MINISTRY OF SCIENCE AND HIGHER EDUCATION
OF THE RUSSIAN FEDERATION
Federal State Budgetary Educational Institution of Higher Education
"IRKUTSK STATE UNIVERSITY"
SAF, Baikal International Business School (Institute)
Strategic and Financial Management Department

APPROVED:
Dean of SAF, Baikal International Business School (institute)
_____ N.B. Grosheva
April 14, 2025

Syllabus

Discipline Б1.В.21 Management Decision-Making Methods

Major 27.03.05 Innovatics

Specialization: Management of Innovative and IT Projects and Products

University Degree: Bachelor

Full time

Approved by the Academic and Methodological Council of Baikal International Business School (institute)
Protocol № 4 March 26, 2025

Chairperson V.M. Maksimova

Recommended by the Strategic and Financial Management Department
Protocol № 9 March 21, 2025

Department Chair N.B. Grosheva

Irkutsk 2025

Contents

I. Goal and Objectives of the Discipline

Goals:

– To develop logical and algorithmic thinking through a detailed analysis of approaches to mathematical modeling and comparative analysis of different types of models;

– To form the skills and abilities to study a wide range of economic tasks in making management decisions;

– To form theoretical knowledge about methods of making and implementing managerial decisions and practical skills to find organizational and managerial solutions and readiness to be responsible for them.

Objectives:

– To learn how to apply a systematic approach to solving problems;

– To learn how to formulate a set of tasks within the framework of the project goal that ensure its achievement, and to study the technologies for making effective management decisions when solving these problems;

– To gain practical skills and abilities in choosing the best way to solve problems, taking into account the current legal norms and existing conditions, resources and restrictions;

– To master the basic mathematical models and methods of making management decisions, which involve the use of standard software – MS Excel, online calculators; to teach how to apply them practically for planning the company's activities.

II. Place of the Discipline in the CPEP Structure

The academic discipline "Б1.В.21 Management Decision-Making Methods" belongs to the part of the bachelor's degree program in the field of study 27.03.05 “Innovatics”, specialization “Management of Innovative and IT Projects and Products”, formed by the participants of educational relations.

To study this academic discipline, it is necessary to have knowledge, skills and abilities formed by the previous disciplines: Б1.О.12 Mathematics; Б1.О.14 Management; Б1.О.16 Economics (Microeconomics and Macroeconomics); Б1.В.17 Information Technologies in Innovative Project Management.

List of subsequent academic disciplines that require knowledge, skills and abilities formed by this academic discipline: Б1.О.15 Digital Marketing; Б1.В.01 Strategic Management, Б1.В.09 Risk Management at an Innovative Company, Б1.В.15 Management of Innovative Projects.

III. Requirements for the Discipline Learning Outcomes

The process of mastering the discipline is aimed at the formation of elements of the following competencies in accordance with the Federal State Educational Standard of Higher Education and CPEP HE in the field of study 27.03.05 **“Innovatics”,** specialization "Management of Innovative and IT Projects and Products".

List of Planned Learning Outcomes for the Discipline, Mapped to Competency Achievement Indicators

Competency	Competency Achievement Indicator	Learning Outcomes
UC-1: is able to search, critically analyze and synthesize information, apply a systematic approach to solving problems	**CAI UC1.2**: Takes a systematic approach to address the challenges	Knowledge: basic theories and models of decision-making; information bases of the organization. Abilities: substantiate

		management decisions using statistical and optimization methods. Skills: in the use of modern mathematical tools to solve management problems.
UC-2: is able to determine the range of tasks within the framework of the set goal and choose the best ways to solve them, based on the current legal norms, available resources and constraints	**CAI UC2.1**: formulates within the framework of the project objective a set of objectives that ensure its achievement	Knowledge: types of optimization tasks used in the management of innovative projects and products. Abilities: formalize mathematical models, optimization problems. Skills: a set of standard management models and methods of their research.
	CAI UC2.2: chooses the best way to solve problems, taking into account the current legal norms and the existing conditions, resources and constraints	Knowledge: the main approaches to the analysis of models of economic processes are graphic, analytical, numerical. Abilities: formulate graphic, optimization tasks in management models. He is proficient in methods of graphical and numerical research of linear and nonlinear programming problems.

IV. Contents and Discipline Structure

Discipline scope is 3 credits, 108 hrs,
Including, 8 hrs for credit with grade.
Form of Summative Assessment: credit with grade.

4.1 Discipline Contents, Structured by Topics, with Indicated Types of Classes and Allocated Academic Hours

№	Discipline Section/Theme	Semester	Total Hrs	Practical training of students	Types of Educational Activities, Including Self-Study, Practical Sessions, and Workload (in hrs)				Formative Assessment Formats; Summative Assessment Formats
					Teacher Contact Hrs			Self-Study	
					Lectures	Practical Sessions	Consultations, Self-Study Monitoring, Summative Assessment		
	2	3	4	5	6	7	8	9	10
1	Management under uncertainty: the basics of the theory of decision-making, playing "with nature", decision tree.	7	6	-	2	2		2	Case task, oral questioning
2	Management in Certainty: An Introduction to Linear Programming; formalization of linear programming tasks.	7	6	-	2	2		2	Case task, oral questioning
3	Transformation of linear programming problems. Graphical study of linear programming problems.	7	6	-	2	2		2	Case task, oral questioning
4	Simplex method for a standard linear programming problem; solving LP problems in MS Excel (the "Search for a solution" add-in)	7	6	-	2	2		2	Case task, oral questioning

	2	3	4	5	6	7	8	9	10
	and online calculators.								
5	Solution of the general problem of linear programming: the method of artificial basis.	**7**	**6**	**-**	**2**	**2**		**2**	Case problem, test
6	Dual problems of linear programming; equilibrium conditions; Dual simplex method.	**7**	**10**	**-**	**4**	**4**		**2**	Case task, oral questioning
7	Postoptimal analysis of linear programming models.	**7**	**12**	**-**	**4**	**4**		**4**	Case task, oral questioning
8	Special problems of linear programming: transport problem (potential method; PC-based research).	**7**	**6**	**-**	**2**	**2**		**2**	Case problem, test
9	Special problems of linear programming: study of an integer problem of linear programming on a PC, problems of assignments.	**7**	**6**	**-**	**2**	**2**		**2**	Case task, oral questioning
10	Introduction to Game Theory: Strategy Games (Solving in Pure Strategies; Graphical Method of Solving in Mixed Strategies; Reduction to Linear Programming Problems)	**7**	**10**	**-**	**4**	**4**		**2**	Case task, oral questioning
11	Fundamentals of network optimization: Euler and Hamiltonian graphs; traveling salesman problems, about the critical path, the shortest route, the maximum flow.	**7**	**6**	**-**	**2**	**2**		**2**	Case task, oral questioning
12	Fundamentals of Network Optimization: Network Analysis of PC Projects; analysis of project implementation costs.	**7**	**7**	**-**	**2**	**2**		**3**	Report, oral survey
13	Problems of nonlinear programming: search for an unconditional extremum; graphical solution of nonlinear programming problems; analysis of models on a PC; Lagrange multiplier method.	**7**	**13**	**-**	**4**	**4**	**1 (cons)**	**4**	Case task, oral questioning
14	**Summative assessment**	**7**	**8**				**8 (KO)**		**Credit with a grade**
	Total hours:		**108**		**34**	**34**	**9**	**31**	

4.2. Plan for Out-of-Class Student Self-Study of the Discipline

Semester	Section, Themes	Self-Study			Assessment Tool	Self-Study Educational and Methodological Support
		Type of Self-Study	Deadlines	Load (hr.)		
7	Management under uncertainty: the basics of the theory of decision-making, playing "with nature", decision tree.	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 2 of Semester	**2**	Case task, oral questioning.	Nabatova D.S. Mathematical and instrumental methods of decision support: Textbook and workshop for bachelor's and master's degrees: [Electronic resource].- Moscow: Yurayt Publishing House, 2015.- 292 p.- ISBN 978599165188.- (EBS "Yurayt", URL: https://urait.ru/bcode/469195), p. 5.5

Semester	Section, Themes	Self-Study			Assessment Tool	Self-Study Educational and Methodological Support
		Type of Self-Study	Deadlines	Load (hr.)		
7	Management in Certainty: An Introduction to Linear Programming; formalization of linear programming tasks.	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 3 of Semester	**2**	Case task, oral questioning	Nabatova D.S. Mathematical and instrumental methods of decision support: Textbook and workshop for bachelor's and master's degrees: [Electronic resource].- Moscow: Yurayt Publishing House, 2015.- 292 p.- ISBN 978599165188.- (EBS "Yurayt", URL: https://urait.ru/bcode/469195), ch.2, Author's lectures http://youtu.be/B0zOUNQknEo http://youtu.be/vZLWZgA1aNE

