Department of Mathematical Sciences
CARNEGIE MELLON UNIVERSITY

OPERATIONS RESEARCH II 21-393

Professor A.M.Frieze,
Wean Hall 7202, x8476, alan@random.math.cmu.edu

1. COURSE OBJECTIVES
(i) To develop and extend the students knowledge of mathematical techniques underlying the application of Operations Research.
(ii) To give experience of working in a group on a project.

2. COURSE TEXT
There is no required book for the course. There are a number of books which cover much of the material, none of which are recommended.

1. Introduction to Operations Research,
by F.S.Hillier and G.J.Liebermann, (published by McGraw-Hill).
2. Operations Research: Applications and Algorithms,
by W.L.Winston, (published by P.W.S. Kent).
3. Principles of Operations Research,
by H.M.Wagner, (published by Prentice-Hall).

3. TOPICS
I will make a selection from the following:
1. **Linear Programming**
Duality and Dual Simplex, Sensitivity Analysis and Parametric Programming, Simple Upper Bounds, Interior Point methods, Two-Person Zero-Sum Games.
2. **Integer Linear Programming**
Formulations, 0-1 Programming, Cutting Planes and Branch and Bound.
3. **Combinatorial Optimisation**
Shortest Paths, Assignment, Minimum Spanning Trees, Network Flows, PERT/CPM, Machine Scheduling, NP-Completeness, Heuristics.
4. **Non-Linear Programming**
Karush, Kuhn-Tucker Conditions, Quadratic Programming.
5. **Inventory Theory**
6. **Markov Decision Processes**
7. **Markowicz Model in Mathematical Finance**

4. THE PROJECT

The class will be partitioned into working groups of three/four students. These groups should be formed voluntarily. If necessary, I will make assignments. Each group will work together on a short project which it will research, write a paper on and make a presentation to the class near the end of the semester. Examples of previous projects are obtainable from Dr. Walker. It will be your responsibility to think of a project. I will vet your ideas for suitability and practicality.

The evaluation of the project will be based on the following factors:

- the degree to which the project demonstrates the group's ability to abstract a problem into mathematical form and to employ the appropriate solution techniques.
- the degree to which the group demonstrates professional writing and presentation skills.

Suggested schedule for carrying out project:

Activity	**Target Date for Completion**
Form small group 3/4 students	September 4
Settle on idea for project	September 29
Finish research	November 17
Finish write-up	December 1

5. GRADING SYSTEM

There will be an initial set of homeworks, amounting to approxmately one quarter the normal load for a one semester course. There will also be two tests.

Project	50%
2 Tests	20% each
Homework	10%

There will be no written final. The tests will be open book and notes.

6. CLASS SCHEDULE

Lectures MWF 10.30 - 11.20 in DH 1211.
Tests September 30, October 21.

7. OFFICE HOURS

MTWThF 9.30 - 10.00 in WEH7202.