



**DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING
MECHANICAL ENGINEERING PROGRAM, BSC.**

Course Syllabus

1. Course number and name

IE 330 Operations research1

2. Credits and contact hours

(3+0) 3 credit hours, 3 contact hours

3. Course type

Face to face Learning Course

4. Instructor's or course coordinator's name

Eng. Dana Salameh

5. Textbook information

Hamdy A. Taha, Operations Research: An Introduction, 10th Edition, Pearson,
2017 ISBN: 9781292165547

a. Other supplemental materials

- Ronald L. Rardin, Optimization in Operations Research, 2nd Edition, Pearson, 2017
- Instructor's Notes

6. Specific course information

a. Catalog description

Mathematical modeling, feasible solutions, Linear Algebra, Linear programming LP. Graphical solution, selected LP applications, simplex method, Big M method, two phase method. Dual problems. Sensitivity analysis, transportation and assignment models, Network models.

b. Prerequisites or co-requisites

Prerequisite: IE 231 Statistics and probability I.

c. The course is:

Required in Industrial engineering program.



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7. Specific goals for the course

a. Course outcomes:

After completion of the course, students are expected to be able to:

1. Formulate linear programming (LP) models
2. Use graphical methods to solve LP models
3. Solve LP model using simplex method, Big M or two-phase method
4. Formulate the transportation, assignment and network models and solve them by different methods

b. The following student outcomes are addressed by the course:

SO-(a) an ability to apply knowledge of mathematics, science, and engineering.

SO-(e) an ability to identify, formulate, and solve engineering problems.

SO-(pc-1) Ability to apply principles of probability, statistics and linear algebra to engineering problems

8. Learning Outcomes and their Alignment with Program Educational Objective (PEO's), Methods of Delivery, and Assessment Methods:

Learning Outcomes	Program PEOs	Method of Delivery	Assessment Method
Course Outcomes			
CO-(1): Formulate linear programming (LP) models	-	Lectures (Example and Problems)	First exam
CO-(2): Use graphical methods to solve LP models	-	Lectures (Example and Problems)	Mid term
CO-(3): Solve LP model using simplex method, Big M or two-phase method	-	Lectures (Example and Problems)	Homework
CO-(4): Formulate the transportation, assignment and network models and solve them by different methods		Lectures (Example and Problems)	Final term
Student Outcomes			



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SO-(a) an ability to apply knowledge of mathematics, science, and engineering			
SO-(e) an ability to identify, formulate, and solve engineering problems.			
SO-(pc-1) Ability to apply principles of probability, statistics and linear algebra to engineering problems			

9. Weekly Teaching Plan

Week number	Lecture	Topic	Method of Delivery
1	Lec_1	Chapter 1: What Is Operations Research? 1.1 :Operations Research Model 1.2: Solving the OR Models	Lecture
	Lec_2	Chapter 1: What Is Operations Research? 1.3: Queuing and Simulation Models 1.4: Art of Modeling 1.5: More Than Just Mathematics 1.6 More Than Just Mathematics	Lecture
	Lec_3	Chapter 2: Modeling with Linear Programming 2.1 Two-Variable LP Model	Lecture
2	Lec_4	Chapter 2: Modeling with Linear Programming 2.1 Two-Variable LP Model 2.2.1 Solution of a Maximization Model	Lecture
	Lec_5	Chapter 2: Modeling with Linear Programming 2.1 Two-Variable LP Model 2.2.1 Solution of a Maximization Model	Lecture
	Lec_6	Chapter 2: Modeling with Linear Programming 2.1 Two-Variable LP Model 2.2.2 Solution of a Minimization Model	Lecture
3	Lec_7	Chapter 3: Sensitivity Analysis 3.6.1 Graphical Sensitivity Analysis of Objective Function Coefficients.	Lecture
	Lec_8	Chapter 3: Sensitivity Analysis 3.6.1 Graphical Sensitivity Analysis of Objective Function Coefficients.	Lecture



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	Lec_9	Chapter 3: Sensitivity Analysis 3.6.1 Graphical Sensitivity Analysis of Availability of resources	Lecture
4	Lec_10	Chapter 3: Sensitivity Analysis 3.6.1 Unit worth of resources	Lecture
	Lec_11	Chapter 2: Modeling with Linear Programming 2.3 Selected LP Applications Diet problem Bank loan policy	Lecture
	Lec_12	Chapter 2: Modeling with Linear Programming 2.3 Selected LP Applications Production Planning and Inventory Control Single period production model	Lecture
5	Lec_13	Chapter 2: Modeling with Linear Programming 2.3 Selected LP Applications Production Planning and Inventory Control Multi period production model	Lecture
	Lec_14	Chapter 2: Modeling with Linear Programming 2.3 Selected LP Applications Manpower Planning Additional Applications	Lecture
	Lec_15	Chapter 3: The Simplex Method and Sensitivity Analysis 3.1 LP Model in Equation Form 3.1.1 Converting Inequalities into Equations with Nonnegative Right-Hand Side	Lecture
6	Lec_16	Chapter3: The Simplex Method and Sensitivity Analysis 3.2 Transition from Graphical to Algebraic Solution Algebraic Determination of Corner Points.	Lecture
	Lec_17	Chapter3: The Simplex Method and Sensitivity Analysis 3.2 Transition from Graphical to Algebraic Solution	Lecture
	Lec_18	Chapter3: The Simplex Method and Sensitivity Analysis 3.3 the Simplex Method 3.3.1 Iterative Nature of the Simplex Method	Lecture
7	Lec_19	Chapter3: The Simplex Method and Sensitivity Analysis 3.3.2 Computational Details of the Simplex Algorithm	Lecture
	Lec_20	Chapter3: The Simplex Method and Sensitivity Analysis 3.3.2 Computational Details of the Simplex Algorithm	Lecture
	Lec_21	Chapter3: The Simplex Method and Sensitivity Analysis 3.3.3 Summary of the Simplex Method	Lecture



