Debre Markos University
Collage of Agriculture and Natural Resources
Department of Agricultural economics

Course title: **Operations Research** in Agricultural Economics
Module Name: Quantitative Economics [Module Code AgEc-M2081]
Course code: AgEc 2082
Academic year: Semester: II ….2020
Credit hour: 3 = 5ECTS, Lecture 48 Hr, Tutor 20 Hr, Home study 67 Hr ……Total: 135Hr
Instructor: Esubalew Tadele (Masters in DevEco)
Beneficiaries: Regular Agricultural Economics Year II students
Pre-requisites: None
Status of the Course Compulsory

Course Description

This course will help students to acquire the knowledge of operation research. Specifically the Origin, nature and impact of operational research, operational research modeling approach, introduction to linear programming, solving linear programming: graphic and simplex methods, revised simplex methods, duality theory and sensitivity analysis, integer programming, non linear modeling, transportation and assignment problem, network models including project evaluation and review techniques (PERT) and critical path methods (CPM).

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

⚔ Discuss the basic concepts of operations research and its applications
⚔ Identify the various types of models in operations research
⚔ Propose suitable decisions to resolve conflicts of interest among various sections of the organizations by seeking out optimal solution
⚔ Apply linear programming model for analyzing operational problems in business (particularly in agricultural firms)
⚔ Solve large system of linear equations using transportation problems model
⚔ Apply the concept of transportation problem to allocate different resources to activities if the resource requires more than activity
⚔ Apply the concept of assignment problem to assign different resources to activities on a one-to-one basis
⚔ Apply the concept of sensitivity analysis to allocate scarce resources efficiently in agricultural firms
⚔ Explain the basic Concepts of PERT/CPM techniques

Course Contents and Schedule

Week	Hr	Conceptual focus	Activities
	4	**Chapter 1:Introduction** 1.1. Definitions and scope of operations research 1.2. Development of operation research 1.3. Overview of the operations research modeling approach 1.4. Applications of operations research	• Actively listening and participating in the class • Accomplish their tasks in time • Active cooperation when performing group work • Participate questioning and answering

	14	**Chapter 2: Linear Programming**
		2.1. Basic Concepts in Linear Programming
		2.2. Formulations of LPP
		2.3. Assumptions of linear programming
		2.4. Methods of Solving LP
		    2.4.1. The Graphic Method
		    2.4.2. The Simplex Method
		2.5.Tie Breaking in simplex method
		2.6.The artificial variable (The Big M) technique
		2.7. Minimization
			• Actively listening and participating in the class
			• Accomplish their tasks in time
			• Active cooperation when performing group work
			• Participate questioning and answering

	10	**Chapter 3: Duality theory and sensitivity analysis** 1.1. The essence of Duality theory 1.2. Economic interpretation of Duality 1.3. Primal-Dual relationship 1.4. The role of duality theory in sensitivity analysis 1.5. Sensitivity analysis	• Actively listening and participating in the class • Accomplish their tasks in time • Active cooperation when performing group work • Participate questioning and answering
	5	**Chapter 4: Integer Programming** 4.1. Need For Integer Programming 4.2. Branch- and- Bound Method	• Actively listening and participating in the class • Accomplish their tasks in time • Active cooperation when performing group work Participate questioning and answering

	11	**Chapter 5: Special types of linear programming**
		5.1. Transportation problem
		    5.1.1. Formulation/construction of the model
		    5.1.2. Methods of solving Transportation problems
		    5.1.3. Special Cases in Transportation problem
		5.2. Assignment problem
		    5.2.1. Formulation/construction of the model
		    5.2.2. Methods of solving assignment problems
		    5.2.3. Special cases in assignment problems
			• Actively listening and participating in the class
			• Accomplish their tasks in time
			• Active cooperation when performing group work
			• Participate questioning and answering
			• Take their own short notes every day

	4	**Chapter 6: Network Analysis with CPM and PERT** 6.1. Basic concepts on net work 6.2. The critical path method (CPM) 6.3. Program evaluation and review technique (PERT)	• Actively listening and participating in the class • Accomplish their tasks in time • Active cooperation when performing group work • Participate questioning and answering

Mode of delivery: The course will be delivered through lectures, class discussions, brainstorming, reading assignment, group discussion**,** exercises and Students taking this course will be assessed through quizzes, assignments, group discussion, and final examinations. **Lecture, Reflections:** Keep a weekly written reflection of your reactions, questions about the readings and discussions in class. **Homework:** Homework assignments will be given to help reinforce some topics covered or not covered in class.

Evaluation

Continuous assessment 50%   [Tests (2) = 20%, Quizzes (2) =10%, Assignment (2) =20%] and Final Exam 50%

References

J.K. Sharma, 1977. Operation Research, Theory and Application. Macmillan, New Delhi.

Hiller and Lieberman, 1986. Introduction to Operations Research, 4th ed.

Hamdy. A. Taha, 2007. Operation Research-An introduction, 8th ed. Prentice Hall, New Jersey

P.K Gupta and D.S Hira, 2007. Operations Research. Revised and enlarged edition 2007

F.S. Hiller and G.J. Lieberman: Introduction to Operations Research-Concepts and Cases, 9th Edition, Tata McGraw, 2010.

R.K. Ahuja, T.L.Magnati, B. Orlin: Network Flows-Theory, Algorithm and Applications, Prentice Hall, NJ, 1993.

J.D. Weist and F.K. Levy: A management guide to PERT/CPM, 2nd Edition, PHI,1967 (Reprint 2007).