JAIPURIA INSTITUTE OF MANAGEMENT
PGDM; TRIMESTER V; ACADEMIC YEAR 2018-19

Course Code and title	**OM 403: Optimization Techniques in Business Operations**
Credits	3
Term and Year	V Term, 2018 -19
Course Pre-requisite(s)	Data Interpretation using Excel, IT101
Course Requirement(s)	Basic knowledge of Spread sheets
Course Schedule (day and time of class)	As per time sheet
Classroom # (Location)	As per time sheet
Course Instructor	Surender Kumar
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Student Consultation Hours	4pm-5pm Thursday
Office location	Noida

Course Overview

Optimization is the process of obtaining the best result under given circumstances. In design, construction and maintenance of any engineering or management system, managers have to take many technological and managerial decisions at several stages. The ultimate goal of all such decisions is either to minimize the effort required or to maximize the desired benefit. A number of advanced optimization methods have been developed for solving different types of optimization problems. In this course, after discussing about the optimization problem formulation, Advance Linear Programming, Non Linear Programming, Goal Programming techniques are explained in detail along with number of applications in different areas of management.

Books and References

Text Book

Anderson, Sweeney, Williams, Camm, Martin, An Introduction to Management Science: Quantitative Approaches To Decision Making, Cengage Learning, New Delhi 2015, 13th edition.

References:
 • Hiller, F.S., Lieberman, G.J, Nag B., Basu P., Introduction to Operations Research, McGraw Hill, New Delhi, 2015, 9th edition.

- Hiller and Hiller, Introduction to Management Science, McGraw Hill Education, New Delhi, 2015, 4th Edition.
- Kenneth D.; Klimberg, Ronald K. In: Applications of Management Science. Edition: 1st ed. Amsterdam : Elsevier JAI-eBook.
- Stevenson, J. William, Ozgur. C., Introduction to Management Science with spreadsheets McGraw Hill Education, New Delhi, 2016, 10th reprint, Indian Edition.
- Taha, H.A., Operations Research – An Introduction, Pearson Education, New Delhi, 2008, 8th edition.

Internet Resources
- ebscohost-ebooks: Introduction to Operations Research- Kaufmann, A.; Faure, Robert, Academic Press-eBook
- ebscohost-ebooks: Applications of Management Science in Productivity, Finance & Operations: Lawrence, Kenneth D.; Klimberg, Ronald K. In: Applications of Management Science. Edition: 1st ed. Amsterdam : Elsevier JAI-eBook.
- Nptel.iitk.ac.in
- Learnerstv.com
- http://people.brunel.ac.uk/~mastjjb/jeb/or/contents.html (J E BEASLEY OR NOTES)
- www.palgrave-journals.com/ORI/free articles.html – This website contains the articles related to the recent work done in the area of Operations Research and its application.

Session Plan

Session	Topic / Sub Topic	Reading Reference	Pedagogy	Session Learning Outcomes	CLO
Module I: Optimization Techniques and its application					
1	**Overview of Optimization Techniques**	Text book, Page-20-40	Case Discussion: Par, Inc., is a small manufacturer of golf equipment	At the end of the session the student will be able to a. Be able to identify the special features of a model that make it a linear programming model. b. Learn how to solve two variable linear programming models by the graphical solution procedure. c. Understand the importance of extreme points in obtaining the optimal solution.	1
2	**Different issues in Linear Programming Problem**	Text book, Page-46-55	Detail discussion of Case Solution: Par, Inc., is a small	At the end of the session the student will be able to a. Know the use and interpretation of slack and surplus variables.	1, 2

