
Study Guide

Linear Programming 381

Academic Year 2025



“Research has shown that it takes 31 days of conscious effort to make or break a habit. That means, if one practices something consistently for 31 days, on the 32nd day it does become a habit. Information has been internalized into behavioral change, which is called transformation.”

Shiv Khera



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Academic Year 2025

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MODULE DESCRIPTION

Module Name	Linear Programming 381
Module Code	LPR381
Qualification	B.Comp
Module NQF Level	7
Duration (weeks)	4
Pre-requisites	LPR281

OUTCOMES**Purpose**

Linear Programming is a scientific approach to decision making that seeks to best design and operate a system, under conditions requiring the allocation of scarce resources. It is an interdisciplinary mathematical science that focuses on the effective use of technology by organisations. In contrast, many other science and engineering disciplines focus on technology, giving secondary considerations to its use.

Outcomes

Upon successful completion of this module, the student will be able to:

- Demonstrate integrated knowledge of the central areas of linear programming, including an understanding of and the ability to apply and evaluate the key terms, concepts, facts, principles, rules and theories of linear programming; and detailed knowledge of an area or areas of specialisation and how that knowledge relates to other fields, disciplines or practices.
- Demonstrate an understanding of knowledge as contested and the ability to evaluate types of knowledge and explanations typical within linear programming.
- An understanding of a range of methods of enquiry in linear programming, and their suitability to specific investigations; and the ability to select and apply a range of methods to resolve problems or introduce change within a practice.
- The ability to identify, analyse, evaluate, critically reflect on and address complex problems, applying evidence-based solutions and theory-driven arguments.
- The ability to develop appropriate processes of information gathering for a given context or use; and the ability to independently validate the sources of information and evaluate and manage the information.

STUDENT SUPPORT

Please contact your lecturer for subject-related support. The lecturers presenting this subject are:

- Dr. R. Jacob – jacob.r@belgiumcampus.ac.za
- Dr A. Kelil - kelil.a@belgiumcampus.ac.za
- H. Munyai – munyai.h@belgiumcampus.ac.za
- K. Moyo moyo.k@belgiumcampus.ac.za
- S. Laubscher- Schoeman.s@belgiumcampus.ac.za

If the lecturers were unable to assist, you can also contact the department head for this subject:

- C.P. Tavagwisa – tavagwisa.p@belgiumcampus.ac.za

Further student support services are available via the counsellors for:

- Alisha Blom - Narine.a@belgiumcampus.ac.za
- Lethlabile Selamolela - Selamolela.l@belgiumcampus.ac.za




For Stellenbosch students, further student support services are available via the counsellors for:

- A. Johnson – johnson.a@belgiumcampus.ac.za

ASSESSMENT PLAN			
ASSIGNMENTS/PROJECTS			
Assignment weight total:	15	Assignment due date:	13-08-2025
Project weight total:	15	Project due date:	29-08-2025
TESTS			
Test 1 weight:	10	Test 1 date:	08-08-2025
Test 2 weight:	15	Test 2 date:	15-08-2025
Test 3 weight:	15	Test 3 date:	22-08-2025
Summative Test weight:	30	Summative Test date:	28-08-2025 (Thursday)

Make sure to keep track of announcements on BC Connect regarding reviews and cut off dates for queries especially before the examinations. Make sure to query while a review is in progress.

Note: there will be no review for assignment quizzes only time to query anything other than answers.

STUDENT RESOURCES	
Which resources will be used during this module?	
PRESCRIBED MATERIAL	
Textbook 1	
Prasad, Devi. <i>Operation Research</i> . Alpha Science Information Limited, 2015.	
Location (Library / URL / PDF)	Ebscohost Operations Research: EBSCOhost
Textbook 2	
Chapters of the following books found in the playlist. feel free to search for the books to see what other topics are there.	
Location (Library / URL / PDF)	https://learning.oreilly.com/playlists/08ef20ec-cad2-4947-aea9-8fd4ae6d3ba6
RECOMMENDED READING	
 Introduction to Management Science – Taylor  Engineering Mathematics – K. A. Stroud  Operations Research - Wayne L Winston	
STUDENT MATERIAL	
Item	Location
Content on Moodle	The relevant Moodle course
PowerPoint slides	Distributed to students via Moodle

