 Course Outline MCDM

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| Title: Multiple Criteria Decision Making (MCDM) |
| Lecturer: M.R. Gholamian Tel: 5067 e-Mail: Gholamian@iust.ac.ir Department: Industrial Engineering |
| Prerequisite--- |
| Overview Main; Master of Industrial Engineering: Socio-economics System Engineering (e-learning)  |
| GoalThe 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 Objectives1. Introduction to MCDM Concepts
2. Introduction to Group Decision Making

Skills Objectives1. 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 Objectives1. Understand the logic of MADM Methods
2. Understand the Optimality Concept in MODM

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| MaterialsExpert ChoiceSuper Decision LingoMATLAB |
| Table of Contents | Subject | Week |
| Basic Concepts of Decision MakingProblem StructuringMCDM Categories | Basics and Principles of MCDM | 1 |
| Constructing the Decision ModelNormalization MethodWeight Assignment MethodsPreference ModelingElementary Methods(Maximin,Maximax, …)  | Basics of MADM | 2 |
| MAVT MethodSAW and WP Methods | MAVT & MAUT | 3 |
| Permutation Ranking MethodMAUT Method | MAVT & MAUT | 4 |
| Basics and Principles of AHPDesign Hierarchy and Make JudgmentsMethods to Calculate Relative Weights | AHP Method | 5 |
| Calculating Total WeightsMeasuring InconsistencyIntroduction to "Expert Choice" | AHP Method | 6 |
| ANP MethodIntroduction to "Super Decision" | AHP Method | 7 |
| TOPSIS MethodVIKOR Method | Distance Based Methods | 8 |
| PROMETHEE MethodELECTRE Method | Outranking Methods | 9 |
| Voting MethodsSocial Choice Functions | Group Decision Making | 10 |
| CCR ModelBCC Model | DEA Method | 11 |
| ISMDEMATELFCM | Structural Models | 12 |
| MODM ConceptsKKT Conditions in MODM | Basics of MODM | 13 |
| Multi-objective Simplex MethodCategorization:* No Preference Methods: Method of the Global Criterion
* A Priori Methods: Goal Programming
 | MODM Solving Methods | 14 |
| Categorization (Cont.):* A Posteriori Methods: Weighting Method and ε-Constraint
* Interactive Methods: ISWT method
 | MODM Solving Methods | 15 |
| Evolutionary Algorithms for Solving MODM (MOEA) | MODM Solving Methods | 16 |
| Multi-Stage MODMMulti-Level MODM | Other MODM Models | 17 |
| References |
| Primary References * Tzeng, G-H. & Huang, J-J. Multiple Attribute Decision Making: Methods and Applications, Chapman and Hall/CRC, 2011.
* Tzeng, G-H. & Huang, J-J. Fuzzy Multiple Objective Decision Making, Chapman and Hall/CRC, 2013.
* Cohon, J.L. Multiobjective Programming and Planning, Dover Publications, 2004.
* Saaty, T.L. & Vargas, L.G. Models, Methods, Concepts and Applications of the Analytic Hierarchy Process, 2nd ed., Springer,2012
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| 1. Additional References
2. Lai, Y-J. & Hwang,C-L. Fuzzy Multiple Objective Decision Making: Methods and Applications, Springer, 1996.
3. Figueira, J. Greco, S. & Ehrgott, M. Multiple Criteria Decision Analysis: State of the Art Surveys, Springer, 2007.
4. Coello, C.C., Lamont, G.B. & VanVeldhuizen, D. A. Evolutionary Algorithms for Solving Multi-Objective Problems, 2nd ed. Springer, 2007.
5. Miettinen, K. Nonlinear Multi-objective Optimization, Springer, 1998.
6. Saaty, T.L. & Vargas, L.U. Decision Making with the Analytic Network Process, Springer, 2006.
7. Cooper, W.W., Seiford, L.M. & Zhu, J. Handbook on Data Envelopment Analysis, 2nd ed. Springer, 2011.
8. Doumpos, M. & Grigoroudis, E. Multicriteria Decision Aid and Artificial Intelligence: Links, Theory and Applications, Wiley-Blackwell, 2013.
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| 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
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| EvaluationFinal Exam: 60%Quiz & Take-home: 15%Research: 25% |