# Amrita Vishwa Vidyapeetham University
## Amrita School of Business
## Elective course on 'Multi-Criteria Decision Making'
### II MBA / VI Trimester
### Course Plan (Updated 17th January 2017)

**Instructor:** Dr.Suresh M.            **Total No. of hours**: 30

## Course Description

Modern industry requires managers who can effectively make decisions using qualitative and quantitative approaches. In recent times, decision making in uncertain and risky environments has become a major attention to managers owing to its strong impact on profitability and efficiency. Business organizations are increasingly adopting group and integrated decision making process to gain competitive advantages. Appropriate decisions could eliminate rework and losses to the firm. The selection of appropriate choice or strategy from the available options is complex when the multiple criteria are involving in the process and it is even more complex when the multiple decision makers are involved.

In this context, this course is designed for imparting knowledge on structured decision making approaches to visualize the decision-making in the systems perspective.

Multi-Criteria Decision Making (MCDM) course is organised in five modules. It opens with the basic concepts of structured decision making, and then focuses on goal, compromise programming and data envelopment analysis principles with their application procedures in business firms. It then explains the classification methods viz. ELECTRE-TRI, Kohonen Neural Networks. It then focuses on Distance, Outranking, Utility and Fuzzy system based MCDM methods. It then focuses on the Group Decision Making. This course uses case studies related to application of multi criteria decision making for effective learning to manage modern business firms and face challenges in competitive markets.

*Prerequisite:*
Data Analytics – I & II courses

*Location & Meeting Times:*

Classroom: Elective Class Room-1, 2nd Floor, Amrita School of Business

Faculty contact hours for technical discussions/mini project/case study: 3.30PM. to 4.30PM.(Monday to Friday)@ Faculty cabin F-09, ASB.

**Assessment:**
Assessment is based on the expectations and the levels of achievement in all the four key areas – communicating, knowledge/understanding, thinking/inquiry, and application/use. The specific evaluation components will be as follows:

- Case study analysis                                 : 10%
- Term Paper                                              : 40%
- Recent advances/Reviews on decision making approaches : 10%
- Final Examination                                    : 40%

**Course Objectives:**

- To help in understanding the differences between traditional decision making and structured decision making methods of selection process.

- To help in learning the theory of decision making and their applications in traditional and modern business firms.

- To help in improving the skills of using the MCDM tools and techniques, in critical thinking especially in appropriate decision making in manufacturing systems.

**Learning Goal: Critical and Integrative Thinking**

- Students will demonstrate ability to identifying and defining the issues in decision making with multiple criteria and understanding its root causes. Analysing the problem in effective manner to provide appropriate solution to the business firms.

**Learning Objectives:**

On successful completion of this course, the student should be able to:

- Understand the basic principles of structured decision making approaches
- Understand the various types of decision making scenarios and application of appropriate decision making methods on situations
- Develop a continuous decision making process for sustainable business practices
- Apply methods/steps adequate enough to make the right group decisions in the new age business firms.

**Course Requirements:**

Students are expected to attend all sessions and arrive for class promptly. Students are allowed maximum six absences during this course. Mini project and all case studies must be submitted by their due dates.

## Session-by-Session Outline:

| Session No. | Topic | Text Book/ Journal Papers |
|---|---|---|
| Session -1 | Introduction to Structured Decision Making | Chapter-1; Raju and Nagesh Kumar |
| Session -2 | Estimation of Weights: Normalization methods; Rating methods; Entropy method; | Chapter-3; Raju and Nagesh Kumar |
| Session -3 | Analytical Hierarchy Process | Chapter-3; Raju and Nagesh Kumar |
| Session -4 | *Case Study-1:* Criticality analysis of spare parts using the analytic hierarchy process | Gajpal et al., (1994) |
| Session -5 | *Case Study-2:* Application of analytical network process for the evaluation of sustainable business practices in an Indian relays manufacturing organization | Vinodh et al., (2012) |
| Session -6 | *Case Study-3:* Evaluating petroleum supply chain performance-Application of analytical hierarchy process to balanced | Varma et al.,(2008) |

