CARLETON UNIVERSITY  
Department of Economics  

ECON 4004 A  Operations Research I  

Course Outline  

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Prerequisite  
The prerequisite for this course is ECON 1402 (or equivalent) with a grade of C- or higher, as outlined in the 2018-2019 Undergraduate Calendar. Students who believe that they have taken a similar background course or courses from another university must provide appropriate documentation to the Department of Economics Undergraduate Administrator, Amanda Wright (LA C875).

Introduction  
Linear programming, duality, sensitivity analysis, transportation and network problems. Both theory and a wide range of applications are studied.

ECON 4004 precludes additional credit for BUSI 2300 (no longer offered), MATH 3801, and SYSC 3200.

Organization  
The class will meet once a week at 11:35 a.m. on Fridays for a 2 hour and 50 minute lecture with a short intermission. (Please note that the final class for this course falls on Friday, November 30. The last day of classes for this term falls on Friday, December 7, but classes follow a
Monday schedule on this day. There will be four (4) required assignments and a final exam. The final exam will be scheduled by Examination Services during the regular final examinations period (December 9-21).

cuLearn and the Carleton email system will be used extensively as a means of communication with students. Therefore, students are strongly advised to access cuLearn and check their Carleton email at regular intervals in order to check for new information. To access cuLearn and the Carleton email system, students require a MyCarletonOne account. For questions about MyCarletonOne accounts, students should access carleton.ca/its/get-started/ (and then click on either New Students or New Grad Students, as appropriate) or contact the ITS Service Desk https://carleton.ca/its/contact/.

Academic Integrity
Please ensure that you are familiar with and comply with the Carleton University Academic Regulations as they apply to Academic Integrity: calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/academicintegrity/

Assignments
Assignments will be posted on cuLearn and will be due in class according to the following schedule:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Posted</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment #1</td>
<td>September 21</td>
<td>October 5</td>
</tr>
<tr>
<td>Assignment #2</td>
<td>October 5</td>
<td>October 19</td>
</tr>
<tr>
<td>Assignment #3</td>
<td>October 19</td>
<td>November 9</td>
</tr>
<tr>
<td>Assignment #4</td>
<td>November 9</td>
<td>November 30</td>
</tr>
</tbody>
</table>

Students may wish to work together on assignment material, BUT each student MUST write up their own assignments INDEPENDENTLY. In this connection, please be sure to read Section 14.3 of the Academic Regulations of the University in the 2018-2019 Undergraduate Calendar, especially with regard to plagiarism and unauthorized cooperation and collaboration. For further information on recognizing and avoiding plagiarism, see “Pammett on Plagiarism and Paraphrasing” at carleton.ca/economics/course/writing-preliminaries

Evaluation
The final % grade for this course will be calculated as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>40%</td>
</tr>
<tr>
<td>Final Examination</td>
<td>60%</td>
</tr>
</tbody>
</table>

(4 assignments each worth 10%)

This % grade will then be converted into the alphabetical grade system using the standard equivalences, as outlined in Section 2.3 of the Academic Regulations of the University in the 2018-2019 Undergraduate Calendar.
In the event that one or more assignments are not submitted, the weight of the missed assignment(s) will not be transferred to the final examination without a documented and compelling reason.

Students who do not write/attend the final examination because of illness or other circumstances beyond their control may apply to write a deferred examination. In order to write a deferred examination, students must contact the Registrar’s Office. (For further details, see Section 2.5 of the Academic Regulations of the University in the 2018-2019 Undergraduate Calendar.) In the event that a student writes a deferred examination, the deferred examination will carry the same weight as the final examination in determining the course grade. Needless to say, any deferred examination will not be identical to the original final examination.

Finally, please note that: “Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by an instructor may be subject to revision. No grades are final until they have been approved by the Dean.”

Requests for Academic Accommodation

**Pregnancy obligation**
Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: [carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf](carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf)

**Religious obligation**
Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: [carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf](carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf)

**Academic Accommodations for Students with Disabilities**
If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. [carleton.ca/pmc](http://carleton.ca/pmc) If you require accommodations for your formally scheduled exam(s) in this course, please submit your request for accommodations to PMC by Nov 9, 2018 for the Fall 2018 term.

**Survivors of Sexual Violence**
As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and is survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For
more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

**Accommodation for Student Activities**
Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf

For more information on academic accommodation, please contact the departmental administrator or visit: students.carleton.ca/course-outline

**Academic Assistance**
Students should be aware of and feel free to take advantage of the various services offered through the Centre for Student Academic Support (CSAS) https://carleton.ca/csas/

**Textbook**
The required textbook for this course is:


The accompanying Student Solutions Manual is highly recommended. It contains detailed solutions to a selection of questions from the textbook.

**Computer Package**
Use of the LINDO linear programming package will be an integral part of this course. A copy of LINDO is available on the CD-ROM which is bound in with the Winston textbook. (A trial copy of the LINDO package, which is sufficient for this course, can also be downloaded from the LINDO website.) Details will be given in class.

NOTE: There are several different software packages available on the Winston CD-ROM. You should be careful to install ONLY the LINDO package on your personal computer at this time. In order to do this, be sure to install LINDO by clicking on the setup.exe icon in the LINDO folder. Do NOT install all of the programs on the Winston CD-ROM. Further information will be given in class. (There is one program on the CD-ROM that may be required for ECON 4005. This program only has a 120-day evaluation period and you do not want to start this 120-day period prematurely.)

**Course Content**

1. Basic Linear Algebra, Winston Ch.2
2. Introduction to Linear Programming, Winston Ch. 3
3. Simplex Algorithm, Winston Ch. 4
4. Sensitivity Analysis and Duality, Winston Chs. 5 and 6
5. Transportation, Assignment, and Transshipment Problems, Winston Ch. 7
6. Network Models (Shortest Path, Critical Path Methods), Winston Ch. 8

IF YOU HAVE PROBLEMS WITH THIS COURSE, PLEASE LET ME KNOW!
IF I DON’T KNOW THAT YOU HAVE PROBLEMS, I CAN’T FIX THEM!