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8	Lec_22	Chapter 3: The Simplex Method and Sensitivity Analysis 3.4 ARTIFICIAL STARTING SOLUTION 3.4.1 M-Method	Lecture
	Lec_23	Chapter 3: The Simplex Method and Sensitivity Analysis 3.4 ARTIFICIAL STARTING SOLUTION 3.4.1 M-Method	Lecture
	Lec_24	Chapter 3: The Simplex Method and Sensitivity Analysis 3.4 ARTIFICIAL STARTING SOLUTION 3.4.2 Two-Phase Method	Lecture
9	Lec_25	Chapter 3: The Simplex Method and Sensitivity Analysis 3.4 ARTIFICIAL STARTING SOLUTION 3.4.2 Two-Phase Method	Lecture
	Lec_26	Chapter 3: The Simplex Method and Sensitivity Analysis 3.5 Special Cases in the Simplex Method 3.5.1 Degeneracy 3.5.2 Alternative Optima	Lecture
	Lec_27	Chapter 3: The Simplex Method and Sensitivity Analysis 3.5.3 Unbounded Solution 3.5.4 Infeasible Solution	Lecture
10	Lec_28	Chapter 3: The Simplex Method and Sensitivity Analysis 3.6 Sensitivity Analysis 3.6.2 Algebraic Sensitivity Analysis-Changes in the Right-Hand Side	Lecture
	Lec_29	Chapter 3: The Simplex Method and Sensitivity Analysis 3.6.3 Algebraic Sensitivity Analysis-Objective Function	Lecture
	Lec_30	Chapter 4: Duality and Post-Optimal Analysis 4.1 Definition of the Dual Problem 1	Lecture
11	Lec_31	Chapter 4: Duality and Post-Optimal Analysis 4.2 Primal-Dual Relationships	Lecture
	Lec_32	Chapter 4: Duality and Post-Optimal Analysis 4.2.1 Review of Simple Matrix Operations	Lecture
	Lec_33	Chapter 4: Duality and Post-Optimal Analysis 4.2.2 Simplex Tableau Layout	Lecture
12	Lec_34	Chapter 4: Duality and Post-Optimal Analysis 4.2.3 Optimal Dual Solution	Lecture
	Lec_35	Chapter 4: Duality and Post-Optimal Analysis 4.2.4 Simplex Tableau Computations	Lecture
	Lec_36	Chapter 4: Duality and Post-Optimal Analysis 4.3 Economic Interpretation of Duality	Lecture



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		4.3.1 Economic Interpretation of Dual Variables 4.3.2 Economic Interpretation of Dual Constraints	
13	Lec_37	Chapter 4: Duality and Post-Optimal Analysis 4.2.1 Review of Simple Matrix Operations	Lecture
	Lec_38	Chapter 4: Duality and Post-Optimal Analysis 4.4 Additional Simplex Algorithms 4.4.1 Dual Simplex Method	Lecture
	Lec_39	Chapter 5: Transportation Model and Its Variants 5.1 Definition of the Transportation Model	Lecture
14	Lec_40	Chapter 5: Transportation Model and Its Variants 5.2 Nontraditional Transportation Models	Lecture
	Lec_41	Chapter 5: Transportation Model and Its Variants 5.3 The Transportation Algorithm 5.3.1 Determination of the Starting Solution 5.3.2 Iterative Computations of the Transportation Algorithm	Lecture
	Lec_42	Chapter 5: Transportation Model and Its Variants 5.4 The Assignment Model 5.4.1 The Hungarian Method	Lecture
15	Lec_43	Chapter 5: Transportation Model and Its Variants 5.5 The Transshipment Model	Lecture
	Lec_44	Chapter 6: Network Models 6.1 Scope and Definition of Network Models 6.2 Minimal Spanning Tree Algorithm	Lecture
	Lec_45	Chapter 6: Network Models 6.3 Shortest-Route Problem 6.3.1 Examples of the Shortest-Route Applications	Lecture

10. Grade Distribution:

Assessment	Grade	Date
- First Exam	20%	Fifth Week
- Second Exam	20%	10 th Week
- Assignments	10%	
- Final Examination	50%	16 th Week

Note: Make-up exams will be offered for valid reasons. It may be different from regular exams in content and format.