ISM UNIVERSITY OF MANAGEMENT AND ECONOMICS

APPROVED BY
THE STUDY COMMISSION
Minutes No. 02-12-2023-11
as of 29th August 2023

QUANTITATIVE DECISION MAKING

Course code	*FUN118*
Compulsory in the programmes	*Economics and Politics, Economics and Analytics, International Business and Communication, Business Management and Marketing, Finance, Industrial Technology Management*
Level of studies	*Undergraduate*
Number of credits	*6 ECTS (48 in-class hours + 6 consultation hours + 2 exam hours, 104 individual work hours)*
Course coordinator (title and name)	*Juozas Granskas, Mindaugas Černiauskas*
Prerequisites	–
Language of instruction	*English*

THE AIM OF THE COURSE:

This is a practical course dealing with the mathematical models supporting decision making in various fields of social sciences and practical environment, i.e. management, economics, and politics. In particular, what-if analysis, forecasting, optimization and multi-criteria decision making are dealt in the course. Computer spreadsheets are used all over the course.

Objectives of the course include:

- To develop structural and algorithmic mindset in dealing with operational issues;
- To develop necessary skills for problem formulation, setting goals and parameters of the problem, choosing relevant model, translating it into the spreadsheet, and justifying alternative solutions of the problem;
- To develop skills of data visualization;
- To develop skills of using computer spreadsheets.

MAPPING OF COURSE LEVEL LEARNING OUTCOMES (OBJECTIVES) WITH DEGREE LEVEL LEARNING OBJECTIVES (See Annex), ASSESMENT AND TEACHING METHODS

Course level learning outcomes (objectives)	**Learning objectives for BSc in Business Management**	**Learning objectives for BSc in Social Science**	**Assessment methods**	**Teaching methods**
CLO1. To be able to develop a mathematical model for relevant problems in economics, finance, business and politics	BLO1.1 BLO1.2	ELO1.1	Homework defense, examination, examination retake	Lectures, computer lab seminars, textbook analysis, homework assignments, individual consultations
CLO2. To be able to select relevant methods for the analysis of mathematical models, to draw quantitatively justified conclusions and to choose the best alternative	BLO1.2	ELO1.2	Homework defense, examination, examination retake	Lectures, computer lab seminars, textbook analysis, homework assignments, individual consultations

CLO3. To be able to analyze the mathematical model by means of the computer spreadsheet	BLO3.1 BLO3.2	ELO3.1 ELO3.2	Homework defense, examination, examination retake	Lectures, computer lab seminars, textbook analysis, homework assignments, individual consultations
CLO4. To be able to visualize arrays of data by means of the computer spreadsheet	BLO4.1	ELO4.1	Homework defense, examination, examination retake	Lectures, computer lab seminars, textbook analysis, homework assignments, individual consultations

ACADEMIC HONESTY AND INTEGRITY

The ISM University of Management and Economics Code of Ethics, including cheating and plagiarism are fully applicable and will be strictly enforced in the course. Academic dishonesty, and cheating can and will lead to a report to the ISM Committee of Ethics. With regard to remote learning, ISM remind students that they are expected to adhere and maintain the same academic honesty and integrity that they would in a classroom setting.

COURSE OUTLINE

Topic	In-class hours	Readings
Introduction to the subject. Principles of Decision making. Developing a model of a problem: example. Data types and formats, data validation. Developing and copying formulas: scale independent approach. What-If Analysis tools: Data table, Goal Seek, Scenarios.	8	[**1**: Ch1], [**2**: 9–31, 40–47 , 53–75, 134–142, 190–203 p.]
Graphical models for decision making. Creating good charts. Building and modifying charts: examples. Inventory management model. Column, Pie, Pareto, Waterfall charts. Data analysis tools.	8	[**1**: Ch6], [**2**: 157–187 p.]
Time series, regression curves and forecasting. The method of least squares using Solver Add-In. Scatter (XY) chart. Trend line and TREND function. Exponential smoothing.	8	[**1**: Ch5], [**2**: 118–121, 210 216 p.]
Linear programming models. Stability of the optimal solution. Integer optimal solutions. Linear programming problems: examples. SUMPRODUCT function. Solver Add-In, it‘s options and available reports.	8	[**1**: Ch7], [**2**: 207–227 p.]
Decision making under uncertainty. Expected monetary value. Expected value of perfect information. Decision trees. . Using Expected Monetary Value (EMV) criterion and decision tree: an example. Total probability and Bayes‘ model as integral part of the decision tree. Scale independent approach and REPLACE tool.	8	[**1**: Ch3,4]
Multi-criteria decision making. Analytical Hierarchy Process. Multi-criteria decision making: examples. Analytical Hierarchy Process: practical issues.	8	[**1**: Module 1]

