATERIALS

Title / Name	Notes / Comments	Required
Course Notes (CO327/CO370)	PDF file posted on Learn	Yes
Lecture Videos	.mp4 files posted on Learn	Yes
Supplements/Handouts/Slides	PDF files posted on Learn	Yes
Gurobi software for solving linear/integer programs	Free academic license, instructions are posted on Piazza	Yes
CO250 Textbook "A gentle introduction to optimization"		Yes

CO327 covers a subset of the material from CO370, and covers some additional items (that are not covered in CO370).

Note: There will be considerable differences between the video-lectures versus what is in the course notes. Please do NOT use the course notes as a primary information source. The course will vary in many areas from what is in the course notes and will cover material not in the course notes.

Students are expected to view and study the lecture videos, read the course notes and handouts (supplements), take notes, and complete all assignments, quizzes, and tests, and to attend the weekly synchronous tutorials. This course is a continuation of CO 227 (or CO 250). All students are expected to review material from that course.

Students are expected to spend approximately 10-15 hours per week on this course. This includes viewing the lecture videos, reading the course notes, constructing and analysing examples and models, attempting and writing solutions to questions on assignments and quizzes.

Students having any difficulty can consult the instructor via Piazza, and the instructor will set up one-on-one meetings over Zoom or Microsoft-Teams, as needed.

STUDENT ASSESSMENT

Component	Value
Three (video-proctored) written tests	40% (Tests 1 and 2: 12.5%, Test 3: 15%)
Assignments (weekly, starting week of Jan.18-22) via Crowdmark	30%

Component	Value
Tutorials (weekly, starting Jan.18-22), Learn Quizzes, Written Quizzes	30%

There is no required project submission in this course, but students wishing to work on course projects should form groups of 2-3 students, and submit a project outline by Feb.12. If there is interest from the class, then further details on course projects will be posted on Piazza and Learn. Project grades could be used as an alternative to the Test grades (that is, the grade for the Test component will be replaced by the maximum of the Project grade and the Test grades).

ASSIGNMENT SCREENING

Assignment screening may be used. Details will be posted on Piazza & Learn, if screening is implemented.

ADMINISTRATIVE POLICY

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (https://uwaterloo.ca/academic-integrity/) for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](https://uwaterloo.ca/secretariat-general-counsel/node/100) (https://uwaterloo.ca/secretariat-general-counsel/node/100) . When in doubt, please be certain to contact the department’s administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. [Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (https://uwaterloo.ca/academic-integrity/) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](https://uwaterloo.ca/secretariat-general-counsel/node/97) (https://uwaterloo.ca/secretariat-general-counsel/node/97) . For typical penalties, check [Guidelines for the Assessment of Penalties](https://uwaterloo.ca/secretariat-general-counsel/node/131) (https://uwaterloo.ca/secretariat-general-counsel/node/131) .

Appeals: A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](https://uwaterloo.ca/secretariat-general-counsel/node/100) (https://uwaterloo.ca/secretariat-general-counsel/node/100) (other than a petition) or [Policy 71, Student Discipline](https://uwaterloo.ca/secretariat-general-counsel/node/97) (https://uwaterloo.ca/secretariat-general-counsel/node/97) may be appealed if there is a ground.

A student who believes he/she has a ground for an appeal should refer to [Policy 72, Student Appeals](#) (<https://uwaterloo.ca/secretariat-general-counsel/node/99>) .

Note for students with disabilities: [AccessAbility Services](https://uwaterloo.ca/disability-services/) (<https://uwaterloo.ca/disability-services/>) , located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.