Course title: Operations Research Applications in Tourism

**Code**: 229051

**Instructor:** Prof. Yechezkel Israeli

**Credit hours:** 2

**Year:** 1**; Semester:** B

**Academic year:** 2021-22 (תשפ"ב)

**Course objectives:**

Operations Research (OR) is a science of modeling and optimization by using scientific approaches to decision-making. Through mathematical modeling, it seeks to design, improve and operate complex systems in the best possible way. The aim of the course is to provide basic insights of the optimization process as a supporting tool for managers in decision making. The course illustrates the principal techniques and their application in the different tourism sectors, including the hotel industry and aviation.

In the course various computational procedures are demonstrated, as manual procedure, computerized packages procedures, full enumeration versus an optimal procedure, and intuitive user decision versus algorithms.

**Intended learnings outcomes:**

Upon completion of this course, students will have the following abilities:

1. The skills to formulate, analyze, and solve mathematical models that represent real tourism problems.
2. It is expected that as future manager, student will be able to identify situations which need optimization tools
3. Understanding the whole procedure of optimization process, whether he/she will be assisted by appropriate software or by an external expert in OR.
4. Distinguishing between “user optimization” and “system optimization” with their related costs, while suggesting a managerial solution.

**Schedule of lessons:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Lesson #** | **Topic** | **Details** | **Relevant reading assignments** |
| 1 | Introduction to Operations Research (OR) | Main problems in the tourism sector that require optimal decision making; Operations Research definition and characteristics; Scope, objectives, phases, models and limitations of OR; Essential features of the OR approach; Quantification of factors; Stages in OR study. | **4** chap. 1 |
| 2 | Linear Programming (LP) | LP definition; LP and allocation of resources; Linearity requirement; Formulation of LP problem; Limitations or constraints, Maximization and Minimization problems; Graphical Solutions; Practical examples. | **4** chap. 2 |
| 3,4 | Linear Programming (LP) techniques | Simplex method definition; Formulating the Simplex model; Adding mixed constraints; Artificial variables; Big-M method; Two-phase method; Degeneracy; Implications to tourism. | **4** chap. 3 |
| 5,6 | Transportation Problem | Transportation model basic assumptions; Formulation of Transportation Problem; Solution Methods:  North-West Corner rule, Least-cost method, Vogel’s approximation method; Optimal Solution: The Stepping Stone Method, Modified Distribution (MODI) Method. Examples from aviation and tourist transport. | **4** chap. 5.1-5.3 |
| 7,8 | The Assignment Model: | Basic Assumptions; Formulation; Solution Methods: Different Combinations Method,  Short-Cut Method (Hungarian Method); Traveling salesman problem; Implications to tourist crew, vehicles and aircraft assignment. | **4** chap. 5.4 |
| 9, 10 | Games Theory  . | Basic assumptions and characteristics; Terms used in game theory; Two person zero sum games; pure strategy; matrix reduction by dominance; Minimax (maximin) method of optimal strategies; Value of the game; Mixed strategy for 2 X 2 games. Application to decision making in tourism | **4** chap. 15.4 |
| 11, 12 | Network Analysis: | Terms used in network analysis, Network or arrow diagram; Fulkerson’s rule; Shortest path method: Dijkestra algorithm, and Floyd’s Algorithm; Bottleneck (Maximum flow in minimum cut). Main problems from the tourism industry regarding networks. | **4** chap. 6.3-6.4  **1** 1.2-1.3 |
| 13 | Multi-objective Programming: | The concept behind the existence of more than one objective; Conflict between contradicting objectives; The compromise solution; Value of solution; Solution techniques. Applications for tourism decision making process. | **2** chap. 2, 6.5  **3** chap.1 |

**Grading scale:**

|  |  |
| --- | --- |
| **Assignment** | **Percentage of final grade** |
| Home exam | 70% |
| Deliveries | 30% |
| **Total** | **100%** |

Note: Addition or reduction of points might be according to general impression of student’s diligence, attendance and participation in class.

**Main bibliography:**

1. Bertsekas, D. (1992). *Linear Network Optimization: Algorithms and Codes*. Cambridge Mass.: The MIT press.
2. Goicochea, A., Hansen, D., Duckstein, L. (1982). *Multiobjective Decision Analysis with Engineering and Business Applications*. US: John Wiley & Sons.
3. Jones, D., Tamiz, M., Ries, J. (2010). *New developments in multiple objective and goal programming*. New York: Springer.
4. Taha, H. (2011). *Operations Research: An Introduction*. 9th ed. Boston: Pearson/Prentice Hall.

**Secondary Bibliography:**

1. Carter, M., & Price, C. (2001). *Operations Research: A Practical Introduction*. Boca Raton: CRC Press.
2. Hillier, F. & Lieberman, G. (2005). *Introduction to Operations Research*. 8th ed. Boston: McGraw-Hill. Chap.: 2, 8.3, 8.4, 14.