				manufacturer of golf equipment	b. Be able to interpret the computer solution of a linear programming problem. c. Understand how alternative optimal solutions, infeasibility and unboundedness can occur in linear programming problems.	
3	**Linear programming applications: Production Scheduling**	Text book, Page-155	*Case Problem:* **Textile Mill Scheduling**	At the end of the session the student will be able a. Learn about applications of linear programming that have been encountered in practice. b. Develop an appreciation for the diversity of problems that can be modeled as linear programs. c. Obtain practice and experience in formulating realistic linear programming models.	**2**
4	**Linear programming applications:** **A Make-or-Buy Decision**	Text book, Page-157	*Case Problem:* **Planning an Advertising Campaign**	At the end of the session the student will be able a. Learn about applications of linear programming that have been encountered in practice. b. Develop an appreciation for the diversity of problems that can be modeled as linear programs. c. Obtain practice and experience in formulating realistic linear programming models.	**2**
5	**Linear programming applications:** **Blending Problems**	Text book, Page-159	*Case Problem:* **Duke Energy Coal Allocation**	At the end of the session the student will be able a. Learn about applications of linear programming that have been encountered in practice. b. Develop an appreciation for the diversity of problems that can be modeled as linear programs.	**2**

				c. Obtain practice and experience in formulating realistic linear programming models.	

Module II: Advanced Optimization Techniques

6	**Performance Evaluation**	Text book, Page-216	Lecture and Class Exercise	At the end of the session the student will be able a. Develop an appreciation for the diversity of problems that can be modeled as linear programs. b. Obtain practice and experience in formulating realistic linear programming models. c. Understand linear programming applications such as: data envelopment analysis	**3**
7	**Revenue Management**	Text book, Page-223	Lecture and Class Exercise	At the end of the session the student will be able a. Obtain practice and experience in formulating realistic linear programming models. b. Understand linear programming applications such as: revenue management	**3**

Module III: Distribution and Network Models

8	**Transshipment Problem**	Text book Page:268	Discussion: Excel solution of transshipment problems	At the end of the session student will be able to a. Be familiar with the special features of the transshipment problem. b. Become familiar with the types of problems that can be solved by applying a transshipment model. c. Be able to develop network and linear programming models of the transshipment problem.	**3, 4**

9	**Maximal Flow Problem**	Text book Page:279	Discussion: Excel solution of maximal flow problems	At the end of the session student will be able a. Know the basic characteristics of the maximal flow problem. Be able to develop a linear programming model and solve the maximal flow problem.	**3,4**
10	**Production and Inventory Application**	Text book, Page-283	Case: Distribution System Design	At the end of the session the student will be able Know how to structure and solve a production and inventory problem as a transshipment problem.	**3,4**
11	**Multiple-Choice and Mutually Exclusive Constraints**	Text book, Page-357	Case: Textbook Publishing	At the end of the session student will be able to a. Know the difference between all-integer and mixed integer linear programming problems. b. Be able to solve small integer linear programs with a graphical solution procedure.	**3,4**
12	**Production Scheduling With Changeover Costs**	Text book, Page-359	Case Discussion	At the end of the session student will be able a. See how zero-one integer linear variables can be used to handle special situations such as multiple choice, k out of n alternatives, and conditional constraints. b. Be familiar with the computer solution of MILPs.	
Module IV: Nonlinear Optimization Models					
13	**Introduction to Nonlinear Optimization Models**	Text book, Page-365	Discussion- Production Application —Par, Inc., Revisited	At the end of the session student will be able a. Learn about applications of nonlinear programming that have been encountered in practice.	**2,3,4**
14	**Constructing An Index**	Text book, Page-375	Caselet: HAUCK	At the end of the session student will be able	**2,3,4**

	Fund		FINANCIAL SERVICES PROBLEM	a. Develop an appreciation for the diversity of problems that can be modeled as nonlinear programs.	
15	**Markowitz Portfolio Model**	Text book, Page-379	Caselet: Portfolio Optimization with Transaction Costs	At the end of the session student will be able a. Obtain practice and experience in formulating realistic nonlinear programming models. b. Learn to use Excel Solver to solve nonlinear programming models.	**2, 3**
16	**Blending: The Pooling Problem**	Text book Page 383	Caselet: CAFE Compliance in the Auto Industry	At the end of the session student will be able a. Learn to use Excel Solver to solve nonlinear programming models.	**3, 4, 5**
17	**Forecasting Adoption of a New Product**	Text book, Page-387	Caselet: Exercise using Excel solver	At the end of the session student will be able a. Obtain practice and experience in formulating realistic nonlinear programming models. b. Learn to use Excel Solver to solve nonlinear programming models.	**3, 4, 5**
Module V: Multicriteria Decisions					
18	**Goal Programming Formulation:**	Text book, Page-660	Caselet Discussion	At the end of the session student will be able; a. Understand the concept of multicriteria decision making and how it differs from situations and procedures involving a single criterion. b. Be able to develop a goal programming model of a multiple criteria problem.	

