Appendix No. 1.5 to the Resolution No. 61/2025
of the Rector of the University of Rzeszów

SYLLABUS

REGARDING THE QUALIFICATION CYCLE FROM 2026 TO 2029
ACADEMIC YEAR 2027/2028

1. BASIC COURSE/MODULE INFORMATION

Course/Module title	Decision-making under risk
Course/Module code *	
Faculty (name of the unit offering the field of study)	Faculty of Exact and Technical Sciences
Name of the unit implementing the subject	Institute of Mathematics
Field of study	Mathematics
Level of education	First-cycle studies (Bachelor's)
Profile	General academic
Form of studies	Full-time
Year and semester of studies	Year 2, Semester 4
Type of item	Specialisation course
Language of instruction	English
Coordinator	Jacek Chudziak, PhD, DSc
Course instructor	Jacek Chudziak, PhD, DSc

* - as agreed at the faculty

1.1. Forms of teaching, number of hours and ECTS points

Semester (no.)	Lectures	Classes	Laboratories	Seminars	Practical classes	Internships	others	**ECTS credits**
5	30	30						6

1.2. Method of conducting classes

☒classes in a traditional form
☐ classes conducted using distance learning methods and techniques

1.3 Form of passing the course/module (in progress) (exam, pass with grade, pass without grade)
Exercises - passing with a grade, lecture – exam

2.PREREQUISITES

Knowledge of the basics of probability theory and mathematical statistics.

3. OBJECTIVES, LEARNING OUTCOMES, CURRICULUM CONTENT AND TEACHING METHODS USED

3.1 Subject/Module Objectives

O1	Familiarization students with the basic concepts and facts related to decision-making in risk conditions and with selected risk management methods.
O2	Presentation of the basics of expected utility theory and selected behavioral models of decision-making under risk conditions.
O3	Indication of possible applications of the learned models for the valuation of risky assets.
O4	Presentation of probabilistic risk assessment methods and their applications.

3.2. COURSE/MODULE LEARNING OUTCOMES (TO BE COMPLETED BY THE COORDINATOR)

Learning Outcome	The description of the learning outcome defined for the course/module	Relation to the degree programme outcomes
LO_01	The student knows and understands the basic concepts and facts necessary to analyze issues related to decision-making in risk conditions (risk aspects and factors, risk management methods).	K_W07
LO_02	The student understands the fundamentals of expected utility theory and utility-based risk assessment methods. They possess a basic understanding of behavioral models of decision-making under risk and probabilistic risk assessment methods (decision tree analysis).	K_W08
LO_03	The student is able to apply decision-making methods based on utility functions.	K_U16,K_U22
LO_04	The student is able to apply behavioral models of decision-making under risk conditions and probabilistic risk assessment methods to solve problems.	K_U16,K_U22
LO_05	The student recognizes the potential applications of learned decision-making models in risky environments. He or she is aware of the limitations associated with their use.	K_K04,K_K05,K_K07

3.3. Course content (to be completed by the coordinator)

A. Lectures

Content outline
1. Risk in human activity. Risk aspects and factors. Risk classification. Risk management methods. 2. Making decisions under conditions of: certainty, uncertainty, risk. 3. Basics of expected utility theory. Lotteries. Relationships of preference, strong preference , and indifference. Utility function. 4. Decision-making methods based on utility functions. Certainty equivalent, its properties and applications. 5. Basic types of risk attitudes. Risk aversion. 6. Application of risk assessment methods to the valuation of risky assets. 7. Behavioral models of decision-making under risk. Probability distortion functions. Risk assessment in behavioral models of decision-making. 8. Probabilistic risk assessment methods. Scenario analysis and decision trees.

B. Classes, laboratories, seminars, practical classes

Content outline
1. Risk in human activity. Risk aspects and factors. Risk classification. Risk management methods. 2. Making decisions under conditions of: certainty, uncertainty, risk. 3. Basics of expected utility theory. Lotteries. Relationships of preference, strong preference, and indifference. Utility function. 4. Decision-making methods based on utility functions. Certainty equivalent, its properties and applications. 5. Basic types of risk attitudes. Risk aversion. 6. Application of risk assessment methods to the valuation of risky assets. 7. Behavioral models of decision-making under risk. Probability distortion functions. Risk assessment in behavioral models of decision-making. 8. Probabilistic risk assessment methods. Scenario analysis and decision trees.

3.4. Methods of Instruction

Lecture: lecture supported by a multimedia presentation (possibility of using MS Teams).
Classes: problem solving, discussion.

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

Learning outcome	Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes)	Learning format (lectures, classes,...)
LO-01	observation during classes, colloquium, written exam	lectures, classes
LO-02	observation during classes, colloquium, written exam, project	lectures, classes
LO-03	observation during classes, colloquium, written exam	lectures, classes
LO-04	observation during classes, colloquium, written exam	lectures, classes
LO-05	observation during classes	lectures, classes

4.2 Course assessment criteria

Passing the tutorials: Preparing a project and passing two tests is required to pass the tutorials. Each test is graded on a 0-20 point scale, and passing requires a minimum of 10 points. The final grade is determined according to the following scale:20-23.5 points - 3.0, 24-27.5 points - 3.5, 28-31.5 points - 4.0, 32-35.5 points - 4.5, 36-40 points - 5.0.

Exam: During the exam, students are given 5 tasks to complete. Each task is graded on a scale of 0-4 points. To pass the exam, students must obtain at least 10 points. The grade is then determined according to the following scale: 10-11.5 points – 3.0, 12-13.5 points – 3.5, 14-15.5 points – 4.0, 16-17.5 points – 4.5, 18-20 points – 5.0.

5. Total student workload needed to achieve the intended learning outcomes – number of hours and ECTS credits

Activity	Number of hours
Course hours	60
Other contact hours involving the teacher (consultation hours, examinations)	2

Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.)	90
Total number of hours	152
Total number of ECTS credits	6

* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

Number of hours	*Not applicable*
Internship regulations and procedures	*Not applicable*

7. Instructional materials

Compulsory literature: 1. Peterson, M., *An Introduction to Decision Theory*. 2nd ed. Cambridge University Press, Cambridge, 2017. 2. Wakker, P P., *Prospect Theory: For Risk and Ambiguity.* Cambridge University Press, Cambridge, 2010.
Complementary literature: 1. Fishburn, P. C., *Foundations of Expected Utility Theory*. Springer, Dordrecht, 1988.

Approved by the Head of the Department or an authorised person