

Module Code	Module title		Module Leader	Credit value
MA3908	Applied Risk and Optimisation in Financial Planning		Prof. J.E Beasley	20
Level	Pre-requisites	Co-requisites	Additional Tutors	School(s) responsible for teaching
3	MA2989	None		Information Systems, Computing and Mathematical Sciences

Date syllabus written or revised: Aug 2006 (revised)

MAIN AIMS OF THE MODULE

To introduce students to advanced modelling techniques in linear and integer programming (LP/IP) and their investigation using an industrial software package and to analyse and investigate cash flow streams using software. To introduce students to the concepts of optimum allocation of financial resources under uncertainty. To familiarise the students with the basic issues of financial planning and with the models that provide mathematical descriptions of these investment problems and to introduce financial risk measures and illustrate how they can be incorporated in financial planning models.

LEARNING OUTCOMES FOR THE MODULE

The module provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas:

(A) Knowledge and Understanding

On successful completion of this module, students will be able to:

1. formulate structured financial planning models;
2. investigate and analyse the solutions of financial planning models;
3. apply decision analysis to problem of uncertainty;
4. represent risk and uncertainty in financial planning problems.

(B) Cognitive (thinking) Skills

On successful completion of this module, students will be able to think clearly and systematically about a range of decision problems.

(C) Other Skills and Attributes (Practical/Professional/Transferable)

On successful completion of this module, students will have gained practice in the use of Excel, together with Solver.

MAIN TOPICS OF STUDY:

LP/IP MODELLING SYSTEMS: structured anatomy of modelling systems; model management, solution reporting and documentation; application developed using a software package; interpreting and analysing solutions using the software package; multi-objective and goal programming formulations; modelling techniques using (0-1) variables; capital budgeting and fixed charge problems.

DECISION MAKING UNDER UNCERTAINTY: the maximin criteria, the maximax criteria, the minimax regret, the expected value criteria, utility theory, decision trees.

SINGLE-PERIOD RANDOM CASH FLOWS: optimisation under uncertainty; formulation of quadratic programs; the Capital Asset Pricing Model; arbitrage pricing theory.

MULTIPERIOD ASSET ALLOCATION DECISION MAKING: multi-period asset allocation model; two stage stochastic programs; multistage stochastic programs; asset liability management models.

RISK MODELS: models of randomness and scenario generation; extreme value theory; risk measures; risk modelling in financial planning models.

TEACHING AND LEARNING METHODS/STRATEGIES USED TO ENABLE THE ACHIEVEMENT OF LEARNING OUTCOMES: these might include lectures, seminars, tutorials, practicals, workshops, laboratories, distance learning, projects or other methods (*please specify*).

The theory and principles are presented in formal *lectures*. *Example classes* are used to support the application of the methodologies using exercises. The *computer workshops* are used to introduce and develop the *MPL* models and *Excel* add-in functions for finance.

The University expects student learning hours to be a notional 10 hours per credit awarded (i.e. a 20 credit module would involve notional learning time of 200 hours) including taught classes, private study, revision and assessment. The University does not provide guidelines on the minimum number of contact hours per module because patterns of study, including the ratio of contact hours to self-study hours, are likely to vary across levels as learner autonomy increases.

Please indicate below the distribution of learning hours across this module:

Lectures: 36 hours
 Seminars/problem classes: 8 hours, Computer Workshop: 24 hours
 Class tests and examination: 5 hours
 Private study: 127 hours

These figures are to be used as a guide and can be varied as the module leader and students think appropriate.

ASSESSMENT METHODS WHICH ENABLE STUDENT TO DEMONSTRATE THE LEARNING OUTCOMES FOR THE MODULE:

WEIGHTING:

Continuous assessment consisting of a class test (10%) and a modelling assignment (20%).

30%

A three hour (plus five minutes reading time) unseen written examination.

70%

The examination tests LO1/3/4. The class test examines LO1/4. The modelling assignment tests LO2/3/4.

INDICATIVE READING LIST:

1 ESSENTIAL READING [* Purchase advised]

2 RECOMMENDED READING

<i>Introduction to operation research</i> (8 th eds.), FS Hillier, GJ Liebermann, McGraw-Hill, 2004	T57.6.H55
<i>Model Building in Mathematical Programming</i> (4 th eds.), HP Williams, Wiley, 1999	T57.7.W55
<i>Investment Science</i> , DG Luenberger, OUP, 1998	HG4515.2.L84
<i>Portfolio Selection: Efficient Diversification of Investments</i> (2 nd ed.), HM Markowitz, B Blackwell, 1991	HG4539.M37

3. OTHER

<i>Operations Research: Applications and Algorithms</i> (4 th ed.), WL Winston, Duxbury, 2004	T57.6.W575
<i>Operations Research. An Introduction</i> (7 th ed.), HA Taha, Prentice-Hall, 2002	T57.6.T34

The following information is optional:

CORE module on the following programmes (please list):	Financial Computing
OPTION module on the following programmes (please list):	