TOMS 5301 A
Modeling Business Decisions
Winter 2022 (W1)

Instructor:	Saroj Koul
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Office Hours:	Tuesday afternoons by appointment and online via ZOOM
Course Timings:	**TOMS 5301-A**: Tuesday, 8.35 am – 11.25 am
Class Meeting:	This course is being delivered *entirely online*. All students are expected to participate remotely via Zoom.
Learning Modality:	[**18** hours synchronous *(i.e., delivered in real-time);* 0 hours asynchronous] Students are required to have reliable, high-speed internet access, a computer (ideally with a webcam), and a headset with a microphone.

Course Calendar Description:
TOMS 5301 [0.25 credit]
Modeling Business Decisions: Quantitative methods for strategic, tactical, and operational business decision making. Optimization, simulation, project management, decision analysis, and multi-criteria analysis. Underlying ideas, model formulation, computer implementation, and analysis of model results, with applications from various business functions.

Course Description:
This course deals with some of the important quantitative methods for strategic, tactical, and operational business decision making. The course will help you develop problem-solving and decision-making skills. The decision modeling techniques studied here have been applied successfully in the problems of business, government, health care, education and many other areas.

The emphasis will be (1) on the understanding of the basic underlying ideas of the techniques, (2) on the applications of those ideas to management/business problems from various functions, (3) on model formulation and (3) on solving and analyzing the models using Excel. The unified approach of this course (minimal theory and more emphasis on applications) is intended to help you to understand how quantitative methods can be applied to practical problems so that you will be able to:

- Identify situations where Management Science techniques can be applied;
- Solve basic problems yourselves as managers;
- Communicate with specialists during the identification and solution stages of business problems.

The course introduces some of the important management science approaches in modeling systems for problem-solving and decision-making. The emphasis will be on optimization models, decision analysis and multi-criteria analysis.

Learning Objectives:
Upon completion of this course, students should:

1) Gain an understanding of the strategic role of modeling in managerial decision making and problem-solving and develop an appreciation of the entire modeling process from problem identification and formulation to solution development, implementation, and evaluation.
2) Recognize which cases are amenable to different types of analysis, what is required to find an optimal solution or even the best solution.
3) Develop an understanding of how to extract insights from management science models and use them to communicate, persuade, and motivate change.
4) Earn how to become an End-User modeller capable of structuring problems to effectively communicate with specialists/consultants or apply by themselves as decision-makers the management science thinking tools this course focuses upon to solve management/business problems;
5) Learn about the resources available to managers in modeling approaches and leverage this knowledge to solve real-life business problems.

Course organization
the format of the course consists of a mixture of lectures, exposing the relevant material, case discussions on specific applications of management science approach, and in-class problem-solving. Students are required to read the assigned reading materials prior to the respective class. Learning will be enhanced through a set of review problems assigned to practice some of the management science approaches discussed in class. The answers to these problems are not to be handed in but should assist in preparing for exams and in-class problem solving and discussion.

Course prerequisite: No prerequisites

Required Materials: Students are required to have reliable, high-speed internet access, a computer (ideally with a webcam), and a headset with a microphone.

Course Textbook(s):
Frederick S. Hillier and Mark S. Hillier: Introduction to Management Science: A Modelling and Case Studies Approach with Spreadsheets, fifth Edition, McGraw Hill Ryerson (Select Chapters)

Please note, you do not require to buy a textbook to succeed in our upcoming course. Following electronic resources are connected via ARES for your use. Either one of the chapters or their parts is required.

1. Applications of Management Science by Kenneth D. Lawrence and Dinesh R. Pai (2020) ARES
2. Optimization Modeling with Spreadsheets by Kenneth R. Baker (2015)
3. Applications of Operations Research and Management Science Case Studies by Murthy, GSR (2015) (ARES)
4. Management Science: The Art of Modeling with Spreadsheets by Kenneth R Baker and Stephen G Powell (2010) ARES
5. Operations research and management science handbook by Ravi Ravindran (2007) ARES

Also, a few related Textbooks listed below are available on RESERVE in the main Library.