	Total: 48 hours	
CONSULTATIONS	6	
FINAL EXAM	2	

FINAL GRADE COMPOSITION

Type of assignment	**%**
Group Components 60%	
Defense of Homework No.1 (Developing a model of a problem.)	10%
Defense of Homework No.2 (Visual models for decision making)	10%
Defense of Homework No.3 (Regression curves and forecasting)	10%
Defense of Homework No.4 (Linear programming models)	10%
Defense of Homework No.5 (Decision making under uncertainty)	10%
Defense of Homework No.6 (Multi-criteria decision making)	10%
Individual Components 40%	
Final examination	40%
Total:	**100%**

DESCRIPTION AND GRADING CRITERIA OF EACH ASSIGNMENT

There are 6 homework assignments (HW) in the course. Homework is defended in the computer lab by a team of two students. Each team member has to demonstrate What-If analysis skills answering 2 questions on the homework topic indicated above given by the lecturer. There are drill-in questions in the homework assignment to make the preparation defense oriented. Each answer and the answering process is graded using 2-1-0 scale. If correct answer is provided within required time interval (typically 1 minute), 2 points are added to the score; if student demonstrated the skills needed, but made one mistake, or additional minute was used, 1 point is added to the score; if a student wasn't able to provide the answer within given time (2 minutes), 0 points is the outcome. The homework itself is graded using the same scale. If all requirements were met – 2 points; 0 points would get an incomplete homework; other cases – 1 point. Both team members get the same grade (number of scored points).
Final examination: *a closed book exam*. Student working at the computer lab has to create the model off the given situation, insert required chart and answer the questions. Set of situations is available for the preparation, but parameters and questions are different at the exam. Two main things impact the grade. Is the problem solved (appropriate solution method chosen, sequence of the steps is correct, no mistakes in the formulas, calculations are complete, conclusions/answers to the given questions are correctly formulated) and quality of the model (named cells, only relevant results in scenario summary, consistent worksheet formatting, chart elements are in harmony, data entries separated from calculations etc.)

RETAKE POLICY
In case the final grade is less than five (not passed) and all 6 homework tasks are completed (uploaded), student is allowed to retake the exam once. It's a repeated final examination, so the weight of the retake is the same 40 percent.

ADDITIONAL REMARKS

REQUIRED READINGS

1. Render B., Stair R., Hanna M. Quantitative analysis for management. Prentice hall. 2003 (8th ed.) 726 p.

ADDITIONAL READINGS

2. A. Vidžiūnas, M. Vidžiūnaitė. Microsoft Excel 2013. Skaičiuoklių taikymas apskaitoje ir vadyboje. – Kaunas: „Smaltijos“ leidykla, 2013. 336 p.

3. Moore J.H., Weatherford L.R. Decision Modelling with Microsoft Excel. Prentice hall. 2001 (6th ed.) 693 p.

ANNEX

DEGREE LEVEL LEARNING OBJECTIVES

Learning objectives for the Bachelor of Business Management
Programmes:
International Business and Communication,
Business Management and Marketing, Finance,
Industrial Technology Management

Learning Goals	Learning Objectives
Students will be critical thinkers	BLO1.1. Students will be able to understand core concepts and methods in the business disciplines
	BLO1.2. Students will be able to conduct a contextual analysis to identify a problem associated with their discipline, to generate managerial options and propose viable solutions
Students will be socially responsible in their related discipline	BLO2.1. Students will be knowledgeable about ethics and social responsibility
Students will be technology agile	BLO3.1. Students will demonstrate proficiency in common business software packages
	BLO3.2. Students will be able to make decisions using appropriate IT tools
Students will be effective communicators	BLO4.1. Students will be able to communicate reasonably in different settings according to target audience tasks and situations
	BLO4.2. Students will be able to convey their ideas effectively through an oral presentation
	BLO4.3. Students will be able to convey their ideas effectively in a written paper

Learning objectives for the Bachelor of Social Science
Programmes:
Economics and Data Analytics,
Economics and Politics

Learning Goals	Learning Objectives
Students will be critical thinkers	ELO1.1. Students will be able to understand core concepts and methods in the key economics disciplines
	ELO1.2. Students will be able to identify underlying assumptions and logical consistency of causal statements
Students will have skills to employ economic thought for the common good	ELO2.1.Students will have a keen sense of ethical criteria for practical problem-solving
Students will be technology agile	ELO3.1. Students will demonstrate proficiency in common business software packages
	ELO3.2. Students will be able to make decisions using appropriate IT tools
Students will be effective communicators	ELO4.1.Students will be able to communicate reasonably in different settings according to target audience tasks and situations
	ELO4.2.Students will be able to convey their ideas effectively through an oral presentation
	ELO4.3. Students will be able to convey their ideas effectively in a written paper