19	**Goal Programming: Solution**	Text book, Page-664	Case Discussion: Solution understanding	At the end of the session student will be able; a. Know how to use the goal programming graphical solution procedure to solve goal programming problems involving two decision variables. b. Understand how the relative importance of the goals can be reflected by altering the weights or coefficients for the decision variables in the objective function.	**4,5**
20	**Goal Programming: Complex Problems**	Text book, Page-668	Case: Suncoast Office Supplies Problem	At the end of the session student will be able to a. Know how to develop a solution to a goal programming model by solving a sequence of linear programming models using a general purpose linear programming package.	**3, 4, 5**
21	**Scoring Models**	Text book, Page-674	Lecture and Discussion	At the end of the session student will be able to a. Know what a scoring model is and how to use it to solve a multicriteria decision problem. b. Understand how a scoring model uses weights to identify the relative importance of each criterion.	**3, 4, 5**
22	**Analytic Hierarchy Process**	Text book, Page-504-516	Caselet Discussion.	At the end of the session student will be able to a. Know how to apply the analytic hierarchy process (AHP) to solve a problem involving multiple criteria. b. Understand how AHP utilizes pairwise comparisons to establish	**3, 4, 5**

				priority measures for both the criteria and decision alternatives.	
23	**Session for Project presentation.**				
24	**Session for project presentation and wind up Feedback and learning Integration and tutorials which will be announced later if required.**				

Rubrics for Assessment Tasks

RUBRICS FOR CLO s

Assessment Component	Description	Weightage	CLOs
Quiz – 1 Quiz – 2 Quiz – 3	Multiple choice questions to test the conceptual knowledge	20% (best 2 would be considered)	1,2
Group Assignment (Project/ Case Analysis)	It will be on group basis (group of 5-6 students). Project will involve application of course content to the primary/secondary data. There will be stage wise submission for the project.	20%	1,2,3,4,5
Individual Assignment	Students will be required to submit two individual assignments based on analysis of cases/case-lets or given situation by instructor.	20%	1,2,3,4,5
End-Term Exam	Conceptual and application-based questions	40%	1,2,3,4,5

CRITERIA	LEVEL 1 BEGINING	LEVEL 2 AVERAGE	LEVEL 3 ACCOMPLISHED	LEVEL 4 EXCELLENT
CLO 1 Obtain practice and experience in formulating realistic linear programming models. (K & S)	Is aware of the concepts of linear programming models	Is able to formulate realistic linear programming models occasionally	Is able to formulate realistic linear programming models some of the times	Is able to formulate realistic linear programming models

CLO 2 Know how to structure and solve a production and inventory problem as a transshipment problem. .(K & S)	Understand the structure of production and inventory problem as a transhipment problem	Demonstrates ability to structure and solve a production and inventory problem as a transhipment problem occasionally	Demonstrates ability to structure and solve a production and inventory problem as a transhipment problem some of the times	Demonstrates ability to structure and solve a production and inventory problem as a transhipment problem most of the times
CLO 3 Be able to formulate and solve fixed charge, capital budgeting, distribution system, and product design problems as integer linear programs. (K & S)	Know about integer linear programs at all.	Is able to design problems as integer linear programs occasionally	Is able to design problems as integer linear programs some of the time.	Is able to design problems as integer linear programs
CLO 4 Develop an appreciation for the diversity of problems that can be modeled as nonlinear programs. (S & A)	Know the importance of nonlinear programs	Is able to develop nonlinear programs sometimes, but fails to take cognizance of context	Is able to develop nonlinear programs assertively sometimes, keeping cognizance of context	Is able to develop nonlinear programs assertively all the time
CLO 5 Understand the concept of multicriteria decision making and how it differs from situations and procedures involving a single criterion. (S & A)	Aware about the concept of multicriteria decision making	Have little understanding of the concept of multicriteria decision making	Have sufficient understanding of the concept of multicriteria decision making	Have clear understanding of the concept of multicriteria decision making

