Modelling for Decision Support
Wood 492 - Fall 2016

Instructor: Dr. Taraneh Sowlati

Contact Info: I have an open door policy and would be happy to help students outside the classroom. My contact info:
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Lectures: Monday, Wednesday 11:30 – 13:00 (FSC 2964)
Lab: Friday 11:00 – 13:00 (FSC 1404, 1406)

Teaching Assistant: Krishna Malladi
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Useful books and references:
- Williams, H.P. Model Building in Mathematical Programming. Fifth Edition. Wiley. 2013. UBC Library ebook.
- Ramamurthy P., Operations Research, New Age International Publisher, 2007, Available online: http://site.ebrary.com/lib/ubc/detail.action?docID=10367718
- Dykstra, D.P. Mathematical Programming for Natural Resource Management. McGraw-Hill. 1984.
- Winston, W.L., Operations Research: Applications and Algorithms, Third Edition, ITP, 1994.

Calendar Description
Applications of mathematical modeling, optimization, and simulation in forest planning and manufacturing; formulating models and interpreting results for decision support.

Course Objective
The main objective of the course is to introduce the concepts and techniques of mathematical programming and their applications in forestry. The main emphasis is on developing suitable models, using proper tools to solve them, and analyzing and presenting the results for decision making.

Learning Outcomes:
Upon successful completion of this course, students will have the skills to:
- Develop and solve mathematical models (linear programming, integer programming, mixed integer programming, and multi-objective programming models) to optimize forest planning and wood manufacturing activities
- Conduct sensitivity analysis to determine the impact of changes in model's parameters on the final solution
- Incorporate uncertainty into decision making models using Monte Carlo Simulation

Course Organisation

There will be a mid-term and a final exam on the material presented in the course, including the readings, and class discussions/presentations. To pass the course, students need to pass the final exam, in case they fail the final exam, their course mark will be the same as their final exam mark. All the lecture notes are available for downloading from http://wood492.forestry.ubc.ca**.** This will save you most of the note taking, but will require that you take an active part in the classroom dialogue.

Class Participation

In order to succeed in this course, students need to be actively engaged in class discussions and activities, and facilitate the learning of others. Class attendance is mandatory.

Weekly Lab assignments

The lab section provides practical application of the lecture material to decision support problems. Students will develop and solve mathematical programming and simulation models to support decision making process. Lab assignments are normally completed during the lab sessions. Due to space limitation in the computer lab, assignments will be done in groups of two. Lab attendance is required.

Case study and presentations

Students will work in groups and give a presentation during the class. The details and requirements will be handed out to students and explained in the class.

Late submission policy

Please note that when a deadline is set for the submission of lab assignments, you must submit them on or before that deadline or there will be a significant penalty, 30% off!

Grading

Class/lab participation	10%
Assignments	25%
Case study and presentation	15%
Mid-term	20%
Final Exam	30%

Tentative schedule

Week	Starting	Topics	Important Notes
1	Sept. 5	Introduction to the course - Course syllabus and expectations Introduction to operations research and decision support systems	Friday Sept. 9: No lab
2	Sept. 12	Linear Programming - Develop models - Solve LP models with 2 variables graphically - Use Excel Solver to solve LP models	
3	Sept. 19	Dual Model Sensitivity Analysis - Shadow prices - Range of feasibility - Range of optimality	
4	Sept. 26	Applications of LP	

		- Timber harvest scheduling optimization (Model I)	
5	Oct. 3	Applications of LP - Veneer production	Case study presentations
6	Oct. 10	Presentations Review	Case study presentations Oct. 14: Review before mid-term
7	Oct. 17	Integer Programming Accessory Variables	Friday Oct. 21: Mid-term
8	Oct. 24	Network Models - Transportation - Assignment	Oct. 24: Guest speaker Case study presentations
9	Oct. 31	Network Models - Minimum Spanning Tree - Shortest Path - Maximum Flow	Case study presentations
10	Nov. 7	Multi-Objective Models - Goal programming	Case study presentations
11	Nov. 14	Simulation - Monte Carlo Simulation and uncertainties in models	Case study presentations
12	Nov. 21	Guest Speaker/Other models (if time permits)	Nov. 23: Guest speaker Case study presentations
13	Nov. 28	Review	