 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](mailto:Gholamian@iust.ac.ir) Department: Industrial Engineering | | |
| Prerequisite  --- | | |
| 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 | | |
| Table of Contents | Subject | Week |
| Basic Concepts of Decision Making  Problem Structuring  MCDM Categories | Basics and Principles of MCDM | 1 |
| Constructing the Decision Model  Normalization Method  Weight Assignment Methods  Preference Modeling  Elementary Methods(Maximin,Maximax, …) | Basics of MADM | 2 |
| MAVT Method  SAW and WP Methods | MAVT & MAUT | 3 |
| Permutation Ranking Method  MAUT Method | MAVT & MAUT | 4 |
| Basics and Principles of AHP  Design Hierarchy and Make Judgments  Methods to Calculate Relative Weights | AHP Method | 5 |
| Calculating Total Weights  Measuring Inconsistency  Introduction to "Expert Choice" | AHP Method | 6 |
| ANP Method  Introduction to "Super Decision" | AHP Method | 7 |
| TOPSIS Method  VIKOR Method | Distance Based Methods | 8 |
| PROMETHEE Method  ELECTRE Method | Outranking Methods | 9 |
| Voting Methods  Social Choice Functions | Group Decision Making | 10 |
| CCR Model  BCC Model | DEA Method | 11 |
| ISM  DEMATEL  FCM | Structural Models | 12 |
| MODM Concepts  KKT Conditions in MODM | Basics of MODM | 13 |
| Multi-objective Simplex Method  Categorization:   * 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 MODM  Multi-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 | | |
| 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. | | |
| 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% | | |