



**Module Handbook**

**MASTER PROGRAMME**

**Applied Data Analytics**

Astana IT University, 2024

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## STUDY PROGRAMME OVERVIEW

Term 1						
Module	Workload					
	ECTS credits	Lecture	Practice sessions	ISIS	SIS	Total hours
Foreign language (professional)	4	20	20	20	60	120
History and philosophy of science	4	20	20	20	60	120
Psychology of Management	4	20	20	20	60	120
Higher Education Pedagogy	4	20	20	20	60	120
Mathematics for data science	5	30	20	30	70	150
Programming for data analysis and databases	5	30	20	30	70	150
<b>Total</b>	<b>26</b>	140	120	140	380	780

Term 2						
Module	Workload					
	ECTS credits	Lecture	Practice sessions	ISIS	SIS	Total hours
Methods and tools for data analysis	5	30	20	30	70	150
Case study on data Analytics	5	30	20	30	70	150
Business process analysis	5	30	20	30	70	150
Business analytics/Digital Finance/Digital business ecosystem	5	30	20	30	70	150
Teaching Internship	4	-	-	40	80	120
Master's research work	6	-	-	54	126	180
<b>Total</b>	<b>30</b>	120	80	214	486	900

Term 3						
Module	Workload					
	ECTS credits	Lecture	Practice sessions	ISIS	SIS	Total hours
Machine learning and artificial intelligence	4	20	20	20	60	120
Data Analytics application project	4	20	20	20	60	120
Data processing and understanding/Making decisions based on data	5	30	20	30	70	150
Product management/Industry 4.0/Information security	5	30	20	30	70	150
Master's research work	4	-	-	36	84	120
<b>Total</b>	<b>22</b>	100	80	136	344	660

Term 4						
Module	Workload					
	ECTS credits	Lecture	Practice sessions	ISIS	SIS	Total hours
Research practice	16	-	-	144	336	480
Master's research work	4	-	-	36	84	120
<b>Total</b>	<b>20</b>			180	420	600

Term 5						
Module	Workload					
	ECTS credits	Lecture	Practice sessions	ISIS	SIS	Total hours
Master's research work (master's thesis)	10			90	210	300
Preparation and defense of a master's thesis	12			108	252	360
<b>Total</b>	<b>22</b>			198	462	660

## 1<sup>st</sup> term

Module name:	Foreign Language (Professional)																			
Code																				
Trimester	1																			
Person responsible for the module	Aliya Ayazbayeva, Assistant Professor, Candidate pf Philological SciencesElmira Gerfanova, Assistant Professor, PhD																			
Lecturer(s)	Aliya Ayazbayeva, Assistant Professor, Candidate pf Philological SciencesElmira Gerfanova, Assistant Professor, PhD Diana Zhanabilova, Senior lecturer, MA, Candidate to PhD degree																			
Language	English																			
Relation to curriculum	Compulsory course																			
Type of teaching	<b>Lectures</b> serve to introduce new concepts and provide theoretical andmethodological foundations. <b>Practice sessions (seminars)</b> are active sessions to develop student’sconfidence through new examples and discussions on the problems. <b>Instructor-supervised independent study (ISIS)</b> deals with review andexploration in greater depth of the course material. <b>Student’s independent study (SIS):</b> Self-study time including the timerequired to prepare for and complete all course assessments. <b>Teaching methods:</b> project-based learning, case study result presentation, task based learning and interactive-communicative learning																			
Workload of course components and credits per trimester	<table><tr><td rowspan="2">ECTS credits</td><td colspan="2">Contact hours</td><td rowspan="2">ISIS</td><td rowspan="2">SIS</td><td rowspan="2">Total hours</td></tr><tr><td>Lectures</td><td>Practice sessions</td></tr><tr><td>4</td><td></td><td>40</td><td>40</td><td>40</td><td>120</td></tr></table>						ECTS credits	Contact hours		ISIS	SIS	Total hours	Lectures	Practice sessions	4		40	40	40	120
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	Period	Assessment type	Number of points	Exam Form	Schedule (Week #)															
	1 <sup>st</sup> attestation	Preparing and defending presentations	15	Presentation defense	Week 3															

