

Soran University

Mathematics Module Specification

1. Module Title
Operation research

2. Module Code
Math A 304 LP

3. Module Level
fourth

4. Module Leader

5. Teaching Semester
First & second semester

6. Credit Rating for the module
3 hours

7. Education Aims:

To provide the for the students to get familiar with the history of linear programming and its origin. He should learn that whatever he studies is a miniature of what is happening in the computer. One should understand that any operation taking place in his living environment is possible to be done in a better way and very likely in the best way. He should fully learn the masterpiece of George B Dantzig, that is, simplex method and the great role it has played in saving billions of dollars in the large incorporations around the world. The impact of computer on the progress of the field of operations research should be appreciated. They should learn how to work with a number of software available to solve the linear programming problems, including Matlab. The students should be acquainted with the real life applications of the operations research such as Transportation problem, game theory, network problems and how to solve them.

Learning Outcomes:

An appreciation of the way in which ordinary differential equation relates to other aspects of mathematics and the natural sciences

- An appreciation of modeling techniques to model practical and real life problems into linear programming so that to be solved by common software.
- Understand geometrical and algebraic bases of the simplex method.
- Appreciation of advanced simplices such as, revised, dual, bounded, and primal dual simplex.
- Being able to work out problems on their own at home
- Undertake practical experiments with Matlab or Maple
- Getting familiar with special applications of linear programming such as Transportation, Game Theory, Network optimization.

Communications with Academic Staff

The email rules

- Write your email in acceptable English.
- In your emails you must include: full name, stage, department and the unit title.
- We only respond to queries from students using genuine/Soran University email accounts.
- Appointments can be arranged through the email system, if you wish.
- We respond to genuine problems and queries as soon as possible, normally within 7 days.
- We will not respond to emails which do not have a subject line.

Staff associated with the unit:

Staff	Room Number	Email
Farhad Djannaty	Head of Mathematics Dep. Room	fdjanaty@soranu.com

Soran University

Department of Mathematics

Unit: Linear Programming

Credit 3

Method of Assessment:

1 x 3 h lectures

Examination and grading

Theory (100% of total course marks)

- The average of 4 written examinations/assessments will stand for 35% of the total course marks.
- Written home works stands for 5% of the total marks
- A Final examination will stand for the remaining 60% of total course marks.

Marking System

The grades for each piece of assessed work are as follows:

- 90-100 % is excellent
- 80-89% is very good
- 70-79% is good
- 60-69% is a moderate pass
- 50-59% is a pass
- <49% is a fail

Unit Timetable/Content

Academic week	Lecture title and content
1 st week	The Origins of Operations Research, The Nature of Operations Research, The Impact of Operations Research, Algorithms and OR

	Courseware
2 nd week	Defining the Problem and Gathering Data, Formulating a Mathematical Model Deriving Solutions from the Model, Testing the Model, Preparing to Apply the Model.
3 rd week	Model Implementation, Prototype Example, The Linear Programming Model , Assumptions of Linear Programming
4 th week	Problem solving sessions
5 th week	Some Case Studies, Displaying and Solving Linear Programming Models using Matlab, Additional Examples, Formulating Very Large Linear Programming Models
6 th week	Answering questions about the first exam. First examination
7 th week	Case study 1 Auto Assembly Case study 2 Cutting Cafeteria Costs Case study 3 Staffing a Call Center
8 th week	Problem solving sessions
9 th week	Foundations of the Simplex Method, The Revised Simplex Method, A Fundamental Insight , Conclusions
10 th week	The Essence of Duality Theory, Economic Interpretation of Duality, Primal-Dual Relationships, Adapting to Other Primal Forms
11 th week	Answering questions about the second exam Second examination
12 th week	The Role of Duality Theory in Sensitivity Analysis, The Essence of Sensitivity Analysis, Applying Sensitivity Analysis
13 th week	Case study 1 Controlling Air Pollution, Case study 2 Farm Management

	Case study 3 Assigning Students to Schools
14 th week	The Dual Simplex Method, Parametric Linear Programming
15 th week	The Upper Bound Technique, The Upper Bound Technique
16 th week	Problem solving sessions
17 th week	Answering questions about the third exam. Third examination
18 th week	An Interior-Point Algorithm
19 th week	Problem solving sessions
20 th week	The Transportation Problem, North west method, Russell Method, Vogel Method
21 st week	A Streamlined Simplex Method for the Transportation Problem
22 nd week	Answering questions about the forth exam Forth examination
23 rd week	A Streamlined Simplex Method for the Transportation Problem The Assignment Problem
24 th week	Hungarian method, Shipping Case study 1 Wood to Market Case study 2 Project Pickings
25 th week	Network Optimization Models, Prototype Example, The Terminology of Networks, The Shortest-Path Problem
26 th week	The Minimum Spanning Tree Problem, The Maximum Flow Problem, The Minimum Cost Flow Problem, The Network Simplex Method
27 th week	Problem solving Fifth examination

References:

1. Hillier, S.H. and Lieberman, G. J. "Introduction to Operations Research", Mc Graw Hill, 2007

2. Bazaraa, M.S., Jarvis, J.J., "Linear Programming and Network Flows", John Wiley, 2005
3. Taha H.. "Operations research: An Introduction 9th Edition", Prentice Hall, 2010
4. Bronson R., Naadimuthu, G "Schaum's Outline of Operations Research" Mc-Graw Hill 1997