Exercises / Activities	Dispersed throughout the course on Moodle.
TECHNOLOGY (HARDWARE OR SOFTWARE) REQUIRED	
Software/Hardware	Details e.g. version to be used (either minimum or required version)
Microsoft Office, Excel	

LESSON PLAN OUTLINE	
Date	Specific outcomes (SO) to be covered / Class Activity / Assessment
04-08-2025	SO1: Revised Simplex Week 1 practice questions given as additional work after class.
05-08-2025	SO2: Discrete programming SO3: Branch and bound algorithms SO4: The cutting plane algorithm
06-08-2025	SO3: Branch and bound algorithms SO4: The cutting plane algorithm SO5: Simplex redux with Hungarian flair
07-08-2025	SO5: Simplex redux with Hungarian flair SO6: Integer Programming – Capital budgeting IP Week 1 practice questions memorandums opened.
08-08-2025	Class Test 1 – SO1-SO6
11-08-2025	SO6: Integer Programming – Fixed charge IP, Location IP Logical constraints are homework. Week 2 practice questions given as additional work after class.
12-08-2025	SO6: Integer Programming – Fixed charge IP, Location IP SO6: Integer Programming – Set-covering IP SO7: Knapsack problems
13-08-2025	SO6: Integer Programming – Set-covering IP SO7: Knapsack problems Review
13-08-2025	<i>Assignment due</i>
14-08-2025	SO8: Combinatorial algorithm Week 2 practice questions memorandums opened.
15-08-2025	Class Test 2 – SO1-SO8
18-08-2025	SO9: Traveling salesperson problems Week 3 practice questions given as additional work after class.
19-08-2025	SO9: Traveling salesperson problems SO10: Machine scheduling problems
20-08-2025	SO10: Machine scheduling problems
21-08-2025	SO9: Traveling salesperson problems SO10: Machine scheduling problems Week 3 practice questions memorandums opened.
22-08-2025	Class Test 3 – SO1-SO10
25-08-2025	SO11: Nonlinear programming – Introduction, 2 nd derivative, Hessian matrix SO11: Nonlinear programming – Golden section search algorithm. Week 4 practice questions given as additional work after class.
05-08-2024	
26-08-2025	SO11: Nonlinear programming – Golden section search algorithm. SO11: Nonlinear programming - Steepest Ascent/Descent algorithm
27-08-2025	SO11: Nonlinear programming - Steepest Ascent/Descent algorithm Week 4 practice questions memorandums opened.

28-08-2025	Summative Test. SO1-SO11
29-08-2025	<i>Project due</i>

OUTCOME BREAKDOWN

Specific Outcome 1: Revised Simplex

- Primal simplex algorithm.
- Dual simplex algorithm.
- Adding constraints.
- Special cases simplex algorithms.

Specific Outcome 2: Discrete programming

- Introduction to Integer programming.
- Mixed vs Pure IPs.

Specific Outcome 3: Branch and bound algorithms

- Branch and Bound simplex algorithm.

Specific Outcome 4: The cutting plane algorithm

- Cutting plane algorithm.

Specific Outcome 5: Simplex redux with Hungarian flair

- Task assignment IP.
- Hungarian Algorithm.

Specific Outcome 6: Integer Programming

- Capital Budgeting IP.
- Fixed Charge IP.
- Location IP.
- Set-covering IP
- Logical constraints.

Specific Outcome 7: Knapsack problems

- Knapsack IP (Binary).
- Knapsack method (Binary).

Specific Outcome 8: Combinatorial algorithm

- Queens combinatorial IP.
- Combinatorial algorithm.

Specific Outcome 9: Traveling salesperson problems

- Traveling salesperson IP.
- Nearest Neighbour Heuristic.
- Cheapest Insertion Heuristic.

Specific Outcome 10: Machine scheduling problems

- Machine scheduling without penalties.
- Machine scheduling with penalties.

Specific Outcome 11: Nonlinear programming

- Introduction to Non-linear problems.
- 2nd derivative check recap for 1 variable.
- Hessian matrix to check 2 variables.
- Golden section search algorithm.
- Steepest Ascent/Descent algorithm.