			Quiz	15	Computer-based	Week 5
			1 <sup>st</sup> attestation total	30		
		2nd attestation	Preparing and defending presentations	15	Presentation defense	Week 8
			Quiz	15	Written	Week 10
			2 <sup>nd</sup> attestation total	30		
		Final Exam		40	Oral	During final exam sessions
		Total for the course		100		
		Cumulative total for the course = 0,3 * 1 <sup>st</sup> Att + 0,3 * 2 <sup>nd</sup> Att + 0,4*Final = 100.				
Recommended prerequisites	Foreign language (English), English for Academic Purposes (Bs degree)					
Recommended postrequisites	Master's research work, including internships and a master's thesis					
Module objectives/intended learning outcomes	<p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"><li>– reading authentic professionally oriented texts and identifying reading structures</li><li>– reading authentic professionally oriented texts for understanding main ideas and identifying supporting details</li><li>– listening effectively to a range of formal and informal discussions presented in the relevant professional fields</li><li>– developing adequate speaking skills to communicate effectively in a professional setting</li></ul> <p><b>Students will have the skill to:</b></p> <ul style="list-style-type: none"><li>– synthesize, draw conclusions, evaluate and discuss ideas from a reading</li><li>– follow and comprehend professional discourse</li><li>– plan and deliver oral presentations based on course project and answer questions</li><li>– analyze written professionally oriented texts</li></ul> <p><b>In terms of competences, students will be able to:</b></p> <ul style="list-style-type: none"><li>– write texts on professional topics</li><li>– read and understand a range of vocabulary and stylistics in authentic sources</li><li>– listen to lectures and presentations related to professional fields</li><li>– participate in group discussions, prepare and give presentations</li><li>– recognize and use grammar and specific vocabulary</li></ul> <p>self-reflect and evaluate reasoning</p>					
Content	Foreign Language (Professional) is designed to help Master program students focus on basic skills in listening, reading, writing and speaking with an emphasis on professional					

	English, research and presentation structures, vocabulary and language usage. The learning outcomes are designed in a way so that the students can successfully apply their knowledge and skills in professional English in the academic context and demonstrate their professional English language competence.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<p><i>Main:</i>  Esteras, S.R., &amp; Fabre, E.M. (2010). Professional English in Use –ICT. Cambridge University Press</p> <p><i>Additional:</i>  Paterson, K. (2013). Oxford Grammar for EAP. London: Oxford University Press.  Chazal, E. &amp; Moore, J. (2022). Oxford EAP. A Course in English for Academic Purposes. London: Oxford University Press.  Swales, J. &amp; Feak Ch. (2012). Academic Writing for Graduate Students. Michigan Series in English for Academic and Professional Purposes</p>

Module name:	<b>History and Philosophy of Science</b>
Code	
Trimester	1
Person responsible for the module	Assoc. Prof. A. Uyzbayeva, PhD
Lecturer(s)	Assoc. Prof. A. Uyzbayeva, PhD
Language	Russian, English
Relation to curriculum	Master program: Compulsory course.
Type of teaching	<p><b>Teaching methods:</b> Lecture-based learning, class discussions, analysis-based learning, gamification, teamwork and individual learning.</p> <p><b>Forms of teaching</b>  <b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.  <b>Practice sessions (seminars)</b> are active sessions to develop student's confidence through new examples and discussions on the problems.  <b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.  <b>Student's independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>

Workload of course components and credits per trimester	<table><tr><td rowspan="2">ECTS credits</td><td colspan="2">Contact hours</td><td rowspan="2">ISI S</td><td rowspan="2">SIS</td><td rowspan="2">Total hours</td></tr><tr><td>Lectures</td><td>Practice sessions</td></tr><tr><td>4</td><td>20</td><td>20</td><td>20</td><td>60</td><td>120</td></tr></table>					ECTS credits	Contact hours		ISI S	SIS	Total hours	Lectures	Practice sessions	4	20	20	20	60	120																																			
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Requirements according to the examination regulations	<p><b>Course and university policies include:</b>  <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b>  Late submissions are not accepted.  <b>No cheating, duplication, falsification of data, plagiarism, and crib</b>  <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</p>
Recommended prerequisites	Philosophy (BS program)
Recommended Post-requisites	Research methodology internship, Master thesis writing
Module objectives/intended learning outcomes	<p>By the end of this course students will attain the following learning outcomes.</p> <p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• know the genesis and history of science from the formation of its models, images and styles of thinking;</li> <li>• see the relationship of scientific and philosophical thoughts;</li> <li>• know the fundamental basis and conceptual apparatus of the history and philosophy of science;</li> <li>• understand basic principles of research activities.</li> </ul> <p><b>Students will have the skill of:</b></p> <ul style="list-style-type: none"> <li>• Application of philosophical knowledge in complex research;</li> <li>• Searching for scientific literature on the philosophy of science;</li> <li>• Writing reviews of scientific articles.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• formulate and solve problems that arise in the course of research activities and require in-depth professional knowledge;</li> <li>• Give critical analysis and evaluation modern scientific achievements;</li> <li>• choose the necessary research methods, modify existing and develop new methods based on the objectives of a particular study;</li> <li>• analyze and comprehend the realities of modern theory and practice based on the history and philosophy of science, the methodology of natural science, socio-humanitarian and technical knowledge.</li> </ul>
Content	The course "History and Philosophy of Science" introduces the problem of the phenomenon of science as a subject of special philosophical analysis, forms knowledge about the history and theory of science; the laws of development of science and the structure of scientific knowledge; science as a profession and a social institution; on methods of conducting scientific research; the role of science in the development of society.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.