1. Quantitative Analysis for Management by Barry Render and Ralph M. Stair Jr. et al. (13th Edition), Pearson Publication
2. An Introduction to Management Science with Spreadsheets by W. J. Stevenson, C. Ozgur, and A.L. Nsakanda, 1st Canadian Edition, McGraw Hill Ryerson, 2009

Case studies
We will use three (3) case studies in the course for group work. Each group (a three-member team) will be using the following cases.

Case Study -1: Appshop, Inc. by Samuel E Bodily and Eric Clark
Source: Darden Business Publishing (2 pages). Product #: UV0367-PDF-ENG

Case Study -2: Merton Truck Co. by: Anirudh Dhebar
Source: Harvard Business School (2 pages). Product #: 189163-PDF-ENG

Case Study -3: Merck & Company: Evaluating a Drug Licensing Opportunity.
Source: Harvard Business School (6 pages). Case No. 9-201-023.

The above three cases can be accessed through ARES for purchase. Please download the case studies in advance and prepare them before the session in which they are to be discussed.

USE OF SOFTWARE
You may use any software package which contains Management Science models, including Microsoft Excel.

Drop Course Policy: The deadline for academic withdrawal is the last day of classes in the term.

Grading Scheme:

Contribution to Class Discussion	**18%**
Problem solving exercises – Individual	**30%**
Case Analysis Presentation – Group-work	**20%**
Final Take-home – Group-work	**32%**
TOTAL	**100%**

Each component of your grade will be assigned a percentage score. Your final course grade will be a weighted average of each of these components.

Contribution to Class Discussion: (18%) Each session per day shall be rated at 3%. The general guidelines are: Make sure that all the required readings of the day are studied prior. Participate in class discussions as actively and constructively as possible. I will grade each student's participation per session. The continuum of the instructors' evaluation ranges from 0 to 3. The minimum possible mark for participation in each class discussion is 0, and the maximum is 3. Therefore, the total highest mark for participation in class discussions throughout the course is 18; the lowest is 0 (all sessions will be counted).

The instructor will evaluate your participation in class discussion by applying the following criteria:
1. Did the student participate in today's session discussion (other than the assigned role of case presenter or case discussant or solving a numerical problem - as there are separate marks assigned for that)?
2. Was there evidence that the student's participation in the discussion was based on his or her knowledge of the required readings? Did the student really read ALL readings assigned for a given class, or was the student's discussion based only on his or her experience and/or common sense?
3. Was the student's discussion appropriate and to the point?
4. Did the student contribute to class learning?

Class discussions provide an opportunity to manifest your creative abilities.

Group-Work: There will be 3 to 5 groups in the class, depending on class enrollment. Group details shall be available one week before the start of the class. Groups shall independently work out all the four case studies for which specific sessions are scheduled in the Course Schedule section.

- Case Analysis Presentation – Groupwork (20%) There will be three (3) short case studies discussed in the course. Each group will be making a case presentation or writing a reflection (three (3) slide PPT or two (2) page write-up/per case study) on the group's learnings. Marks will be based on group performance.

Approach: Cases are brief descriptions of a situation in which an organization finds itself at a point in time. Basically, they are a description of events, usually in chronological order. These events provide one source of information you will need to answer the questions posed. Another source is the lecture material and research articles discussed in the class. The group assignment's primary purpose is to identify the problem(s)/opportunities facing the organization and utilize theories and ideas you have learned in this course to decide how to solve those problems. You may feel uncomfortable making such decisions even after you have done a thorough analysis of all the information available. Some of what you consider key pieces of information may be missing, but this is part of everyday reality. Management decisions are never made based on complete information.

The cases will be discussed in class. You may be called upon to discuss some aspect of a case during the case discussion. You should come to class prepared to discuss any aspects of the problem(s)/opportunities in the case and of the decisions you make.