Semester	Section, Themes	Self-Study			Assessment Tool	Self-Study Educational and Methodological Support
		Type of Self-Study	Deadlines	Load (hr.)		
7	Transformation of linear programming problems. Graphical study of linear programming problems.	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 4 of Semester	**2**	Case task, oral questioning	Nabatova D.S. Mathematical and instrumental methods of decision support: Textbook and workshop for bachelor's and master's degrees: [Electronic resource].- Moscow: Yurayt Publishing House, 2015.- 292 p.- ISBN 978599165188.- (EBS "Yurayt", URL: https://urait.ru/bcode/469195), ch.2, Author's lecture http://youtu.be/u0h9Q7lug7E
7	Simplex method for a standard linear programming problem; solving LP problems in MS Excel (add-in "Search for a solution") and online calculators on the Internet.	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 5 of Semester	**2**	Case task, oral questioning	Author's lectures http://youtu.be/XJ4hVULacWQ http://youtu.be/fFdNWRqMSoA

Semester	Section, Themes	Self-Study			Assessment Tool	Self-Study Educational and Methodological Support
		Type of Self-Study	Deadlines	Load (hr.)		
7	Solution of the General Problem of Linear Programming: Artificial Basis Method.	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 6 of Semester	**2**	Case problem, test	Author's lecture http://youtu.be/PGYvn-v_kiA
7	Dual problems of linear programming; equilibrium conditions; Dual simplex method.	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 7 of Semester	**2**	Case task, oral questioning	Author's lectures http://youtu.be/jqzCP0dx6IA http://youtu.be/f57lQPcQ_2c http://youtu.be/QF1ofFU60WM
7	Postoptimal analysis of linear programming models.	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 9 of Semester	**4**	Case task, oral questioning	Author's lecture http://youtu.be/NIX_GV2nWyQ

Semester	Section, Themes	Self-Study			Assessment Tool	Self-Study Educational and Methodological Support
		Type of Self-Study	Deadlines	Load (hr.)		
7	Special problems of linear programming: transport problem (potential method; PC-based research).	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 11 of Semester	**2**	Case problem, test	Nabatova D.S. Mathematical and instrumental methods of decision support: Textbook and workshop for bachelor's and master's degrees: [Electronic resource].- Moscow: Yurayt Publishing House, 2015.- 292 p.- ISBN 978599165188.- (EBS "Yurayt", URL: https://urait.ru/bcode/469195), ch. 2, Author's lectures http://youtu.be/JVxEa_e_i50 http://youtu.be/4BBnh8SY7OY

Semester	Section, Themes	Self-Study			Assessment Tool	Self-Study Educational and Methodological Support
		Type of Self-Study	Deadlines	Load (hr.)		
7	Special problems of linear programming: study of an integer problem of linear programming on a PC, problems of assignments.	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 12 of Semester	**2**	Case task, oral questioning	Nabatova D.S. Mathematical and instrumental methods of decision support: Textbook and workshop for bachelor's and master's degrees: [Electronic resource].- Moscow: Yurayt Publishing House, 2015.- 292 p.- ISBN 978599165188.- (EBS "Yurayt", URL: https://urait.ru/bcode/469195), ch. 2, Author's lecture http://youtu.be/V6m227QVODY

Semester	Section, Themes	Self-Study			Assessment Tool	Self-Study Educational and Methodological Support
		Type of Self-Study	Deadlines	Load (hr.)		
7	Introduction to Game Theory: Strategy Games (Solving in Pure Strategies; Graphical Method of Solving in Mixed Strategies; Reduction to Linear Programming Problems)	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 14 of Semester	**2**	Case task, oral questioning	Nabatova D.S. Mathematical and instrumental methods of decision support: Textbook and workshop for bachelor's and master's degrees: [Electronic resource].- Moscow: Yurayt Publishing House, 2015.- 292 p.- ISBN 978599165188.- (EBS "Yurayt", URL: https://urait.ru/bcode/469195), ch. 5, Author's lectures http://youtu.be/MF6W0rMp30o http://youtu.be/Dq-7QIiLI6U
7	Fundamentals of network optimization: Euler and Hamiltonian graphs; traveling salesman problems, about the critical path, the shortest route, the maximum flow.	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of the 15th week of the semester	**2**	Case task, oral questioning	Author's lecture http://youtu.be/5RiME6fk3UM

Semester	Section, Themes	Self-Study			Assessment Tool	Self-Study Educational and Methodological Support
		Type of Self-Study	Deadlines	Load (hr.)		
7	Fundamentals of Network Optimization: Network Analysis of PC Projects; analysis of project implementation costs.	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 16 of Semester	**3**	Report, oral questioning.	Nabatova D.S. Mathematical and instrumental methods of decision making: Textbook and workshop for bachelor's and master's degrees: [Electronic resource].- Moscow: Yurayt Publishing House, 2015.- 292 p.- ISBN 978599165188.- (EBS "Yurayt", URL: https://urait.ru/bcode/469195), p. 3.5
7	Problems of nonlinear programming: search for an unconditional extremum; graphical solution of nonlinear programming problems; analysis of models on a PC; Lagrange multiplier method.	Consolidation and systematization of knowledge on the topic of the lesson: work with notes, educational and reference literature, with Internet sources. Performance of computational and graphic work.	End of Week 17 of Semester	**4**	Case task, oral questioning	Author's lectures http://youtu.be/IK6MGQtYIV4 http://youtu.be/EwKgJxB79Ww http://youtu.be/nMF745lL1P4
Total self-study load (hr)				**31**		
Self-study load using e-learning and distance learning technologies (hour)				–		

4.3. Learning Content

Topic 1. Management under uncertainty: the basics of the theory of decision-making, playing "with nature", decision tree.

Topic 2. Management in Certainty: An Introduction to Linear Programming; formalization of linear programming tasks.

Topic 3. Transformation of linear programming problems. Graphical study of linear programming problems.

Topic 4. Simplex method for a standard linear programming problem; solving LP problems in MS Excel (the "Search for a solution" add-in) and online calculators.

Topic 5. Solution of the General Problem of Linear Programming: Artificial Basis Method.

Topic 6. Dual problems of linear programming; equilibrium conditions; Dual simplex method.

Topic 7. Postoptimal analysis of linear programming models.

Topic 8. Special problems of linear programming: transport problem (potential method; PC-based research).

Topic 9. Special problems of linear programming: study of an integer problem of linear programming on a PC, problems of assignments.

Topic 10. Introduction to Game Theory: Strategy Games (Solving in Pure Strategies; Graphical Method of Solving in Mixed Strategies; Reduction to Linear Programming Problems)

Topic 11. Fundamentals of network optimization: Euler and Hamiltonian graphs; traveling salesman problems, about the critical path, the shortest route, the maximum flow.

Topic 12. Fundamentals of Network Optimization: Network Analysis of PC Projects; analysis of project implementation costs.

Topic 13. Problems of nonlinear programming: search for an unconditional extremum; graphical solution of nonlinear programming problems; analysis of models on a PC; Lagrange multiplier method.

4.3.1. List of Seminars, Practical Sessions and Laboratory Work

№	Theme Number	Seminars, Practical Sessions and Laboratory Work	Load (hr.)		Assessment Tools	Developed Competencies (Indicators)
			Total hrs	Including Practical Sessions		
1	2	3	4	5	6	7
1	1	Games "with nature", decision tree.	**2**	–	Case task, oral questioning	UC-1.2, 2.1, 2.2
2	2	Formalization of linear programming problems.	**2**	–	Case task, oral questioning	UC-1.2, 2.1, 2.2
3	3	Graphical study of linear programming problems.	**2**	–	Case task, oral questioning	UC-1.2, 2.1, 2.2
4	4	Simplex method for a standard linear programming problem; solving LP problems in MS Excel.	**2**	–	Case task, oral questioning	UC-1.2, 2.1, 2.2
5	5	Solution of the General Problem of Linear Programming: Artificial Basis Method.	**2**	–	Case problem, test	UC-1.2, 2.1, 2.2

