Applied problem solving via computer programming

Schedule and course plan version 2009-09-14

WITH SCHEDULE CORRRECTIONS!

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Practical information:

If nothing else is explicitly stated, all lectures take place in the seminar room of the department of forest economics, SLU, Umea. We apply "academic quarters", which means that the meetings start 15 minutes after the hours stated in the schedule. During the course, we will use software that can be downloaded free of charge from the internet. It is suggested that you already before the course starts, download and install the latest free student version of the software "LINGO" that can be found here: http://www.Lindo.com .
(Please beware of the fact that "LINGO" is the software that you should download and install, not the software "LINDO".)
(During the course, we will also use several other types of programming software. Details will be available later.)

Schedule:

Tuesday	September 1	13 – 15	(L1)
Tuesday	September 8	13 – 15	(L2)
Wednesday	September 16	13 – 15	(L3)
Wednesday	September 23	13 – 15	(L4)
Tuesday	September 29	13 – 15	(L5)
Tuesday	October 6	13 – 15	(L6)
Monday	October 12	13 – 15	(L7)
Tuesday	October 27	13 – 15	(L8)
Friday	October 30	13 – 15	(T1)

Course documents, lectures and similar:
http://www.lohmander.com/Kurser/Kurser.htm

Postgraduate Courses

PFG0035 Applied problem solving via computer programming, 7.5 HEC

Application Code	Deadline	Subject
P0013	24 August 2009	Economy
Location	**Distance**	**Language**
Umeå	No	English

Time 1 September - 30 October 2009, 55%, daytime

Application and Further Information
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Prerequisites
Participants should have some knowledge of calculus, linear and nonlinear optimization before the course starts.

Objective
After the course, the participants should have:
- fundamental knowledge of numerical methods and connected computer programming.
- ability to apply these methods to new research problems from current research projects.
- ability to correctly and efficiently present and discuss relevant problem descriptions, model definitions, solution approaches, model results and interpretations.

Content
- Fundamental principles and algorithms of numerical methods, useful in order to analyse dynamic developments and to find equilibria and optima in typical applied research problems.
- Fundamental computer programming with focus on applications of numerical methods and applied research problems.
- Case studies where alternative numerical methods are used in combination with new computer codes developed by the course participants.
- Seminars with discussions of the case studies.

Examination
Written exam and seminar presentation of a case study.

Literature
Winston, W.L., Operations Research, Applications and Algorithms, Duxbury Press, International Thomson Publishing, ISBN 0-534-20971-8, 2004.

Software development manuals etc.

Additional Information
Time period: September - October 2009. Between the lectures, the course participants study the literature and solve problems.

Course Organiser
Department of Forest Economics

Links:

http://www.Lohmander.com

http://www.slu.se/?id=546&Utokad=0

PFG0035 Applied problem solving via computer programming, 7.5 HEC
http://www.slu.se/?id=547&Anmkod=P0013.0910

PFG0016 Optimization in dynamic and stochastic decision problems, 7.5 HEC
http://www.slu.se/?id=547&Kurskod=PFG0016

PFS0017 Forest Economics, 7.5 HEC
http://www.slu.se/?id=547&Kurskod=PFS0017

Lectures:

This is a preliminary description. Input from the course participants may change the optimal design of the list.

L1
Introduction to applied problem solving via computer programming:
Motivation, central ideas and examples of problems where the approach is necessary
A preliminary contact with useful software (LINGO and EXCEL in combination)
Equation systems, applications and solutions via software. Introduction to sets, matrixes and data lists.

L2
Linear programming. (Linear objective function and linear constraints.) General theory, application examples, analytical solutions and numerical solutions via computer programming.

L3
Linear programming with binary and integer constraints. General theory, application examples, analytical solutions and numerical solutions via computer programming.
Search for optimal solutions in problems or low dimensionality where you can not solve the optimization problem via a linear equation system of first order conditions. Low level programming and application of fundamental numerical methods. Introduction to low level programming software.

L4
Quadratic programming and other multi dimensional nonlinear programming. Focus on problems with concave objective functions and convex feasible sets. General theory, application examples, analytical solutions and numerical solutions via computer programming. Regression and curve fitting with flexible nonlinear functions, different constraints and objective functions.

L5
Quadratic programming and other multi dimensional nonlinear programming in combination with looping. General theory, analytical solutions and numerical solutions via computer programming. Portfolio theory according to Markowitz with applications.

L6
Deterministic dynamic programming. General theory, application examples, analytical solutions and numerical solutions via computer programming.

L7
Stochastic dynamic programming. General theory, application examples, analytical solutions and numerical solutions via computer programming.

L8
Dynamic game theory. General theory, application examples, analytical solutions and numerical solutions via computer programming.

T1
Test.