The following steps are a suggested framework. You can modify them as necessary:

1) Preview the Case - You may read rapidly or skim through the case, take notes, and jot down the essential ideas. Discover the parameters of the problem and keep in mind the questions that have been asked.
2) Read the Case – Once you have reviewed the case, read it in detail. While reading in detail, you should be looking for significant problems, variables, constraints, limitations, alternatives. Keep in mind the relevant literature that may help in solving the case. Note down the relevant points.
3) Identify the causes of the problem and the type of relationship between the problem and the causes.
4) Identify alternative solutions and try to determine what is the best solution.
5) Give a recommended solution and an implementation plan (action plan). The action plan should attempt to solve both present and future problems. Undesirable solutions that may occur in the future should also be addressed during this stage. Try to answer what, who, when and why. For example, what should be done, when it should be done, who should do it, and why should it be done. Give a clear rationale for the recommendation.
6) Conduct risk analysis. In other words, what things could go wrong if your client/organization implements your recommendations and how the organization can prepare for the least damage in case an unwanted situation occurs. What are the suggestions you can give to the firm for the smooth implementation of your recommendations?
7) Writing should be well organized, logical, clear and free of any grammatical or spelling mistakes. You must support statements with facts.

Group Approach: An interactive learning environment provides the maximum potential to explore and truly grasp the course material. To facilitate interactive discussion groups (each with four members) will be formed. It will be necessary for the groups to meet outside of class (in Zoom break-out rooms) to discuss the case analyses. Also, during class, groups may be given topics for discussion and small tasks to

accomplish. Good group dynamics are essential. You are strongly advised to speak to the instructor about group problems as soon as they arise, rather than waiting until it is too late. Instructors will do their best to help mediate group problems as needed.

The Sprott School of Business encourages group assignments in the school for several reasons. They provide you with opportunities to develop and enhance interpersonal, communication, leadership, followership and other group skills. Group assignments are also suitable for learning integrative skills for putting together a complex task. Before embarking on a specific problem as a group, it is your responsibility to ensure that the problem is meant to be a group assignment and not an individual one.

Problem solving exercises (30%) – This shall be based on the individual effort and submission of the numericals assigned (5x6) on a weekly basis. Marks will be based on group performance.

Final Take-Exam Exam (32%) The exam shall be held in class on **March 1, 2022 (8.30 AM – 11.30 AM).** The structure of the exam and examples will be provided. The goal of the exam is to test the knowledge acquired during the course. The release of the exam will be on Saturday, February- 26, 8.30 Hrs. Questions will be asked from the material covered in the class, including cases, simulation exercises, class notes and readings. The format of the examination may consist of short essay questions, qualitative and quantitative, writing a short-concept based case-study, or even analyzing and presenting a mini-case (analyzing and make recommendations).

Late Assignments:
To ensure fairness for all students, penalties will be applied. As a presence in all the six sessions is essential, missing a session means no marks, especially group work. Requests for an extension (for Final Take-home) will be considered in cases of illness, family emergency, or other exceptional circumstances.

Preparation and Participation:

The format of the course consists of a mixture of lectures, exposing the relevant material, case discussions on specific applications of the management science approach, and practicing problem-solving numericals.. Students are required to read the assigned reading materials prior to beginning of the class. These will be useful in group settings as you work on the case analysis and simulation exercises. The Zoom class sessions are expected to be interactive, and class participation from each participant is expected and encouraged. Due to time constraints, not all chapter material will be covered in class. Students are responsible for the entire content of each chapter of the textbook and all additional topics discussed in class, except for those areas specifically excluded by the instructor.

