



DE LA SALLE UNIVERSITY  
College of Science  
Department of Mathematics



**LINPROG** – Linear programming  
Prerequisite: LINEALG

Prerequisite to:

**Instructor:** \_\_\_\_\_  
**Consultation Hours:** \_\_\_\_\_

**Contact details:** \_\_\_\_\_  
**Class Schedule and Room:** \_\_\_\_\_

**Course Description**

As an introductory course in Operations Research, this course focuses on the basic models, the analysis and the solution of linear optimization models. The thrust is in the analysis of problems and their solution approaches. This course provides a firsthand exposure to vast and highly relevant area of operations research.

**Learning Outcomes**

On completion of this course, the student is expected to present the following learning outcomes in line with the Expected Lasallian Graduate Attributes (ELGA)

ELGA	Learning Outcome
Critical and Creative Thinker Effective Communicator Lifelong Learner Service-Driven Citizen	Develop an understanding and appreciation of linear programming concepts as effective tools in addressing real world problems especially those that are relevant to decision making in business, economics and other related areas.

**Final Course Output**

As evidence of attaining the above learning outcomes, the student is required to submit the following during the indicated dates of the term.

Learning Outcome	Required Output	Due Date
Develop an understanding and appreciation of linear programming concepts as effective tools in addressing real world problems especially those that are relevant to decision making in business, economics and other related areas.	Case Study on a real life situation that is solvable by using linear programming methods  Form of output: Written	Week 13

**Rubric for assessment**

**Written Group Report**

CRITERIA	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
<b>Content and Organization (50%)</b>	In-depth and insightful discussion in addition to score 3 performance	Logical sequencing of information throughout. Sufficient supporting details. Clear and effective concluding paragraph	Logical sequencing of information most of the time. Details are given but inadequate to support the topic. Clear concluding paragraph but lacks effectiveness	Information presented with little organization. Most of the details irrelevant. Concluding paragraph not clear
<b>Grammar (30%)</b>		No error	Between one and three errors	More than four errors
<b>Bibliography (15%)</b>		All resources cited	Some of the resources not cited	Majority of the resources not cited

**Group Member Assessment**

Criteria	Excellent/4	Good/3	Satisfactory/2	Needs Improvement/1
Contribution	Group member completed an equal share of work and strived to maintain that equity throughout the project	Group member contributed significantly, but other members clearly contributed more	Group member contributed little toward the project	Group members contributions were insignificant or nonexistent
Dependability	Group member provided	Group member contributions	Group member contributions were	Group member was undependable

	contributions with 100% punctuality and always appeared for group work	were mostly punctual and almost always appeared for group work	regularly late and often missed scheduled group work	forcing other members to take up the slack
Efficiency	Work performed was very useful and contributed significantly to the final product	Participation was inefficient and thus contributions were less than expected	Work performed was inappropriate and mostly useless toward the final product	Work performed was completely ineffective and useless in the final product
Attitude	Group member was very positive and pleasant to work with	Group member didn't complain but offered little enthusiasm	Group member sometimes complained and was somewhat of a burden	Group member often complained and generally demoralized the group

Additional Requirements

- Aside from the learning output, the student will be assessed at other times during the term by the following:
- Skills Check (Seatwork/Quizzes/Boardwork)
  - Individual/Group Report
  - Individual/Group Problem Set

Grading System

	FOR EXEMPTED STUDENTS (w/out Final Exam)	FOR STUDENTS with FINAL EXAM		95-100% 89-94% 83-88% 78-82% 72-77% 66-71% 60-65% <60%	4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.0
		<i>with no missed quiz</i>	<i>With one missed quiz</i>		
Average of quizzes & Project	95%	65%	55%		
Class participation & Lab exercises	5%	5%	5%		
Final exam	-	30%	40%		

Learning Plan

Learning Outcome	Culminating Topics	Week No.	Learning Activities
Develop an understanding and appreciation of linear programming concepts as effective tools in addressing real world problems especially those that are relevant to decision making in business, economics and other related areas.	<b>1. Introduction and Overview of Linear Programming</b> 1.1 The Linear Decision Model 1.2 Applications and Purpose of LP	Week 1	This is left as a reading assignment. Library work
	<b>2. The Conventional Linear Programming Model</b> 2.1 Models and Model Types 2.2 General Guidelines in Model Building 2.3 Basic Steps in LP Model Formulation 2.4 The General Form of the LP Model 2.5 Assumptions of the LP Model 2.6 Model Validity	Week 1 - 2	Group discussion and presentations Skills exercises Student self-assessment and Reflection Seatwork and Assignments
	<b>3. Foundations of the Simplex Method</b> 3.1 Converting an LP Program into	Week 3 - 6	Group discussion and presentations Skills exercises