RUBRICS FOR QUIZ

Poor Points 0-2	Fair Points 3-5	Good Points 6-8	Excellent Points 9 – 10
UNSATISFACTORY	MINIMAL	PROFICIENT	EXEMPLARY
Only up to 30% answers are correct. Most of the	Between 30 – 60% answers are correct.	Between 60 – 80% answers are correct.	80% or more answers are

concepts are not clear and student is unable to understand the same.	Many of the concepts are clear and understood by student.	Majority of concepts are clear and understood by student.	correct. Most of concepts are clear and understood by the student.

RUBRICS FOR GROUP ASSIGNMENT

CRITERIA	DEVELOPING	APPROACHING PROFICIENCY	PROFICIENT	ADVANCED
Collect the appropriate information/data	Inadequate information collection	Average information collection	Adequate information collection	All (directly and indirectly related) information collected
Analyze the data as per the identified objectives	No analysis only presenting the data	Basic analysis performed	Basic & advanced data analysis	Complete and appropriate Data Analysis Able to use Interpretation for decision making
Project Report	Language is poor Defined format is missing Reference is inadequate Table of index is absent Formatting is poor Results & Interpretations not there	Language is occasionally poor Format is followed References is somewhat adequate Occasionally format is not good Results is there but not interpretation	Is adequately Impressive Format is followed Proper referencing Results & Interpretations is there	Is impressive Impressive Format Proper referencing Results, interpretation, conclusion, limitations, suggestions for future research are there

RUBRICS FOR INDIVIDUAL ASSIGNMENT

CRITERIA	DEVELOPING	PROFICIENT	ADVANCED
Analyze the data as per the identified objectives	Does not identify the appropriate tool for analysis	Able to apply the tool	Complete the analysis using appropriate tool
Interpretation of results obtained	Does not clearly interpret the results	Able to interpret the results	Clearly understand the relevance of Interpretation

RUBRICS FOR END TERM

Poor Points 0-2	Fair Points 3-5	Good Points 6-8	Excellent Points 9 – 10
UNSATISFACTORY	MINIMAL	PROFICIENT	EXEMPLARY
Only up to 30% answers are correct. Most of the concepts are not clear and student is unable to understand the same.	Between 30 – 60% answers are correct. Many of the concepts are clear and understood by student and able to solve the problems given	Between 60 – 80% answers are correct. Majority of concepts are clear and understood by student and also provide the answers in business language.	80% or more answers are correct. Most of concepts are clear and understood by the student, provide answers in business language and may also be able to indicate the additional information required for better decision making

10. Academic Conduct

Institute's Policy Statements

It is the responsibility of every student to be aware of the requirements for this course, and understand the specific details included in this document. It is emphasized that this course requires a significant commitment outside of formal class contact. The learning tasks in this course may include classes (lectures or seminars), required reading, preparation of answers to set questions, exercises and problems, and self-study. In addition, students may be required to complete an assignment, test or examination.

LMS-Moodle/ Impartus

LMS-Moodle/ Impartus is used to host course resources for all courses. Students can download lectures, additional reading materials, and tutorial notes to support class participation.

Late Submission

Assessment tasks submitted after the due date, without prior approval/arrangement, will be not be accepted. Requests for extension of time must be made with the faculty member concerned and based on Special Consideration guidelines.

Plagiarism:

Plagiarism is looked at as the presentation of the expressed thought or work of another person as though it is one's own without properly acknowledging that person.

Cases of plagiarism will be dealt with according to Plagiarism Policy of the institute. It is advisable that students should read the Student Handbook for detailed guidelines. It is also advisable that students must not allow other students to copy their work and must take care to safeguard against this happening. In cases of copying, normally all students involved will be penalized equally; an exception will be if the students can demonstrate that the work is their own and they took reasonable care to safeguard against copying.