Reading list	<p><b>Basic Literature:</b></p> <ol style="list-style-type: none"> <li>1. History and philosophy of science. Ed. Kryaneva Yu.V., Motorina L.E. - M.: INFRA-M, 2011. - 416 p.</li> <li>2. Stepin V.S. History and philosophy of science. - M.: Academic Project, 2011. - 423 p.</li> <li>3. Khasanov M.Sh., Petrova V.F. History and philosophy of science. - Almaty: Kazakh University, 2013. - 150 p.</li> <li>4. Philosophy of science. Edited by A.I. Lipkin. - M.: Eksmo, 2009. - 608 p.</li> </ol> <p><b>Supplementary literature:</b></p> <ol style="list-style-type: none"> <li>1. Myrzaly S. Philosophy, 2018.</li> <li>2. Lebedev S.A., Ilyin V.V. Introduction to the philosophy and history of science. - M.: Editorial URSS, 2009. - 344 p.</li> <li>3. Kokhanovsky V.P. etc. Fundamentals of philosophy of science. - M.: Phoenix, 2010. - 603 p.</li> <li>4. Nurysheva G.Zh. Philosophy. - Almaty, 2016.</li> </ol>
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Module name:	<b>Psychology of Management</b>
Code	
Trimester	1
Person responsible for the module	Assoc. Prof. A. Issakhanova, PhD
Lecturer(s)	Issakhanova Assel Alimakhanovna PhD in Pedagogy and psychology
Language	Russian
Relation to curriculum	Master program: Compulsory course.
Type of teaching	<p><b>Teaching methods:</b> formal and interactive lecturing, gamification, role playing and case study.</p> <p><b>Forms of teaching:</b></p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student's confidence through new examples and discussions on the problems.</p> <p><b>Instructor-supervised independent study (ISIS)</b> comprises review of the professionally oriented material, discussion of issues related to students' professional fields.</p>

	<b>Student's independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.					
Workload of course components and credits per trimester	ECTS credits	Contact hours		ISI S	SIS	Total hours
		Lectures	Practice sessions			
	4	20	20	20	60	120
Course assessment and forms of examination	Period	Assessment type	Number of points	Exam Form	Schedule (Week #)	
	1 <sup>st</sup> attestation	Problem Sets	60	Submission of written reports	Weekly	
		Mid-term Exam	40	Written. Individual project	5 <sup>th</sup> week	
		<b>1<sup>st</sup> attestation total</b>	<b>100</b>			
	2 <sup>nd</sup> attestation	Problem Sets	60	Submission of written reports	Weekly	
		End-term Exam	40	Written. Individual project	10 <sup>th</sup> week	
		<b>2<sup>nd</sup> attestation total</b>	<b>100</b>			
	Final Exam		100	Quiz	During final exam session	
	Cumulative total for the course = 0,3 * 1 <sup>st</sup> Att + 0,3 * 2 <sup>nd</sup> Att + 0,4*Final = 100.					
	Requirements according to the examination regulations	<b>Course and university policies include:</b> <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b> Late submissions are not accepted. <b>No cheating, duplication, falsification of data, plagiarism, and crib</b> <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.				
Recommended prerequisites	Psychology, Philosophy, History (Bs program modules).					
Post-requisites	Research practice					
Module objectives/inte	By the end of this course students will attain the following learning outcomes.					