6	6	Dual problems of linear programming; equilibrium conditions; Dual simplex method.	**4**	–	Case task, oral questioning	UC-1.2, 2.1, 2.2
7	7	Postoptimal analysis of linear programming models.	**4**	–	Case task, oral questioning	UC-1.2, 2.1, 2.2
8	8	Solution of transport problems (method of potentials; research on PC).	**2**	–	Case problem, test	UC-1.2, 2.1, 2.2
9	9	Study of an integer problem of linear programming on a PC, assignment problems.	**2**	–	Case task, oral questioning	UC-1.2, 2.1, 2.2
10	10	Strategy games (solving in pure strategies; graphical method of solving in mixed strategies; reduction to linear programming problems)	**4**	–	Case task, oral questioning	UC-1.2, 2.1, 2.2
11	11	Fundamentals of network optimization: Euler and Hamiltonian graphs; traveling salesman problems, about the critical path, the shortest route, the maximum flow.	**2**	–	Case task, oral questioning	UC-1.2, 2.1, 2.2
12	12	Fundamentals of Network Optimization: Network Analysis of PC Projects; analysis of project implementation costs.	**2**	–	Report, oral survey	UC-1.2, 2.1, 2.2
13	13	Problems of nonlinear programming: search for an unconditional extremum; graphical solution of nonlinear programming problems; analysis of models on a PC; Lagrange multiplier method.	**4**	–	Case task, oral questioning	UC-1.2, 2.1, 2.2
		Total Hours	**34**			

4.3.2. List of Topics (Questions) Assigned for Independent Work as Part of Student Self-Study

№	Theme	Task	Competency	Indicators
1	**2**	**3**	**4**	**5**
1	Management under uncertainty	Decision tree for a real business situation	**UC-2**: is able to determine the range of tasks within the framework of the goal and choose the best ways to solve	**UC-2.2**: chooses the best way to solve problems, taking into account the current legal

			them, based on the current legal norms, available resources and restrictions.	norms and the available conditions, resources and restrictions.
2	Control under Certainty: Formalization of Linear Programming Problems	Form a linear programming model for a real business situation	**UC-1**: is able to search, critically analyze and synthesize information, apply a systematic approach to solving problems**.** **UC-2**: is able to determine the range of tasks within the framework of the goal and choose the best ways to solve them, based on the current legal norms, available resources and restrictions.	**UC-1.2**: applies a systematic approach to solving the tasks. **UC-2.1**: formulates a set of tasks within the framework of the project goal that ensure its achievement.
3	Postoptimal Analysis of Linear Programming Models	Analysis of the stability of the optimal plan of the company's production activity in relation to fluctuations in product prices	**UC-1**: is able to search, critically analyze and synthesize information, apply a systematic approach to solving problems. **UC-2**: is able to determine the range of tasks within the framework of the goal and choose the best ways to solve them, based on the current legal norms, available resources and restrictions.	**UC-1.2**: applies a systematic approach to solving the tasks. **UC-2.2**: chooses the best way to solve problems, taking into account the current legal norms and the available conditions, resources and restrictions.

4	Network Optimization Basics	Network analysis of projects on a PC; Analysis of project costs using online calculators	**UC-1**: is able to search, critically analyze and synthesize information, apply a systematic approach to solving problems **UC-2**: is able to determine the range of tasks within the framework of the goal and choose the best ways to solve them, based on the current legal norms, available resources and restrictions.	**UC-1.2**: applies a systematic approach to solving the tasks. **UC-2.2**: chooses the best way to solve problems, taking into account the current legal norms and the available conditions, resources and restrictions.

4.4. Guidelines for Organizing Student Self-Study

Independent work of students is carried out using e-learning and distance learning technologies. Educational and methodological materials for self-study are available to students through electronic library systems and the Hecadem Internet learning system, which presents materials of lectures and practical (seminar) classes, interactive forms of training, examples of tasks. The Hecadem Internet Learning System is a platform for distance learning and learning using digital technologies of the Baikal International Business School of ISU. Each student receives authorized access to the system. Available at: https://edu.buk.irk.ru.

Independent work consists of:

– in the student's independent preparation for the lecture – reading the notes of the previous lecture, watching the video version of the lecture (if any). This helps to better understand the material of the new lecture, relying on previous knowledge;

– in preparation for practical classes on the main and additional sources of literature;

– in independent study of individual topics or questions in classes on the main and additional sources of literature, on sources on the Internet and on the electronic portal of the university;

– in preparation for current control and intermediate certification.

When performing independent work in preparation for current control and intermediate certification, the student must take into account the criteria for evaluating the task being performed (section 8 of this program).

Control over independent work is carried out when the student performs tasks from the fund of assessment materials of the discipline. In the course of independent work control, both the actual knowledge, skills and abilities of students are assessed, as well as the depth of understanding and the ability to isolate and interpret integral semantic structures, as well as the skills of independent search for the necessary information on the topic of the lesson and its critical assessment.

Independent work of students is a process of active, purposeful acquisition of new knowledge and skills by a student without the direct participation of a teacher, characterized by a subject

orientation, effective control and evaluation of the results of the student's activities.

Goals of independent work:

- systematization and consolidation of the theoretical knowledge and practical skills of students;
- deepening and expanding theoretical knowledge;
- formation of skills to use regulatory and reference documentation, special literature;
- development of cognitive abilities, activity of students, responsibility and organization;
- formation of independent thinking, creative initiative, abilities for self-development, self-improvement and self-realization;
- development of research skills and academic skills.

Independent work can be carried out individually or by groups of students, depending on the goal, volume, level of complexity, and specific topics.

The technology of organizing students' independent work includes the use of information and material and technical resources of an educational institution.

Before students perform extracurricular independent work, the teacher can instruct them on how to complete the task. The briefing includes:

- the purpose and content of the task;
- deadlines;
- an estimated amount of work;
- basic requirements for the results of work and evaluation criteria;
- possible typical errors during execution.

Instruction is conducted by the teacher at the expense of the amount of time allotted for the study of the discipline.

Control of the results of extracurricular independent work of students can take place in written, oral or mixed form.

Students should approach independent work as the most important means of consolidating and developing theoretical knowledge, developing a unity of views on certain issues of the course, acquiring certain skills and using professional literature.

Premises for independent work of students should be equipped with computer equipment with the ability to connect to the Internet and provide access to the electronic information and educational environment of the organization.

When studying the course independently, students should:

- view key definitions and facts;
- repeat the material summarized at the lecture session and supplement it taking into account the literature recommended on this topic;
- study the recommended literature, make theses, annotations and summaries of the most important points;
- independently perform tasks similar to those offered in the classroom;
- use the materials of the assessment tools fund for self-examination.

V. Educational, Methodological, and Information Support for the Discipline

a) Required Reading:

1. Golubkov, E. P. Methods of Managerial Decision Making in 2 Parts. Part 1: Textbook and Practicum for Higher Educational Institutions / E. P. Golubkov. - 3rd ed., ispr. Moscow: Yurayt Publishing House, 2022. — 183 p. — (Higher Education). — ISBN 978-5-534-06815-3. — Text : electronic // Educational platform Yurayt [site]. — URL: https://urait.ru/bcode/489387
2. Golubkov, E. P. Methods of Managerial Decision Making in 2 Part 2: Textbook and Practicum for Higher Educational Institutions / E. P. Golubkov. - 3rd ed., ispr. Moscow: Yurayt Publishing House, 2022. — 249 p. — (Higher Education). — ISBN 978-5-534-06700-2. — Text : electronic // Educational platform Yurayt [site]. — URL:

https://urait.ru/bcode/490620
3. Methods of Managerial Decision Making: Textbook for Higher Educational Institutions / P. V. Ivanov [i dr.] ; edited by P. V. Ivanov. - 2nd ed., ispr. Moscow: Yurayt Publishing House, 2022. — 276 p. — (Higher Education). — ISBN 978-5-534-10862-0. — Text : electronic // Educational platform Yurayt [site]. — URL: https://urait.ru/bcode/494754
4. Trofimova, L. A. Methods of Managerial Decision Making: Textbook and Practicum for Higher Educational Institutions / L. A. Trofimova, V. V. Trofimov. — Moscow : Yurayt Publishing House, 2022. — 335 p. — (Higher Education). — ISBN 978-5-534-01584-3. — Text : electronic // Educational platform Yurayt [site]. — URL: https://urait.ru/bcode/488692

Additional Sources:

