

BN2290 – OPERATIONAL RESEARCH 1

Module Number: BN2290

Module Title: Operational Research 1

Number of Aston Credits: 10

Total Number of ECTS Credits: 5
(European Credit Transfer)

Staff Member Responsible for the Module:

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Availability: Please see office hours on door or group administrator, John Morley, ABS266, Extension 3236

Pre-Requisite(s) for the Module: BN1105 - Quantitative Techniques
BN1106 - Business Decision Analysis

Module Learning Outcomes:

Upon successful completion of the module students will be able to:

- Develop a general understanding of the Operational Research (OR) approach to decision making.
- Understand the basic ideas behind each analytical tool, which is important for the reality check and sensitivity analysis of the obtained solution.
- Use basic terminology of the presented techniques, which will in turn enable you to easily understand and use any related software tools.
- Identify best techniques to solve a specific problem.
- Make your own conclusions as to how to modify the learned techniques or where and how to find help when faced with more complex problems.
- Put practical problems through the language of mathematics down to the language of the computers.
- Make the knowledge transfer in the opposite direction as well, that is to know how to interpret and discuss the results on the practical level.

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Module Content:

- Week 1 **Introduction.** Mathematical models and optimization techniques: basic issues and introduction to some frequently used techniques.
- Weeks 2-5 **Mathematical Programming:** linear and integer programming, shadow prices and opportunity costs, examples using linear programming in transportation and assignment problems.
- Weeks 6-7 **Network Analysis:** shortest route problem, minimal spanning tree and maximal flow problems.
- Weeks 8-9 **Dynamic Programming:** basic principles and concepts, examples: shortest route problem and knapsack problem.
- Week 10 **Mathematical Modelling in practice:** Case study based discussion and group presentations.
- Week 11 **Revision lecture.**

International Dimensions:

Problems and Data from international sources are used where appropriate to illustrate the modelling techniques.

Corporate Connections:

Looking into a specific problem of how Network Modelling was used in making optimal allocation of DVDs to the on-line DVD rental customers: “Cinema Paradiso” case study. Throughout the module, case studies from different areas and many examples of real world applications are used to demonstrate the usefulness of the mathematical modelling. Although the example real world problems will be extensively used in the module, their main purpose will be to clarify the theoretical concepts learned.

Links to Research:

The module covers basic principles of mathematical and statistical modelling within a business context. These are all well established principles where the core material is not affected by new research in the area. However, examples of novel applications of these principles within a business context will be briefly discussed in the classroom.

Learning and Teaching Rationale and Methods:

- a) Method of learning – Lectures and tutorials

There will be one lecture and one tutorial each week. Tutorials may occasionally take place in a computer lab to enable you to familiarise yourselves with Operational Research software.

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b) Composition of learning hours

Contact and directed learning

Lectures & Tutorials	22 hours
Examination	3 hours

Indirect learning

Tutorial preparation	15 hours
Group Coursework preparation	15 hours
Case Study	10 hours
Exam revision	20 hours
Reading	15 hours

Total **100 hours**

Ethical Approval:

No ethical approval will be necessary for this module.

Assessment and Feedback Rationale and Methods:

Assessment is via Group Coursework (20%), Class Test (10%), In-class discussion and presentation on Case Study (10%) and the Final Examination (60%).

Group Coursework will assess your ability to formulate a mathematical model to describe a realistic business problem, solve the problem using suitable software and produce a report, which clearly communicates your findings and includes sensitivity analysis. Feedback regarding your performance will be returned through coursework feedback sheets.

Class Test in Week 8 will serve as an opportunity to monitor your learning success and to obtain a very quick feedback relating to the knowledge acquired within the first 7 weeks of the module.

In-class discussion on a case study will take place every week during tutorial hours. Discussion finale together with the presentation of final solutions will take place in Week 10. The case study is based on a real problem that contains and illustrates many issues an analyst is frequently faced with in real world mathematical modelling.

The Examination (Week 12/13) is an open book exam. It will test knowledge and understanding of all the material covered in the module.