Course Outline MCDM

Title: Multiple Criteria Decision Making (MCDM)
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Prerequisite
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Overview Main; Master of Industrial Engineering: Socio-economics System Engineering (e-learning)

Goal
The purpose of this course, is an introduction with the concepts, tools and techniques of decision making under multiple criteria. The course consists of two main parts. In the first part, the multi-attribute decision making techniques and tools are introduced. In particular, the AHP method is discussed in detail. The second part introduces multi-objective operational research models and methods for their solution are explained.

Objectives

Knowledge or Comprehension Objectives
1- Introduction to MCDM Concepts
2- Introduction to Group Decision Making

Skills Objectives
1- Using the Tools and Techniques of MADM
2- Modeling and Solving of MODM problems
3- Using the Structural Modeling
4- Productivity Measurement by DEA

Attitude Objectives
1- Understand the logic of MADM Methods
2- Understand the Optimality Concept in MODM

Materials
Expert Choice
Super Decision
Lingo
MATLAB

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<th>Subject</th>
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<td>Basics and Principles of MCDM</td>
<td>Basic Concepts of Decision Making Problem Structuring MCDM Categories</td>
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<td>Basics of MADM</td>
<td>Constructing the Decision Model Normalization Method Weight Assignment Methods Preference Modeling Elementary Methods(Maximin,Maximax, …)</td>
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<td>MAVT &amp; MAUT</td>
<td>MAVT Method SAW and WP Methods</td>
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| 4 | MAVT & MAUT | Permutation Ranking Method  
MAUT Method |
|---|---|---|
| 5 | AHP Method | Basics and Principles of AHP  
Design Hierarchy and Make Judgments  
Methods to Calculate Relative Weights |
| 6 | AHP Method | Calculating Total Weights  
Measuring Inconsistency  
Introduction to "Expert Choice" |
| 7 | AHP Method | ANP Method  
Introduction to "Super Decision" |
| 8 | Distance Based Methods | TOPSIS Method  
VIKOR Method |
| 9 | Outranking Methods | PROMETHEE Method  
ELECTRE Method |
| 10 | Group Decision Making | Voting Methods  
Social Choice Functions |
| 11 | DEA Method | CCR Model  
BCC Model |
| 12 | Structural Models | ISM  
DEMATEL  
FCM |
| 13 | Basics of MODM | MODM Concepts  
KKT Conditions in MODM |
| 14 | MODM Solving Methods | Multi-objective Simplex Method  
Categorization:  
- No Preference Methods: Method of the Global Criterion  
- A Priori Methods: Goal Programming |
| 15 | MODM Solving Methods | Categorization (Cont.):  
- A Posteriori Methods: Weighting Method and $\varepsilon$-Constraint  
- Interactive Methods: ISWT method |
| 16 | MODM Solving Methods | Evolutionary Algorithms for Solving MODM (MOEA) |
| 17 | Other MODM Models | Multi-Stage MODM  
Multi-Level MODM |

**References**

**Primary References**

1. Additional References
### Classroom Methods
1. Research: Present and Analysis an ISI Paper in MCDM Topic
2. Book Present: Present one chapter of the latest books in e-business models

### Evaluation
- Final Exam: 60%
- Quiz & Take-home: 15%
- Research: 25%