1. Borg, James. The power of persuasion. The Art of Influencing People. Borg; Ed. by T. Kabachenko. - 4th ed. stereotype. - Moscow: Pretext, 2011. - 308 p. - ISBN 9785989950607
2. Gerster R. Who Said That Elephants Can't Dance? Tough Reforms for Company Survival: Translated from English / L. Gerster. - 3rd ed. - Moscow: Alpina Publisher, 2015. - 320 p. - ISBN 9785961450071
3. Diogenov, A. B. Introduction to Quantitative Methods in the Theory of Decision Making. Manual / A. V. Diogenov. – Irkutsk : ISU, 2008. – 171 p. – (Baikal International Business School).
4. Christensen, Clayton. Solving the problem of innovation in business. How to Create a Growing Business and Successfully Support Its Growth: transl. from English / K. M. Christensen, M. Raynor; transl. E. Kalinik ; Ed. by E. Auzan. - Moscow: Alpina Publisher, 2014. - 290 p. - ISBN 9785961445909
5. Krogerus M. The Book of Solutions. 50 Models of Strategic Thinking: transl. from German. / M. Krogerus, R. Chappeler; transl. by E. Turchaninov. - M. : OLYMP-BUSINESS, 2012. - 208 p. : ill. - ISBN 9785969302075
6. Lifshitz A. S. Managerial Decisions: Textbook / A. S. Lifshitz. - Moscow: KnoRus, 2009. - 248 p. - ISBN 978539000518
7. Methods of Managerial Decision Making : Textbook / Ed. by P. V. Ivanov. - Rostov-on/D.: Phoenix, 2014. - 413 p.: ill. - (Higher Education). - ISBN 9785222228456
8. Mkrtychyan, G. A. Managerial Decision Making: Textbook and Practicum for Higher Educational Institutions / G. A. Mkrtychyan, N. G. Shubnyakova. — Moscow : Yurayt Publishing House, 2021. — 140 p. — (Higher Education). — ISBN 978-5-534-13827-6. — Text : electronic // EBS Yurayt [site]. — URL: https://urait.ru/bcode/477222
9. Nabatova D.S. Mathematical and instrumental methods of decision support: Textbook and workshop for bachelor's and master's degrees: [Electronic resource]/ D. S. Nabatova.- Moscow: Yurayt Publishing House, 2015.- 292 p.- ISBN 978599165188.- (EBS "Yurayt", URL: https://urait.ru/bcode/469195).
10. Puzhaev A. V. Managerial Decisions: Textbook / A. V. Puzhaev. - Moscow: KnoRus, 2010. - 192 p. - ISBN 9785406001271
11. Trofimova L.A., Trofimov V.V. Methods of Managerial Decision Making – Moscow: Yurayt, 2015. – 202 p. (10 copies).
12. Trofimova, L. A. Methods of Managerial Decision Making: Textbook and Practicum for Higher Educational Institutions / L. A. Trofimova, V. V. Trofimov. — Moscow : Yurayt Publishing House, 2021. — 335 p. — (Higher Education). — ISBN 978-5-534-01584-3. — Text : electronic // EBS Yurayt [site]. — URL: https://urait.ru/bcode/468457
13. Filinov-Chernyshev, N. B. Development and Adoption of Management Decisions: Textbook and Practicum for Higher Educational Institutions. - 2nd ed., ispr. Moscow: Yurayt Publishing House, 2021. — 324 p. — (Higher Education). — ISBN 978-5-534-03558-2. — Text : electronic // EBS Yurayt [site]. —

URL: https://urait.ru/bcode/470089
14. Tsvetkov A. N. Methods for solving creative problems in management: a textbook / A. N. Tsvetkov, V. E. Zarembo. - Moscow: KnoRus, 2011. - 152 p. - ISBN 9785406012147.

List of author's methodological developments:

A series of author's video lectures and practical video classes on the youtube.com platform

15. http://youtu.be/B0zOUNQknEo 00. Introductory lecture
16. http://youtu.be/IK6MGQtYIV4 01. Mathematical Programming: Unconditional Extremum.
17. http://youtu.be/EwKgJxB79Ww 02. Mathematical Programming: Conditional Extremum.
18. http://youtu.be/nMF745lL1P4 03. Consultation: solving problems of mathematical programming.
19. http://youtu.be/YZKIP7s69dM 04. Convex programming problems.
20. http://youtu.be/vZLWZgA1aNE 05. Introduction to Linear Programming.
21. http://youtu.be/u0h9Q7lug7E 06. Properties of LP problems. The idea of the simplex method.
22. http://youtu.be/XJ4hVULacWQ 07. Simplex method algorithm.
23. http://youtu.be/fFdNWRqMSoA 08. Tabular implementation of the simplex method.
24. http://youtu.be/PGYvn-v_kiA 09. Methods of Artificial Basis.
25. http://youtu.be/jqzCP0dx6IA 10. Duality in LP. Lecture 1.
26. http://youtu.be/f57lQPcQ_2c 11. Dual simplex method.
27. http://youtu.be/QF1ofFU60WM 12. Duality in Liberal Life. Lecture 2.
28. http://youtu.be/NIX_GV2nWyQ 12'. Postoptimal analysis of LP problems.
29. http://youtu.be/V6m227QVODY 13. Integer problems.
30. http://youtu.be/JVxEa_e_i50 14. Transport problems. The method of potentials.
31. http://youtu.be/4BBnh8SY7OY 15. Practice. Solving a transport problem.
32. http://youtu.be/MF6W0rMp30o 16. Elements of Game Theory. Lecture 1.
33. http://youtu.be/Dq-7QIiLI6U 17. Elements of Game Theory. Lecture 2.
34. http://youtu.be/p9K3Rq31Zms 18. Dynamic programming models. Lecture 1.
35. http://youtu.be/xWXbK_mvHdI 19. Dynamic programming models. Lecture 2.
36. http://youtu.be/5RiME6fk3UM 20. Network optimization.

b) Databases, Search and Reference Systems, and Information Systems

1. EBS ECZ "Bibliotech". State Contract No 019 dated 22.02.2011 Bibliotech LLC. License Agreement No 31 dated 22.02.2011 Access address: https://isu.bibliotech.ru/ Validity: from 22.11.2011 indefinitely.

2. EBS "Rukont" Contract No 98 dated 11/13/2020; Act No bK-5415 dated 11/14/20 Valid until 11/13/2021. access: http://rucont.ru/

3. EBS "Lan Publishing House". LLC "Lan Publishing House". Information letter No 128 dated 09.10.2017 Validity period: indefinite. Access address: http://e.lanbook.com/

4. EBS "National Digital Resource "Rukont". Central Design Bureau "Bibkom". Contract No 04-E-0343 dated 12.11.2021 Access address: http://rucont.ru/

5. EBS "Ibuks.ru/ibooks.ru". LLC "Ibux". Contract No 04-E-0344 dated 12.11.2021; Act dated 14.11.2021. Access address: http://ibooks.ru

6. Electronic Library System "EBS Yurayt". LLC "Electronic Publishing House Yurayt". Contract No 04-E-0258 dated 20.09.2021. Available at: https://urait.ru/

VI. Material and Technical Support for the Discipline

6.1. Educational and Laboratory Equipment

Name of Specialized Premises and Self-Study Premises	Equipment of Specialized Premises and Self-Study Premises	List of Licensed Software. Details of Supporting Document
Lecture hall for lecture-type classes	The hall is equipped with specialized (educational) furniture for 48 students and technical teaching aids that serve to present educational information to a large audience. 1.PC HP Elite 8300 SFF i5 3470/4Gb/1Tb/DVDRV /kb/m/DOS/Solenoid Lock and Hood Sensor (RUS)2. Monitor Viewsonic TFT 20" VA2014WM glossy-black 5ms 20 00:1 250cd M/M3. Projector Epson EB-18304. Genius SP-S110 Active Speakers Black5. Aten VS92A Video Splitter 2-port VGA It is equipped with educational and visual aids and electronic presentations that provide thematic illustrations on all topics specified in the work program of the discipline	BASIC SOFTWARE INSTALLATION KIT:Office 2007 Russian OpenLicensePack NoLevel AcademicEdition – agreement with SoftLine Trade Tr026664 dated 17.05.2007Project Standard 2007, Access 2007 – Academic cooperation programs with Microsoft DreamSpark Premium Electronic Software Delivery. –Agreement with CJSC "SoftLine Trade" Tr000023480 dated 19.05.2015 Windows Operating Systems for Licensed OEM Pre-Installation Programs, Academic Cooperation Programs with Microsoft MSDN AA.- Agreement with CJSC "SoftLine Trade" Tr017431 dated 15.05.2008 Windows Operating Systems for Licensed OEM Pre-Installation Programs, Academic Cooperation Programs with Microsoft DreamSpark Premium Electronic Software Delivery. – agreement with CJSC "SoftLine Trade" Tr000031723 dated 05.08.2015Anti-virus programs - Rights to computer programs drWeb Server Security complex protection 120PC (1 license per year) migration with additional purchase(LBW-BC-12M-120:119-C4) – agreement with CJSC "SoftLine Trade" 13982/MOS2957 dated 22.01.2016Archivers WinRAR: 3.x: Standard License - for legal entities 100-199 licenses – agreement with CJSC "SoftLine Trade" No15422/IRK11 dated 05.02.2010Network client part Rights to computer programs Windows Server CAL 2012 Russian OLP NL Akademic Edition Device CAL 120 licenses – agreement with CJSC "SoftLine Trade" 13512/MOS2957 dated 29.10.2015Firewall, Proxy functionality - Right to use computer programs Traffic Inspector GOLD preferential – agreement with CJSC "SoftLine Trade" Tr044356 dated 27.08.2013Right to use computer programs Extension of Traffic Inspector GOLD Special for 1 year – agreement with CJSC "SoftLine Trade" Tr000112196 dated 29.09.2016
Room for seminar-type classes	The room is equipped with specialized (educational) furniture for 48 students and	BASIC INSTALLATION KIT:Office 2007 Russian OpenLicensePack NoLevel AcademicEdition – agreement with SoftLine Trade Tr026664 dated 17.05.2007Project Standard 2007, Access 2007 –

	technical teaching aids that serve to present educational information to a large audience The demonstration kit includes: 1.PC HP Elite 8300 SFF i5 3470/4Gb/1Tb/DVDRV /kb/m/DOS/Solenoid Lock and Hood Sensor (RUS)2. Monitor Viewsonic TFT 20" VA2014WM glossy-black 5ms 20 00:1 250cd M/M3. Projector Epson EB-18304. Genius SP-S110 Active Speakers Black5. Aten VS92A Video Splitter 2-port VGA	Academic cooperation programs with Microsoft DreamSpark Premium Electronic Software Delivery. – agreement with SoftLine Trade CJSC Tr000023480 dated 19.05.2015 Windows operating systems under licensed OEM preinstallation programs, Academic cooperation programs with Microsoft MSDN AA.- agreement with CJSC "SoftLine Trade" Tr017431 dated 15.05.2008 Windows operating systems under licensed OEM preinstallation programs, Academic cooperation programs with Microsoft DreamSpark Premium Electronic Software Delivery. – agreement with CJSC "SoftLine Trade" Tr000031723 dated 05.08.2015 Anti-Virus Programs - Rights to computer programs drWeb Server Security complex protection 120PC (1 license per year) migration with additional purchase (LBW-BC-12M-120:119-C4) – contract with CJSC "SoftLine Trade" 13982/MOS2957 dated 22.01.2016 Archivers WinRAR: 3.x: Standard License - for legal entities 100-199 licenses – agreement with CJSC "SoftLine Trade" No15422/IRK11 dated 05.02.2010 Network client part Rights to computer programs Windows Server CAL 2012 Russian OLP NL Akademic Edition Device CAL 120 licenses – agreement with CJSC "SoftLine Trade" 13512/MOS2957 dated 29.10.2015 Firewall, functionality Proxy - Right to use computer programs Traffic Inspector GOLD preferential – agreement with CJSC "SoftLine Trade" Tr044356 dated 27.08.2013 Right to use computer programs Extension of Traffic Inspector GOLD Special for 1 year – agreement with CJSC "SoftLine Trade" Tr000112196 dated 29.09.2016
Hall for group and individual consultations, formative and summative assessment	The hall is equipped with specialized (educational) furniture for 11 students, 5 workplaces, equipped with computers with Internet connection and access to the EIOS of the Federal State Budgetary Educational Institution of Higher Education "ISU". 1. 5 Workstations HP compad dc7800SFF Dual Core PE-2180, 4 Gb DDR2 PC6400, 160GB SATA 3.0	BASIC SOFTWARE INSTALLATION KIT:Office 2007 Russian OpenLicensePack NoLevel AcademicEdition – agreement with SoftLine Trade Tr026664 dated 17.05.2007Project Standard 2007, Access 2007 – Academic cooperation programs with Microsoft DreamSpark Premium Electronic Software Delivery. –Agreement with CJSC "SoftLine Trade" Tr000023480 dated 19.05.2015 Windows Operating Systems for Licensed OEM Pre-Installation Programs, Academic Cooperation Programs with Microsoft MSDN AA.- Agreement with CJSC "SoftLine Trade" Tr017431 dated 15.05.2008 Windows Operating Systems for Licensed OEM Pre-Installation Programs, Academic Cooperation Programs with Microsoft DreamSpark Premium Electronic Software Delivery. – agreement with CJSC "SoftLine Trade" Tr000031723 dated 05.08.2015Anti-virus programs - Rights to

	HDD2. LCD Monitor 17.0" ViewSonic "VA703m" 1280x1024, 8mc, TCO"03, Silver-Black (D-Sub, MM)3. Printer Hewlett-Packard LaserJet 3055 All-in-One Multifunction Device, one piece.	computer programs drWeb Server Security complex protection 120PC (1 license per year) migration with additional purchase(LBW-BC-12M-120:119-C4) – agreement with CJSC "SoftLine Trade" 13982/MOS2957 dated 22.01.2016Archivers WinRAR: 3.x: Standard License - for legal entities 100-199 licenses – agreement with CJSC "SoftLine Trade" No15422/IRK11 dated 05.02.2010Network client part Rights to computer programs Windows Server CAL 2012 Russian OLP NL Akademic Edition Device CAL 120 licenses – agreement with CJSC "SoftLine Trade" 13512/MOS2957 dated 29.10.2015Firewall, Proxy functionality - Right to use computer programs Traffic Inspector GOLD preferential – agreement with CJSC "SoftLine Trade" Tr044356 dated 27.08.2013Right to use computer programs Extension of Traffic Inspector GOLD Special for 1 year – agreement with CJSC "SoftLine Trade" Tr000112196 dated 29.09.2016
Room for student self-study work	It is equipped with specialized (educational) furniture for 10 students, equipped with computer equipment connected to the Internet and provided with access to the EIOS of ISU 1. Think Centre M80 Series SFF System Unit Included: Intel® Core™ i3-540 Clarkdale 2.93GHz / 1333MHz / Dual Core™ / 4M / 73W / LGA 1156 / 32nm / 4GB PC3-10600 SDRAM x 2 /250 GB, 7200RPM SATA	BASIC SOFTWARE INSTALLATION KIT:Office 2007 Russian OpenLicensePack NoLevel AcademicEdition – agreement with CJSC "SoftLine Trade" Tr026664 dated 17.05.2007 Project Standard 2007, Access 2007 - Academic cooperation programs with Microsoft DreamSpark Premium Electronic Software Delivery. –agreement with CJSC "SoftLine Trade" Tr000023480 dated 19.05.2015Windows operating systems under licensed OEM preinstallation programs, Academic cooperation programs with Microsoft MSDN AA.- Agreement with CJSC "SoftLine Trade" Tr017431 dated 15.05.2008 Windows operating systems for licensed OEM pre-installation programs, Academic cooperation programs with Microsoft DreamSpark Premium Electronic Software Delivery. – Agreement with CJSC "SoftLine Trade" Tr000031723 dated 05.08.2015Anti-Virus Programs - Rights to computer programs drWeb Server Security, complex protection 120PC (1 license per year)

	/DVD RW - 10pcs2. LCD Monitor - 20.0 ViewSonic "VA2013w" 1600x900 Monitor, 5mc, TCO 03, Black (D-Sub) - 10pcs3. HP LaserJet 5000N, A3, 22ppm, 32 MB, 250&500 sheet feeder, JetDirect 615n prn svr4. HP LaserJet 5100th, A3, 22ppm, 32 MB, 250&500 sheet feeder, JetDirect 615n prn svr	migration with additional purchase (LBW-BC-12M-120:119-C4) – agreement with CJSC "SoftLine Trade" 13982/MOS2957 dated 22.01.2016 Archivers WinRAR: 3.x: Standard License - for legal entities 100-199 licenses – agreement with CJSC "SoftLine Trade" No15422/IRK11 dated 05.02.2010 Network client part Rights to computer programs Windows Server CAL 2012 Russian OLP NL Akademic Edition Device CAL 120 licenses – agreement with CJSC "SoftLine Trade" 13512/MOS2957 dated 29.10.2015 Firewall, Proxy functionality - Privileged right to use Traffic Inspector GOLD computer programs – agreement with CJSC "SoftLine Trade" Tr044356 dated 27.08.2013 Right to use computer programs Extension of Traffic Inspector GOLD Special for 1 year – agreement with CJSC "SoftLine Trade" Tr000112196 dated 29.09.2016

6.2. Software

The university is provided with the necessary set of licensed and freely distributed software, including domestic production:

1. Basic installation kit: Office 2010 Services for granting the right to use Microsoft Desktop Edu ALNG LicSAPk OLV E 1Y Acdmc Ent., 39 licenses for BSBS ISU. Contract No 03-K-1131 dated 29.11.2021 KOSGU 226.4
2. Project Standard 2007, Access 2007 – ISU Azure Dev Tools for Teaching subscription (Visio, Projekt) 1 Year. Microsoft Corporation, One Microsoft Way, Redmond, WA 98052. Expiration Date March 31, 2023.
3. Microsoft Project Professional 2010, ISU Azure Dev Tools for Teaching subscription (Visio, Projekt) 1 year. Microsoft Corporation, One Microsoft Way, Redmond, WA 98052. Expiration Date March 31, 2023.
4. Operating systems Windows'7, Windows'10 Services for granting the right to use the program Microsoft Desktop Edu ALNG LicSAPk OLV E 1Y Acdmc Ent., 39-licenses for BMBS ISU. Contract No 03-K-1131 dated 29.11.2021 KOSGU 226.4
5. Anti-virus programs - Dr.Web renewal Contract No Tr000582689/03-E-0043 dated February 05, 2021 Invoice No Tr000582689 dated February 08, 2021
6. WinRAR Archivers: 3.x: Standard Licence - for legal entities 100-199 licenses - annex. No1 to contract No15422/IRK11 of CJSC "SoftLine Trade" dated 05.02.2010
7. Network client part Rights to computer programs Windows Server CAL 2012 Russian OLP NL Akademic Edition Device CAL 120 licenses - account Tr000051059 CJSC "SoftLine Trade" dated 27.10.2015
8. Firewall, Proxy functionality - Right to use computer programs Traffic Inspector GOLD preferential account Tr005456 CJSC "SoftLine Trade" dated 27.08.2013
9. Traffic Inspector GOLD Special* for 5 years Contract RSZ-0000276 dated 16.11.2021 KOSGU 226.4 License renewal

6.3. Technical and Electronic Learning Tools

Multimedia Equipment and Other Technology for Presentation of Educational Material:

1. HP ElliteDesk 800 G4 SFF Intel Core i5 8500

(3Ghz)/8192Mb/1000Gb/DVDrw/war 3y/W10Pro +V2 Desktop. ViewSonic 21 Monitor, 5" VA2245a - LED [LED, 1920x1080, 10M: 1 5ms,170gor, 160ver, D-Sub]3. Projector Nec M420X LCD 4200ANSI Lm XGA 2000:1 lamp 3500h. Eco modeHDMI USB Viewer RJ-45 10W 3.6 kg4. Jetbalance JB-115U 2.0 black speakers (4W)5. Video signal splitter Aten VS92A 2-port VGAWead of licensed software used:1. Office 2010 under the program of academic cooperation with Russian Microsoft Desktop Education AllLng License/Software Assurance Pack Academic OLV 1License LevelEEnterprise2. Project Standard 2007, Access 2007 – under the program of academic cooperation with Microsoft DreamSpark Premium Electronic Software Delivery.3. Microsoft Project Professional 2010, Microsoft Visio Professional 2010 under the program of academic cooperation with Microsoft Imagine Standard Electronic Software Delivery with the assistance of the Central Research Center of ISU.

VII. Educational Technologies

In accordance with the requirements of the Federal State Educational Standard, the widespread use of active and interactive forms of conducting classes in the educational process (computer simulations, business and role-playing games, analysis of specific situations) in combination with extracurricular work in order to form and develop the professional skills of students is envisaged.

Teaching the discipline involves the use of the following educational technologies:

- conducting classroom classes using multimedia technologies, audio and video materials;
- conducting lectures in the form of a problem lecture, lecture;
- the use of a problem-oriented approach through independent and control work;
- test technologies on the remote platform of the BIBS "Hekadem";
- the use of interactive learning technologies, such as group discussion, work in small groups.

The share of classes conducted in interactive forms - practical classes - is determined by the main goal (mission) of the program, the characteristics of the contingent of students and the content of specific disciplines (determined by the requirements of the Federal State Educational Standard, taking into account the specifics of the CPEP). Lecture-type classes for the relevant groups of students are determined by the relevant working curriculum in accordance with the requirements of the Federal State Educational Standard.

Distance technologies used in the implementation of various types of educational work:

- individual communication with students through the teacher's e-mail;
- the use of the BIBS platform "Hekadem" to organize current monitoring of progress and attendance.

VIII. Materials for Formative and Summative Assessment

8.1. Tools Used for Entrance Assessment

Entrance testing in the discipline "Management Decision-Making Methods" is not conducted, since basic knowledge of higher mathematics and computer science is enough to master the discipline.

8.2. Tools Used for Formative and Summative Assessment

The purpose of assessment tools for formative and summative assessment is to identify the formation of competencies in accordance with the table below.

№	Formats of Assessment Tools	Assessed Themes (Sections)	Assessed Competencies/ Indicators
1	2	3	4
1	Oral questioning	1–4; 6–7; 9–13	UC-1.2; 2.1; 2.2

2	Case Study	1–11; 13	UC-1.2; 2.1; 2.2
3	Report	12	UC-1.2; 2.1; 2.2
4	Test	5, 8	UC-1.2; 2.1; 2.2
5	Intermediate certification – credit with a grade	1–13	UC-1.2; 2.1; 2.2

8.3. Types of Tools Used for Formative and Summative Assessment

The list of assessment tools used to assess competencies at various stages of their formation, as well as a brief description of these tools, is given in the table

№	Assessment Tools	Brief Description of the Assessment Tool	Formats of Assessment Tools
	Oral questioning	A means of control at a practical lesson, organized as a special conversation between the teacher and the student on topics related to the discipline being studied, and designed to find out the amount of knowledge of the student on a certain section, topic, problem, etc. It can be used to assess the skills, abilities and (or) experience of students.	Questions for oral questioning on the topics (sections) of the discipline
	Case Study	A means of monitoring independent work or assimilation of the results of a practical lesson, which allows you to assess the student's ability to state the essence of the task, independently apply the standard methods of solving the problem studied within the discipline, and analyze the result of the work. It can be used to assess the skills, abilities and (or) experience of students' activities	Case Study
	Report	A product of independent work of a student, which is a public presentation of the results of research on a certain educational and practical, educational research or scientific problem It can be used to assess the knowledge, skills, and (or) experience of students' activities	Topics
	Test	A system of standardized tasks that allows you to automate the procedure for measuring the level of knowledge and skills of a student. Performed by a student in the "Hecadem". The number of questions in the test bank is 100. The number of questions in the test is 25, the time to complete is 45 minutes, the number of attempts is 1. It can be used to assess the knowledge and skills of students	List of test tasks
	Credit with grade	A means that allows you to assess the knowledge, skills, and (or) experience of the student's activities in the discipline. It is conducted either orally in the form of an interview on the topics and tasks from section 8.6, or in the form of testing in the "Hecadem". The preparation time is 45 minutes. It can be used to assess the knowledge, skills, and (or) experience of students' activities	List of theoretical questions and practical tasks for credit

8.4. Criteria for assessing the formation of competencies during formative and summative assessment

Oral questioning

Grading Criteria	Characteristics of the result (answer)	Level of competency development
86 – 100 points	The student's answer reflects the main concepts and theories on this issue, their critical analysis and comparison, the described theoretical provisions are illustrated with practical examples and empirical data. Students formulate and substantiate their own point of view on the stated problems, the material is presented in professional language using the appropriate system of concepts and terms	High
70 – 85 points	In the student's answer, the main modern concepts and theories on this issue are described and compared, the described theoretical provisions are illustrated with practical examples, the student formulates his own point of view on the stated problems, but he experiences some difficulties in its argumentation. The material is presented in professional language using the appropriate system of concepts and terms	Basic
61 – 70 points	The student's answer reflects only some modern concepts and theories on this issue, the analysis and comparison of these theories is not carried out. The student experiences significant difficulties in illustrating theoretical provisions with practical examples. The student does not have his own point of view on the stated problems. The material is presented in professional language using the appropriate system of concepts and terms	Minimum
0 – 60 points	The student's answer does not reflect modern concepts and theories on this issue. The student cannot give practical examples. The material is inconsistent and illogical, the concepts and terms of the relevant scientific field are not used. The answer reflects the system of non-professional ideas of the student to the stated problem, the student cannot name a single scientific theory, does not give a definition of basic concepts.	Competencies are not formed

