Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2018-2019

Course Handout Part II

07.01.2019

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **BITS F313**
Course Title : **Multicriterion Decision Making in Engineering and Management**
Instructor-in-Charge : **Komaragiri Srinivasa Raju**
Chamber No. : **D - 107**

1. Scope and Objective of the Course:
This course is an introduction to the field of Multicriterion Decision Making (MCDM) and allied fields. The aim of this course is twofold: **1**. Provide a thorough understanding of the basics; **2.** Bring the students face-to-face with an application in Multicriterion Decision Making and allied fields. In addition, every student is required to work on a project, as part of the course, involving an application of Multicriterion Decision Making and allied fields. Further, the project work provides an opportunity to learn about the latest developments in this upcoming field. The unified approach will enable students to tackle the real life problems in more comprehensive manner and provide a broader view on the subject.

Course Outcomes: At the end of this course, the students will be able to:

1. Formulate engineering problems in optimization framework
2. Choose the best suited Decision Making Technique and Data Mining Technique
3. Acquainting with Matlab/R/Suitable Programming Language
4. Develop a power point based presentation that describes the formulated model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making process.

Student Learning Outcomes (SLOs) assessed in this course **– (a), (b), (c), (e), (h), and (k).**

2(a) Textbook:

T1. K.Srinivasa Raju, D.Nagesh Kumar, Multicriterion Analysis in Engineering and Management, PHI Learning Private Limited, New Delhi, 2014

(b) **Reference books**
R1. S.N. Sivanandam and S.N.Deepa, Principles of Soft Computing, Wiley, 2013.
R2. Ross TJ, Fuzzy Logic with Engineering Applications, John Wiley and Sons, 2013.

3.Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book	SLO*
1-2	To identify the intricacies involved in Decision Making	Introduction to the course and role of optimization, data mining, MCDM methods in sustainable and effective decision making	CH-1	a
3-5	Able to formulate Single Objective Optimization problem including identifying appropriate objective functions, constraints; Able to solve the same using software	Linear Programming Nonlinear Programming and other methods	CH-2	a,c,e
6	Able to understand necessity of multiobjective optimization in real world problems	Necessity of Multiobjective approaches	CH-4	a
7 -10	Able to understand necessity of assigning weights to different objectives/criteria in multiobjective context; Able to estimate weights for the given situation and data	Normalization approaches Rating method Entropy method Analytic Hierarchy Process MATLAB perspective	CH-3	a,c,e,k
11 -13	Able to understand various approaches to solve multiobjective optimization problems; Able to solve the same using software	Weighting method Constraint method Case study MATLAB perspective	CH-4	a,c,e,h
14-18	Able to understand necessity of grouping/clustering non-dominated data sets obtained from multiobjective optimization;	K-Means Cluster Analysis Artificial Neural Networks Kohonen Neural Networks Cluster Validation Techniques Case Study SPSS perspective MATLAB perspective	CH-5	a,c,e

	Able to solve the same manually and using software			
19- 25	Able to understand necessity of ranking non-dominated data sets obtained from multiobjective optimization/cluster analysis; Able to solve the same manually and using software	Introduction to Discrete MCDM methods Compromise Programming Co-Operative Game Theory TOPSIS VIKOR PROMETHEE Weighted average Multi Attribute Utility Theory Analytic Hierarchy Process Case Studies MATLAB perspective	CH-6 & Supplementary material	a,c,e,h
26-27	Able to understand necessity of ranking non-dominated data sets obtained from multiobjective optimization/cluster analysis in uncertain environment Able to solve the same manually and using software	Role of uncertainty in decision making Normalization techniques Fuzzy TOPSIS MATLAB perspective	CH-7 & Supplementary material	a,c.e
28-29	Able to understand necessity of knowing correlation between ranking methods and group decision making Able to solve the same manually and using software	Spearman rank correlation coefficient Kendall rank correlation coefficient Group decision making algorithms SPSS perspective MATLAB perspective	CH-8 & Supplementary material	a,b,c,e
30-42	Able to understand necessity of advanced topics related to Evolutionary algorithms, Data Envelopment Analysis and Expert Systems	Data Envelopment Analysis Taguchi methodology Differential Evolution Particle Swarm Optimization Expert Systems Cognitive mapping MATLAB perspective Case Studies	CH-9 CH-2, CH-4 & Supplementary material	a,c,e

***Student Learning Outcomes (SLOs):**
SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

(a) an ability to apply knowledge of mathematics, science and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

4.Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-Semester Test	90 Min	25	11/3, 9.00 - 10.30AM	Closed Book
Surprise Quiz (At least 10)		15	_	Open Book
Project (3 reviews)		20	Continuous	Open Book
Comprehensive	3 Hours	40	01/05 FN	Closed Book

5.Chamber Consultation Hour: Monday 5-6 P.M

6. Notices: All notices concerning the course will be displayed on CMS/ Civil Engineering Department Notice Board

7. Make-up Policy: Make-up will not be entertained under any circumstances.

8. Academic honesty and academic integrity Policy: Academic honesty and academic integrity are to be maintained by all of the students throughout the Semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE