Hong Kong Baptist University
Faculty of Science
Department of Mathematics

Title (Units): ORBS7280 Advanced Operational Research (3,3,0)

Course Aims: This course introduces advanced theory and algorithms for linear programming, dynamic programming and nonlinear programming. Numerous examples will be adopted to demonstrate the use of various algorithms and techniques involved. The emphasis is not only on mastering these algorithms and techniques but also on the applications of them on various practical problems.

Prerequisite: No

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Remark: This course is delivered by staff of HKBU.

Course Intended Learning Outcomes (CILOs):

Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
1	Explain the fundamental principles of dynamic programming, linear programming, and nonlinear programming
2	Formulate real-life problems into dynamic, linear and nonlinear programming problems
3	Apply appropriate solution methods to solve linear, integer and nonlinear programming problems

Teaching & Learning Activities (TLAs):

CILO	TLAs will include the following:
1,2,3	Lectures with rigorous mathematical discussions and concrete examples. Lecturer will constantly ask questions in class to make sure that the majority of students are following the teaching materials.
1,2,3	Assignments to monitor both students' learning and mastering of the taught materials. In addition, common mistakes will also be addressed and analyzed.

Assessment:

No.	Assessment Methods	Weighting	CILO Addressed	Remarks
1	Assignments	40%	all	Assignments are designed to measure students' understanding of the theory, techniques, and applications of dynamic programming, linear programming, and nonlinear programming. Assignments are conducted to monitor the students' understanding of the theory, techniques and skills taught in the class. This may involve, but not limited to, in-class discussions of rigorous technical problems and their solutions.

2	Final Examination	60%	all	Final Examination is designed to see how far students have achieved their intended learning outcomes especially in the knowledge domain. Students should have a thorough understanding of the knowledge and apply them correctly in different context to do well in the exam.

Course Intended Learning Outcomes and Weighting:

Content	**CILO No.**	**Teaching (in hours)**
1. Linear programming	1,2,3	9
2. Dynamic programming	1,2,3	15
3. Nonlinear programming	1,2,3	15

References:

1. F. S. Hillier and G. J. Lieberman (2005). *Introduction to Operations Research: Eighth edition* McGraw Hill.
2. H. A. Taha, Prentice Hall (2003). *Operations Research, an introduction: Sixth edition*. Prentice Hall.
3. W. L. Winston, (2004). *Operations Research applications and algorithms: Fourth edition.* Thomson Brooks/Cole.
4. E. V. Denardo (1982). *Dynamic Programming: models and application*. Prentice Hall.
5. D. G. Luenberger, Addison-Wesley (1984). *Linear and Nonlinear Programming: Second edition.*
6. R. Fletcher, John Wiley & Sons. (1987). *Practical Methods of Optimization: Second edition.*
7. J. E. Dennis, Jr. and R. B. Schnabel. (1996) *Numerical Methods for Unconstrained Optimization and Nonlinear Equations.* SIAM.

Course Content in Outline:

	Topic	**Hours**
1.	Linear Programming	9
	• Duality theory	
	• Interior point methods for linear programming	
2.	Dynamic Programming	15
	• Dynamic programming models	
	• Characteristics of dynamic programming	
	• Principle of optimality	
	• Computation in dynamic programming	
3.	Nonlinear Programming	15
	• Basic theory for nonlinear optimization	
	• Numerical methods for unconstrained problems	
	• Numerical methods for constrained problems	