INTERNATIONAL UNIVERSITY LIAISON INDONESIA IULI

SYLLABUS

Date/ Revision 22June 2016
Faculty Engineering
Approval

SUBJECT : INTRODUCTION TO OPERATION RESEARCH

1. Identification of Subject:

Name of Subject : INTRODUCTION TO OPERATION RESEARCH
Code of Subject :
SKS / ECTS :2/
Semester :5
Study Program :B-CSE
Lecturer :

2. Competency

After having the course, students are expected to:

a) Formulate a real-world problem as a mathematical programming model
b) Implement and solve the model in EXCEL and LINDO
c) Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand
d) Understand the relationship between a linear program and its dual, including strong duality and complementary slackness
e) Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change
f) Solve specialized linear programming problems like the transportation and assignment problems
g) Solve network models like the shortest path, minimum spanning tree, and maximum flow problems
h) Understand the applications of, basic methods for, and challenges in integer programming

3. Description of Subject:

Operations research (OR) has many applications in science, engineering, economics, and industry and thus the ability to solve OR problems is crucial for both researchers and practitioners. Being able to solve the real life problems and obtaining the right solution requires understanding and modeling the problem correctly and applying appropriate optimization tools and skills to solve the mathematical model. The goal of this course is to teach you to formulate, analyze, and solve mathematical models that represent real-world problems. We will also discuss how to use EXCEL and LINDO for solving optimization problems. In particular, we will cover linear programming, network flow problems, integer programs, and nonlinear programs.

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4. Learning Approach

Approach : Combination of Expository - inquiry and colaborative
Method : Discussion, question answer, sample problem, group work
Student Task : Home work, group report, group presentation
Media : LCD projector, slide.

5. Evaluation

a) Absence maximum : 25%
b) Participation in discussion : 5 points
c) Homework, Classwork : 5 points
d) Presentation, Simulation : 10 points
e) Daily Quiz : 20 points
f) Final Examination : 60 pointa

Total : 100 points

6. Contents/ Topics of Lecturing:

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	**What Is Operations Research:** Introduction; Operations Research Models; Solving the OR Model; Queuing and Simulation Models; Art of Modeling; More Than Just Mathematics; Phases of an OR Study.	Ch1[1]	
2	**Modeling with Linear Programming:** Two-Variable LP Model; Graphical LP Solution; Computer Solution with Solver and AMPL; Linear Programming Applications.	Ch2[1]	
3,4	**The Simplex Method and Sensitivity Analysis:** LP Model in Equation Form; Transition from Graphical to Algebraic Solution; The Simplex Method; Artificial Starting Solution; Special Case in the Simplex Method; Sensitivity Analysis; Computational Issues in Linear Programming.	Ch3[1]	
5	**Duality and Post-Optimal Analysis:** Definition of the Dual Problem; Primal-Dual Relationship; Economical Interpretation of Duality; Additional Simplex Algorithms; Post-optimal Analysis	Ch4[1]	
6	**Transportation Model and Its Variants:** Definition of the Transportation Model; Nontraditional Transportation Models; The Transportation Algorithm, The Assignment Model.	Ch5[1]	
7	**Network Models:** Uses and Characteristics of Joints in Machine Assemblies; Selection of Joint Type and Fastening Method; Potential Failure Modes; Threaded Fasteners; Rivets; Welds; Adhesive Bonding.	Ch6[1]	
8,9	**Advanced Linear Programming:**	Ch7[1]	

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	Simplex Method Fundamentals; Revised Simplex Method; Bounded-Variables Algorithm; Duality; Parametric Linear Programming.		
10	**Goal Programming:** A Goal Programming Formulation; Goal Programming Algorithms; The Weights Method; The Preemptive Method.	Ch8[1]	
11	**Integer Linear Programming:** Illustrative Applications; Capital Budgeting; Set-Covering Problem; Fixed-Charge Problem; Either-Or and If-Then Constraints; Integer Programming Algorithms; Brand-and-Bound Algorithm; Cutting-Plane Algorithm.	Ch9[1]	
12	**Heuristic Programming:** Introduction; Greedy (Local Search) Heuristics; Metaheuristic; Application of Metaheuristics to Integer Linear Programs; Introduction to Constraint Programming (CP).	Ch10[1]	
13	**Traveling Salesperson Problem:** Example Application; TSP Mathematical Model; Exact TSP Algorithm; Local Search Heuristic; Metaheuristic.	Ch11[1]	
14	**Rehearsal and Tutorial:** Rehearsal of all subject and students can ask for more detail.		
15	**Final Examination**		

7. Book Reference:

a) Main Text Book:[1]"Operation Research: An Introduction, 9th Edition, 2010", Authors:Hamdy A. Taha, Publisher: Pearson.

b) Supplement Textbooks:

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