Case Study

Grading Criteria	Characteristics of the result (answer)	Level of competency development
86 – 100 points	The case problem was solved by the student in full in compliance with the necessary sequence of actions. The student worked completely independently; showed the theoretical knowledge, practical skills and abilities necessary for the work. The decision is drawn up neatly, without significant shortcomings.	High
70 – 85 points	The case problem was solved by the student in full	Basic

	and independently. Deviations from the necessary sequence of the solution are made, which do not affect the correctness of the final result. The solution shows the student's knowledge of the basic theoretical material and mastery of the skills necessary for independent performance of work. Inaccuracies and negligence in the design of the results of the work were committed.	
61 - 70 points	The case problem is solved by the student with outside help. It takes a lot of time to prepare a solution. The student shows knowledge of theoretical material, but experiences difficulties in independent work with sources of knowledge.	Minimum
0 – 60 points	The case problem has not been solved by the student. The results obtained by the student do not allow to draw the right conclusions and completely diverge from the goal. Poor knowledge of theoretical material and lack of necessary skills are shown.	Competencies are not formed

Report

Grading Criteria	Characteristics of the result (answer)	Level of competency development
86 – 100 points	The problem on the topic of the report (message) is indicated and its relevance is substantiated, a brief analysis of various points of view on the problem under consideration is made and one's own position is logically stated, conclusions are formulated, the topic is fully disclosed.	High
70 – 85 points	The problem on the topic of the report (message) is indicated and its relevance is substantiated, the analysis of various points of view on the problem under consideration does not reflect all scientifically grounded positions, one's own position is not quite logically stated or conclusions are formulated, the topic is covered in sufficient volume.	Basic
61 - 70 points	The problem on the topic of the report (message) is indicated, but its relevance is not substantiated, there is no analysis of various points of view on the problem under consideration, there is no logic and own position in the formation of conclusions, the topic is partially disclosed.	Minimum
0 – 60 points	The problems of the topic of the report (message) are not disclosed, the existing points of view on the given problem are not given, there is no own point of view, conclusions are not formulated.	Competencies are not formed
0 – 60 points	The share of correctly solved test tasks is 0 – 54 of the total volume of tasks in the test.	Competencies are not formed

Test

Grading Criteria	Characteristics of the result (answer)	Level of competency development
86 – 100 points	The share of correctly solved test tasks is 86 – 100% of the total volume of tasks in the test.	High
70 – 85 points	The share of correctly solved test tasks is 70 - 85% of the total volume of tasks in the test.	Basic
61 - 70 points	The share of correctly solved test tasks is 61 - 70% of the total volume of tasks in the test.	Minimum
0 – 60 points	The share of correctly solved test tasks is 0 – 60% of the total volume of tasks in the test.	Competencies are not formed

Summative Assessment in the form of a test with grade

Grades		Grading Criteria	Level of competency development
86 – 100 points	"Pass"	The student correctly answered the theoretical questions. Showed excellent knowledge within the framework of the educational material. Correctly completed practical tasks. Showed excellent skills and mastery of the skills gained in applying the acquired knowledge and skills in solving problems within the framework of the educational material. Answered all additional questions	High
70 – 85 points		The student answered theoretical questions with minor inaccuracies. Showed good knowledge within the framework of the educational material. With minor inaccuracies, he completed practical tasks. Showed good skills and mastery of the skills gained in applying the knowledge and skills gained in solving problems within the framework of the educational material. Answered most of the additional questions	Basic
61 - 70 points		The student answered theoretical questions with significant inaccuracies. Showed satisfactory knowledge within the framework of the educational material. With significant inaccuracies, he completed practical tasks. Showed satisfactory skills and skills in applying the acquired knowledge and skills in solving problems within the framework of the educational material. Made a lot of inaccuracies when answering additional questions	Minimum
0 – 60 points	"Fail"	The student, when answering theoretical questions and performing practical tasks, demonstrated an insufficient level of knowledge and skills in solving problems within the framework of the educational	Competencies are not formed

		material. When answering additional questions, many incorrect answers were made	

8.5. Description of the Procedures for Conducting Summative Assessment and Evaluating Learning Outcomes

When conducting intermediate certification in the form of a test with a grade, the teacher can use the results of the current monitoring of progress during the semester. Assessment tools and standard control tasks, test tasks used in the current control allow you to assess the knowledge, skills and possession of skills/experience of students in the development of the discipline. In order to use the results of the current monitoring of progress, the teacher calculates the average assessment of the level of formation of the student's competencies (the sum of the grades received by the student is divided by the number of grades). Testing on the materials studied during the semester consists of 25 questions, the test time is 45 minutes, the number of attempts is one. Examples of questions for testing are given in clause 8.6.

Intermediate certification in the form of a test with a grade can be carried out by means of an oral interview on tickets. The ticket contains one theoretical question for assessing knowledge and one practical task for assessing skills, abilities and (or) work experience. Questions and tasks are selected from the list of standard theoretical questions and practical tasks for the exam (clause 8.7). The distribution of theoretical questions and practical tasks on exam tickets is closed to students.

At the test, the student takes a ticket, and the student is given time within 45 minutes to prepare an answer. In the process of answering the student's questions and the tasks of the ticket, the teacher can ask additional questions.

Each question/task of the ticket is evaluated on a hundred-point scale, and then the arithmetic mean of the scores received for each question/task is calculated. The arithmetic mean of grades is rounded to an integer according to the rules of arithmetic rounding.

8.6. Demonstration Examples of Tools for Formative Assessment

	Assessment Tool	Example of Assessment tools
1.	Questions for oral questioning	1. What statistical criteria are used in games "with nature"? 2. How is a decision tree built? 3. Stages of formalization of linear programming problems? 4. An algorithm for graphical research of linear programming problems? 5. How can you solve the LP problem in MS Excel? 6. The idea of the artificial basis method? 7. Dual Problems of Linear Programming? 8. Equilibrium conditions? 9. Dual simplex method? 10. Stages of postoptimal analysis of linear programming models? 11. Algorithm of the potential method for a transport problem? 12. Strategy games – what is meant by a decision in pure strategies? 13. Strategy games – reduction to linear programming problems? 14. Fundamentals of Network Optimization – Euler and Hamiltonian Graphs?
2.	Case Study	Solve the assignment problem using MS Excel or an online calculator. The administration of the wood processing enterprise hired five people. Each of them spends a different amount of time to perform a certain job. There are five types of work to be performed. The time of work performed

<table>
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<td></td>
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<td>by each employee is shown in the table
<table>
<tr><td>Empl oyees</td><td colspan="5">Time of work performance, hour</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>M_1</td><td>25</td><td>16</td><td>15</td><td>14</td><td>13</td></tr>
<tr><td>M_2</td><td>25</td><td>17</td><td>18</td><td>23</td><td>15</td></tr>
<tr><td>M_3</td><td>30</td><td>15</td><td>20</td><td>19</td><td>14</td></tr>
<tr><td>M_4</td><td>27</td><td>20</td><td>22</td><td>25</td><td>12</td></tr>
<tr><td>M_5</td><td>29</td><td>19</td><td>17</td><td>32</td><td>10</td></tr>
</table>
Do you need to assign one of the employees to each type of work so that the total time required to complete all types of work is minimal?
The company can hire another part-time employee who performs each job during the following time:
<table>
<tr><td>Part-time worker</td><td colspan="5">Time of work performance, hour</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>M_6</td><td>28</td><td>16</td><td>19</td><td>16</td><td>15</td></tr>
</table>
Determine how this measure will affect the assignment of workers and minimize the overall time of work.</td>
</tr>
<tr>
<td>3.</td>
<td>Topics</td>
<td>1. Network analysis of projects (CPM method – critical path method)
2. Network analysis of projects (PERT method – method of evaluation and review of the program)
3. Algorithm for building a network diagram
4. The Traveling Salesman's Problem
5. The Critical Path Problem
6. Shortest Route Problem
7. Maximum Flow Problem</td>
</tr>
<tr>
<td>4.</td>
<td>Examples of test tasks</td>
<td>1. The solution is called optimal, ...
a) if it is agreed with the management
b) if it is preferable to others on certain grounds
c) if it is rational
d) if it is approved by the general meeting
2. The task of linear programming is ...
a) creation of a linear program in the chosen programming language, designed to solve the problem
b) compilation and solution of a system of linear equations
c) finding the largest (smallest) value of a linear function in the presence of linear constraints
d) finding the extremum of a linear function in the presence of any constraints
3. Linear programming problem to minimize the function F = -x1 -3x2 + 5, under the conditions: x1 ³ 0; x2 ³ 0; x1 + 3x2 £ 6, has a solution that corresponds to the
a) the only point where the minimum is reached;
(b) Only two points where the minimum is reached;
(c) An infinite number of points where a minimum is reached.</td>
</tr>
</table>