| | scorecard | |
|---|---|---|
| Session -7 | Compromise Programming | Chapter-4; Raju and Nagesh Kumar |
| Session -8 | Methods of Classification: ELECTRE-TRI; Kohonen Neural Networks; Cluster validity indices | Chapter-5; Raju and Nagesh Kumar |
| Session -9 | **Distance based MCDM methods:** TOPSIS; Composite Programming; | Chapter-6; Raju and Nagesh Kumar |
| Session -10 | *Case Study-4:*Multicriteria selection of project managers by applying grey criteria | Zavadskas et al., (2008) |
| Session -11 | *Case Study-5:* Evaluation of buyer-supplier relationships using an integrated mathematical approach of interpretive structural modeling (ISM) and graph theoretic matrix. | Thakkar et al.,(2008) |
| Session -12 | **Outranking based MCDM methods:** PROMETHEE-2; ELECTRE-3; ELECTRE-4; | Chapter-6; Raju and Nagesh Kumar |
| Session -13 | **Utility Based MCDM Method:** Multi-Attribute Utility Theory | Chapter-6; Raju and Nagesh Kumar |
| Session -14 | Data Envelopment Analysis | Chapter-9; Raju and Nagesh Kumar |
| Session -15 | Multi Criterion Q-Analysis-2; EXPROM-2; STOPROM-2 | Chapter-6; Raju and Nagesh Kumar |
| Session -16 | Fuzzy Logic-Based Discrete MCDM Fuzzy TOPSIS | Chapter-7; Raju and Nagesh Kumar |
| Session -17 | *Case Study-6:*Application of fuzzy VIKOR for concept selection in an agile environment | Vinodh et al., (2013) |
| Session -18 | *Case Study-7:*Assessment of sustainability using multi-grade fuzzy approach. | Vinodh (2011) |
| Session -19 | Fuzzy Programming Methods in MCDM | Chapter-7; Raju and Nagesh Kumar |
| Session -20 | Correlation Coefficient and Group Decision Making | Chapter-8; Raju and Nagesh Kumar |
| Session -21 | *Case Study-8:* Selecting the advanced manufacturing technology using fuzzy multiple attributes group decision making with multiple fuzzy information | Jong Chuu (2009). |
| Session -22 | *Case Study-9:* A hybrid approach using ISM and fuzzy TOPSIS for the selection of reverse logistics provider | Kannan et al., (2009). |
| Session -23 | *Case Study-10:* A fuzzy multi-criteria group decision making framework for evaluating health-care waste disposal alternatives | Dursun et al., (2011) |
| Session -24 | Mini Project Presentation | |

**Text book**

(1).Raju K.S ., Nagesh Kumar D.,(2014). Multicriterion Analysis in Engineering and Management, Prentice Hall of India (PHI) Learning Pvt. Ltd, New Delhi.

**Supplementary Materials**

(1). Dursun, M, Karsak, E. E.,Karadayi, M.A., (2011). A fuzzy multi-criteria group decision making framework for evaluating health-care waste disposal alternatives, Expert Systems with Applications,38,11453–11462.

(2).Gajpal.P.P., Ganesh, L.S.,Rajendran, C., (1994).  Criticality analysis of spare parts using the analytic hierarchy process, International Journal of Production Economics, 35, 293-297.

(3).Jong Chuu, S, (2009). Selecting the advanced manufacturing technology using fuzzy multipleattributes group decision making with multiple fuzzy information, Computers & Industrial Engineering, 57, 1033–1042.

(4).Kannan,G., Pokharel, S.,  Sasi Kumar, P., (2009). A hybrid approach using ISM and fuzzy TOPSIS for the selection of reverse logistics provider, Resources, Conservation and Recycling, 54, 28–36.

(5).Thakkar,J.,  Kanda, A., Deshmukh, S.G.(2008). Evaluation of buyer-supplier relationships using an integrated mathematical approach of interpretive structural modeling (ISM) and graph theoretic matrix, Journal of Manufacturing TechnologyManagement, 19(1), 92-124.

(6).Varma,S.,  Wadhwa,S., Deshmukh,S.G.(2008).Evaluating petroleum supplychain performance-Application of analytical hierarchy process tobalanced scorecard, Asia Pacific Journal of Marketingand Logistics, 20(3),343-356.

(7).Vinodh,S, Varadharajan, A.R,  Subramanian,A,(2013).Application of fuzzy VIKOR for concept selectionin an agile environment, International Journalof Advanced Manufacturing Technology, 65(5-8), 825-832.

(8). Vinodh, S, (2011).  Assessment of sustainability using multi-grade fuzzy approach, Clean Technologies and Environmental Policy,13, 509–515.

(9).Vinodh,S,Prasanna,M, Manoj,S, (2012).  Application of analytical network process for the evaluation of sustainable business practices in an Indian relays manufacturing organization, Clean Technologies and Environmental Policy, 14,309–317.

(10).  Zavadskas,  E.K.,Turskis,Z.,Tamosaitiene,JMarina,V. (2008).Multicriteria selection of project managers by applying grey criteria, Technological and Economic Development of Economy, 14(4), 462-477.

**Communication information of the instructor:**
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