	Standard Form 3.2 Graphical Solution of the Two-Dimensional LP 3.3 Convex Sets and Polyhedral Sets 3.4 Basic Feasible Solutions and Extreme Points		Student self-assessment and Reflection Seatwork and Assignments Use of Mathematica and/or Graphmatica in representing the LP problems geometrically
	<b>4. The Simplex Method: Tableaux and Computation</b> 4.1 Algebra of the Simplex Method 4.2 The Simplex Method in Tableau Form 4.3 Finding an Initial Basic Feasible Solution 4.4 Unrestricted Variables and Variables with Negative Lower Bounds 4.5 Degeneracy and Cycling	Week 7 - 10	Group discussion and presentations Skills exercises Student self-assessment and Reflection Seatwork and Assignments Use of Mathematica and/or MS Excel to create simple programs or routines in generating the tableau
	<b>5. Duality and Sensitivity Analysis</b> 5.1 Formulation of the LP Dual 5.2 Relationships in Duality 5.3. Economic Interpretation of the Dual 5.4 The Dual Simplex Algorithm 5.5 Sensitivity Analysis in LP 5.6 Parametric Programming	Week 11 – 13	Group discussion and presentations Skills exercises Student self-assessment and Reflection Seatwork and Assignments  Use of Mathematica or MS Excel in generating the solution of the LP problem and its dual
	<b>FINAL EXAMINATION</b>	Week 14	

### References

Taha, Hamdy.(2006) *Operations Research: An Introduction, 5th edition*, Macmillan Publishing Company  
 McNickel Donald C., Daellenbach Hans and George John A., (1983) *Introduction to Operations Research*, Allyn And Bacon Inc.  
 Lieberman Gerald and Hillier Frederick.,(2005) *Introduction to Operations Research, 8th Edition*, Mc-Graw – Hill Science Engineering.

### Online Resources

<http://www2.isye.gatech.edu/~spyros/Lp/Lp.html>  
[http://people.hotstra.edu/Stefan\\_waner/RealWorld/Summary4.html](http://people.hotstra.edu/Stefan_waner/RealWorld/Summary4.html)

### Class Policies

1. The required minimum number of quizzes for a 3-unit course is 3, and 4 for 4-unit course. No part of the final exam may be considered as one quiz.
2. Cancellation of the lowest quiz is not allowed even if the number of quizzes exceeds the required minimum number of quizzes.
3. As a general policy, no special or make-up tests for missed exams other than the final examination will be given. However, a faculty member may give special exams for
  - A. approved absences (where the student concerned officially represented the University at some function or activity).
  - B. absences due to serious illness which require hospitalization, death in the family and other reasons which the faculty member deems meritorious.
4. If a student missed two (2) examinations, then he/she will be required to take a make up for the second missed examination.
5. If the student has no valid reason for missing an exam (for example, the student was not prepared to take the exam) then the student receives 0% for the missed quiz.
6. Students who get at least 89% in every quiz are exempted from taking the final examination. Their final grade will be based on the average of their quizzes and other prefinal course requirements. The final grade of exempted students who opt to take the final examination will be based on the prescribed computation of final grades inclusive of a final examination. Students who missed and/or took any special/make-up quiz will not be eligible for exemption.
7. Learning outputs are required and not optional to pass the course.

8. Mobile phones and other forms of communication devices should be on silent mode or turned off during class.
9. Students are expected to be attentive and exhibit the behavior of a mature and responsible individual during class. They are also expected to come to class on time and prepared.
10. Sleeping, bringing in food and drinks, and wearing a cap and sunglasses in class are not allowed.
11. Students who wish to go to the washroom must politely ask permission and, if given such, they should be back in class within 5 minutes. Only one student at a time may be allowed to leave the classroom for this purpose.
12. Students who are absent from the class for more than 5 meetings will get a final grade of 0.0 in the course.
13. Only students who are officially enrolled in the course are allowed to attend the class meetings.

Approved by:

**DR. ARTURO Y. PACIFICADOR, JR.**  
Chair, Department of Mathematics