DE LA SALLE UNIVERSITY
College of Science
Department of Mathematics

OPRESM1 – *Operations Research Models 1*
Prerequisite: LINPROG *Prerequisite to: OPRESM2*

Instructor:_____ **Contact details:**_____
Consultation Hours:_____ **Class Schedule and Room:**_____

Course Description

This course is designed for BS Mathematics students who are majoring in Business Applications covering topics on the integer linear programming (ILP) models, transportation model, network models, unconstrained and constrained optimization.

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 specialized linear programming concepts (integer LP, transportation and assignment models, network models) and unconstrained and constrained optimization 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
At the end of the course, the student will develop an understanding and appreciation of specialized 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 Studies involving any **ONE** of the following types: (1) Minimum Cost Network Flow Problem (2) Integer Programming Problem (3) Constrained or Unconstrained Optimization Problem Form of output: written	Week 13

Rubric for assessment

Written Group Report

CRITERIA	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Content and Organization (55%)	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
Grammar (30%)		No error	Between one and three errors	More than four errors
Bibliography (15%)		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 25%	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 25%	Group member provided contributions with 100% punctuality and always appeared for group work	Group member contributions were mostly punctual and almost always appeared for group work	Group member contributions were regularly late and often missed scheduled group work	Group member was undependable forcing other members to take up the slack
Efficiency 25%	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 25%	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**	
		with no missed quiz	*With one missed quiz*
Average of quizzes	95%	65%	55%
Seatwork, Boardwork, Assignment	5%	5%	5%
Final exam	-	30%	40%

Scale:

95-100%	4.0
89-94%	3.5
83-88%	3.0
78-82%	2.5
72-77%	2.0
66-71%	1.5
60-65%	1.0
<60%	0.0

Learning Plan

Learning Outcome	Culminating Topics	Week No.	Learning Activities
Develop an understanding and appreciation of specialized linear programming concepts (integer LP, transportation and assignment models, network models) and unconstrained and constrained optimization as effective tools in addressing real world problems especially those that are relevant to decision making in business, economics and other related	**1. The Network Simplex Method** 1.1 Network Terminology 1.2 Minimum-Cost Network Flow Problems 1.3 The Network Simplex Method	Week 1 – 2	Group discussion and presentations Skills exercises Student self-assessment and Reflection Seatwork and Assignments Use of matrices and graphs in solving MCNF problems
	2. The Transportation and Assignment Problem 2.1 The Transportation Problem 2.2 The Assignment Problem	Week 2 – 3	Group discussion and presentations Skills exercises Student self-assessment and Reflection Seatwork and Assignments
	3. Integer Programming 3.1 Graphical Solution of Two-Dimensional Integer Programs 3.2 Branch and Bound Enumeration 3.3 Implicit Enumeration 3.4 Cutting-Plane Methods	Week 4 - 7	Group discussion and presentations Skills exercises Student self-assessment and Reflection Seatwork and Assignments Use of Mathematica and/or

areas.			Graphmatica in solving IP problems
	4. Unconstrained Optimization 4.1 Golden Mean Search 4.2 Method of Steepest Ascent 4.3 Gradient Method 4.4 Newton's Method	Week 8 - 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 executing the different methods of solving
	5. Constrained Optimization 5.1 Lagrange Multiplier 5.1.1 An Algebraic Derivation 5.1.2 Geometric Interpretation Applications 5.2 Kuhn-Tucker Conditions 5.2.1 Necessary and Sufficient Conditions 5.2.2 Geometric Interpretation Applications	Week 11 – 13	Group discussion and presentations Skills exercises Student self-assessment and Reflection Seatwork and Assignments Use of Mathematica in visualizing the optimal problem geometrically
	FINAL EXAMINATION	Week 14	

References

Bazaraa, M.S., Jarvis, J.J., Sherali, H.D. (1990) *Linear Programming and Network Flows* (2nd ed.) Singapore: Wiley

Ignizio, J.P. and Cavalier, T.M. (1994) *Linear Programming.* New Jersey: Prentice Hall

Lieberman G. and Hillier.,(2005) *Introduction to Operations Research, 8th Edition*, Mc-Graw –Hill Science Engineering.

Taha, Hamdy.(2006) *Operations Research: An Introduction, 5th edition*, Macmillan Publishing Company

Winston, W. (2004) *Operations Research: Applications and Algorithms* (4th ed). Belmont, CA: Thomson Brooks/Cole

Online Resources

www.wolframa/pha.com

www.wlu.ca/documents/40644/networksimplex.pdf

web.mit.edu/15.053/www/AMP-Chapter09.pdf

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