COURSE SCHEDULE

Session	Topics	Readings/Assignments
1st (Jan-11)	Introduction to Business Modeling with Management Science approaches. Linear Programming – Formulation, Graphical Method, Sensitivity Analysis	Handout and Class notes available Practice Problems
2nd (Jan-18)	Simplex Method - Formulation, different Models, using MS Excel Solver.	Handout and Class notes available Practice Problems • Case- Merton Truck Company
3rd (Jan-25)	Simplex Method - Formulation, different Models, using MS Excel Solver. (continued) Integer Linear Program (ILP)	Handout and Class notes available Practice Problems
4th (Feb-1)	Integer Linear Program (ILP) (continued) Transportation and Assignment	Handout and Class notes available Practice Problems • Case – Merck & Company
5th (Feb-8)	Decision Analysis – Different Models, Decision Trees, Multi Criteria Decision Making	Handout and Class notes available Practice Problems • Case – Appshop Inc.
6th (Feb-15)	Scheduling Projects Introduction to Simulation	Handout and Class notes available Practice Problems
7th (March-1)	End-term Exam	during Class Timings

Contribution to Program Learning Goals (MBA):

MBA Learning Goal	Not Covered	Introduced	Taught but Not Assessed	Taught and Assessed
MB1 Leadership and Collaboration *Graduates will be equipped for leadership and collaboration.*			✓	
MB2 Communication *Graduates will be effective communicators*				✓
MB3 Critical Thinking and Problem Solving *Graduates will be skilled in critical thinking and problem solving.*				✓
MB4 Functional Knowledge *Graduates will have functional knowledge of all areas of business.*			✓	
MB5 Global Business *Graduates will have an appreciation of the global environment of business.*				✓
MB6 Ethical Reasoning *Graduates will be skilled in ethical reasoning and decision-making.*			✓	

ADDITIONAL INFORMATION

Course Sharing Websites:

Materials created for this course (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).

Letter Grades:

In accordance with the Carleton University Undergraduate Calendar (p 34), the letter grades assigned in this course will have the following percentage equivalents:

A+ = 90-100	B+ = 77-79	C+ = 67-69	D+ = 57-59	F = Below 50
A = 85-89	B = 73-76	C = 63-66	D = 53-56	
A - = 80-84	B - = 70-72	C - = 60-62	D - = 50-52	

Grades entered by Registrar: WDN = Withdrawn from the course DEF = Deferred

Academic Regulations:

University rules regarding registration, withdrawal, appealing marks, and most anything else you might need to know can be found on the university's website, here:
http://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/

Requests for Academic Accommodation:

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

- **Pregnancy**
  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: https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

- **Religious Obligations**
  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: https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

- **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 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. https://carleton.ca/pmc/

- **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 its 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: https://carleton.ca/sexual-violence-support/

- **Student Activities**
  Carleton University recognizes the substantial benefits, to both the individual student and the university, that result from participating in activities beyond the classroom experience. Reasonable accommodation will 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: https://students.carleton.ca/course-outline/

Academic Integrity:

Violations of academic integrity—presenting another's ideas, arguments, words or images as your own, using unauthorized material, misrepresentation, fabricating or misrepresenting research data, unauthorized co-operation or collaboration or completing work for another student—are a serious academic offence, weaken the quality of the degree, and will not be tolerated. Penalties may include; a grade of Failure on the submitted work and/or course; academic probation; a refusal of permission to continue or to register in a specific degree program; suspension from full-time studies; suspension from all studies at Carleton; expulsion from Carleton, amongst others. Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy which is available, along with resources for compliance at: https://carleton.ca/registrar/academic-integrity/

Centre for Student Academic Support:

The Centre for Student Academic Support (CSAS) is a centralized collection of learning support services designed to help students achieve their goals and improve their learning both inside and outside the classroom. CSAS offers academic assistance with course content, academic writing and skills development. Visit CSAS on the 4th floor of MacOdrum Library or online at: https://carleton.ca/csas/

Other Important Information:

- Students must always retain a hard copy of all work that is submitted.
- All final grades are subject to the Dean's approval.
- For us to respond to your emails, we need to see your full name, CU ID, and the email must be written from your valid CARLETON address. Therefore, in order to respond to your inquiries, please send all email from your Carleton cmail account. If you do not have or have yet to activate this account, you can do so by visiting https://carleton.ca/its/get-started/new-students-2/