		4. When studying the linear function of two variables in the region of a triangle with vertices A = (1; 1), B = (3; 1), C = (3; 3), it turned out that at point (2; 2) the minimum is achieved. Then the minimum is reached at each point of the segment (a) [SC]; (b) [AB]; (c) [AC]. 5. In accordance with the input rule in the simplex method algorithm, the following column is selected as the column to be entered into the next basis: a) With the lowest negative rating (b) With a score of zero (c) Lowest positive rating 6. Mark the correct statements about the properties of the plan x = (1,1,1,1,1,1) for a linear programming problem with a set of valid plans D: D $= \{x \in R^n \mid \quad 2x_1 + 2x_2 + 6x_4 = \ 10, \quad -4x_2 - 2x_3 + 11x_4 + x_5 = 6,$ $x \geq 0 \ \}$ a) x – invalid b) x – allowable, basic c) x – admissible, but not basic 7. If the minimum value of the objective function in the initial linear programming problem is 5, then the objective function of the dual problem is: a) reaches a maximum value of 5; (b) Does not reach a value of 5; (c) Reaches a maximum value of "-5". 8. If in the optimal plan of the M-problem, out of three artificial variables introduced for it, two turned out to be equal to zero, and the third was greater than zero, then the initial problem of linear programming a) does not have a solution due to contradictory conditions; (b) Has a decision; (c) Does not have a solution because of the unrestricted objective function. 9. If the M-problem does not have a solution when solving a linear programming problem by the M-method, then the reason for this is: a) the objective function of the M-problem is unlimited from below; b) the unbounded upper objective function of the M-task; c) the contradictory conditions of the M-problem. 10. If, when solving a linear programming problem by the M-method, all artificial variables introduced for it are equal to zero in the optimal plan of the M-problem, then the initial problem: a) also has a solution, and the optimal plan for it coincides with the values of the main variables in the optimal plan of the M-problem; b) does not have a solution, due to contradictory conditions; c) has no solution, due to the unrestricted objective function. 11. When solving the problem of linear programming by the M-method, it is assumed that M is: a) some arbitrarily large positive number, significantly exceeding modulo any quantities encountered in solving the problem; (b) An arbitrarily large modulo, negative number that is much greater

than any values encountered in solving the problem;

(c) Any positive number.

12. In the problems of dynamic programming...

a) Dynamite production needs to be streamlined
b) Need to optimize the use of speakers
c) only models whose variables depend on time are considered
d) The process of finding a solution is multi-stage

13. In two points A1 and A2 there are 60 and 160 units of goods respectively. All goods must be transported to points B1, B2, B3 in the amount of 80, 70 and 70 units respectively. $C = \begin{pmatrix} 4 & 6 & 8 \\ 5 & 8 & 7 \end{pmatrix}$

a) transport task
b) nonlinear programming problem
c) the traveling salesman's task
d) assignment task

14. The transport task will be closed if...

	30	100+b
20	3	9
30+a	4	1
100	6	8

a) a=60, b=80
b) a=60, b=85
c) a=60, b=70
d) a=60, b=75

15. To solve the following transport problem

	50	90
20	3	9
30	4	1
100	6	8

it is necessary to enter...

a) fictitious supplier
b) Effective tariff
c) fictitious consumer
d) effective interest rate.

16. The initial reference plan of the transport task can be drawn up...

a) Northwest Corner Method
b) Minimum fare method
c) by the Vogel approximation method
d) all of the above methods

17. To solve the transport problem, ...

a) Potential Method
b) Lagrange multiplier method
c) Gaussian method
d) Disorientation method

18. The objective function of a linear programming problem may be the function of:

a) F= $\sqrt{x_1^2 + x_2^2} \rightarrow \min$

b) F= 12x1+20x2–30x3 → min

c) F= $3x_1 - 4x_2 + \sqrt{x_3} \rightarrow \max$

d) F= $x_1^2 - 2x_2 \rightarrow \max$

19. The system of constraints of the linear programming problem may be a system of:

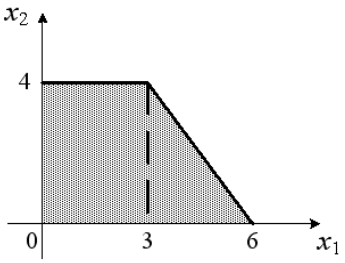
a) $\begin{cases} x_1 - x_2 \geq 3, \\ x_1 + x_2 \leq 0. \end{cases}$

b) $\begin{cases} x_1^2 + x_2^2 \geq 3, \\ x_1 - x_2 \leq 2. \end{cases}$

c) $\begin{cases} \sqrt{x_1} + x_2 = 4, \\ x_1 + x_2^2 \leq 6. \end{cases}$

d) $\begin{cases} x_2^3 - x_1 = 4, \\ x_1^2 - x_2^2 \geq 4. \end{cases}$

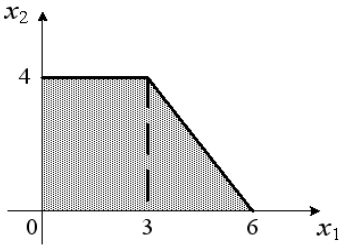
20. The scope of admissible solutions to the linear programming problem is as follows:



Then the maximum value of the function F(x1, x2)= 3x1 + 5x2 is equal to...

a) 29
b) 20
c) 27
d) 31

21. The field of admissible solutions to the linear programming problem is as follows:



Then the minimum value of the function F(x1, x2)= 2x1 - 2x2 is equal to...

a) –12
b) 2
c) –8
d) 0

22. A small enterprise produces products of two types. For the manufacture of one type A product, 2 kg of raw materials are consumed, for the manufacture of one type B product - 1 kg. It is necessary to draw up a

		production plan that ensures the receipt of the highest revenue, if the selling price of one product of type A is 3 MU, type B - 1 CU, and the products of type A are required to be made no more than 25, and type B - no more than 30. This task is ... a) a problem solved by the method of dynamic programming b) nonlinear programming problem c) network planning task. d) linear programming task 23. The transport table contains 5 rows and 7 columns. The total volumes of cargo on departure and receipt are equal. Then the number of basic (occupied) cells in the table is: a) 12; b) 11; c) 10. 24. If in a matrix transport problem the total volumes of cargo on dispatch and receipt coincide, then the minimum cost plan for the transportation of homogeneous cargo: a) always exists and, at the same time, is always unique; (b) Always exists and is not always unique; (c) Does not always exist. 25. The critical path on the network diagram contains: a) The longest work b) All works c) Start and end events d) work with zero time reserve

8.7. Demonstration of Tasks for Summative Assessment

Examples of questions and tasks for credit with grade:

a) theoretical issues:

1. A standard linear programming problem. Economic interpretation. Scarce resources. Cost-effective products.
2. A standard linear programming problem. Economic interpretation. Non-scarce resources. Unprofitable products.
3. A standard linear programming problem. Transition to the canonical task.
4. Graphical solution of linear programming problems (permissible set, lines of the level of the objective function, direction of increasing the objective function).
5. Formulation of a dual problem for the problem of optimal production planning.
6. Symmetrical dual pair. Equilibrium conditions. Economic interpretation.
7. An asymmetrical dual pair. A necessary and sufficient condition for optimality. Equilibrium conditions.
8. The idea of the simplex method.
9. The method of artificial basis.
10. Dual simplex method.
11. Transport task. Closed and open models.
12. Finding the initial transportation plan. The "northwest corner" method.
13. Finding the initial transportation plan. Minimum fare method.
14. The method of potentials.
15. Assignment problem.

b) practical task:

Build a mathematical model and solve the problem using MS Excel or an online calculator.

A small coffee shop in the city center buys coffee beans, whipped cream and milk for delicious

coffee drinks. The cost rates for the production of one cup of coffee and the amount of resources used are shown in the table.

Resources	Resource consumption rate per cup of coffee			Resource Stock
	Cappuccino	Espresso	Café latte	
Coffee beans	4	1	2	100
Whipped cream	4	1	1	70
Milk	2	1	1	150
Cost of one cup (monetary units)	60	50	80	x

Find the optimal coffee production plan that maximizes the coffee shop's revenue.

Developer:

- Associate Professor of the Department of Strategic
ınd Financial Management Derenko N.V.
(position)

The program is compiled in accordance with the requirements of the Federal State Educational Standard of Higher Education in the field of study 27.03.05 “Innovatics”, specialization "Management of Innovative and IT Projects and Products".

The program was considered at a meeting of the Department of Strategic and Financial Management on March 21, 2025, Protocol № 9.

Head of the Department N.B. Grosheva