ended learning outcomes	<p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• Know the conceptual apparatus describing management activities;</li> <li>• Mastering the theoretical laws of life and dynamics of control systems;</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Manage the ways of introspection, self-development and self-organization;</li> <li>• The ability to organize methods of organizing teamwork;</li> <li>• Apply the techniques of discussions, group work, independent analysis of cases arising in the practical work of a psychologist.</li> <li>• Independently navigate the various approaches existing in domestic and world science to psychological processes and phenomena arising in management;</li> <li>• Use socio-psychological mechanisms for managing group phenomena and processes; analyze employee motivation.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• to organize management activities; to explain the psychological phenomena of management, selection of diagnostic tool and corrective techniques in the analysis of cases arising in the practice of applied psychological work.</li> </ul>
Content	This course provides scientifically - based training of highly qualified specialists based on the study and analysis of psychological conditions and features of managerial activity in the process of professional formation within the chosen specialty and orientation on personal self - development.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<p><b>Basic Literature:</b></p> <ol style="list-style-type: none"> <li>1. Akhtaeva N. S., Abdigapparova A. I., Bekbaeva Z. N. Management psychology. - Almaty: Kazakh University, 2018.</li> <li>2. Essentials of Organizational Behavior / S. P. Robbins, T. A. Judge. - 14th ed. - Almaty : National Translation Bureau, 2019</li> <li>3. Balzac R. Organizational Psychology for Managers / R. Balzac, R. Stephen. 2020</li> <li>4. Looij, August van. Series: Psychology of Emotions, Motivations and Actions. New York : Nova. 2019.</li> <li>5. Susan W. Weinschenk. 100 Things Every Designer Needs To Know About People / W. W. Susan. - USA : Pearson, 2020.</li> <li>6. Social Psychology: Handbook of Basic Principles / Van Lange A.M. Paul, H.E. Tory, W. A. Kruglanski. - New York : The Guilford Press, 2021.</li> <li>7. Psychology/ G.M. David, C. Nathan DeWall. - 13 ed. - New York: Macmillan International Higher Education, 2021.</li> <li>8. Susan W. Weinschenk. 100 Things Every Designer Needs To Know About People / W. W. Susan. - USA: Pearson, 2020</li> </ol>

	<b>Supplementary literature:</b> <ol style="list-style-type: none"> <li>1. Duane P. Schultz. Theories of Personality / P. S. Duane, E.S. Sydney. - 11 ed. - Mexico : Cengage, 2017.</li> <li>2. Armstrong M. Strategic human resource management. - M.: INFRA-M., 2014.</li> <li>3. Bakirova G.H. Human resource management. - St. Petersburg: Speech, 2008.</li> <li>4. Becker G.S. Human capital: Theoretical and Empirical Analysis. - N-Y., 2011.</li> <li>5. Dobrenkov V. I. Human resource management: a socio-psychological approach. Studies manual. - M.: KDU, 2015.</li> <li>6. Ignatov V. G. Theory of management: a course of lectures / V.G. Ignatov, L.N. Albastova. - M. ICC "March"; Rostov-n/A: Publishing center "March", 2012</li> </ol>
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Module name:	<b>Higher Education Pedagogy</b>
Code	
Trimester	1
Person responsible for the module	Assoc. Prof. Zh.Tleshova, Candidate of Pedagogical Sciences
Lecturer(s)	Assoc. Prof. Zh.Tleshova, Candidate of Pedagogical Sciences
Language	English
Relation to curriculum	Master degree program: Compulsory course.
Type of teaching	<p><b>Teaching methods:</b> Lecture-based learning, class discussions, analysis-based learning, gamification, teamwork and individual learning, active learning, interrogative teaching methods.</p> <p><b>Forms of teaching:</b>  <b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.  <b>Practice sessions (seminars)</b> are active sessions to develop student's confidence through new examples and discussions on the problems of higher education and didactics.  <b>Instructor-supervised independent study (ISIS)</b> focuses on the review of reviewing research papers, theories, and practices. It is designed to explore in greater depth the course material.  <b>Student's independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assignments.</p>

Workload of course components and credits per trimester	<table><tr><td rowspan="2">ECTS credits</td><td colspan="2">Contact hours</td><td rowspan="2">ISIS</td><td rowspan="2">SIS</td><td rowspan="2">Total hours</td></tr><tr><td>Lectures</td><td>Practice sessions</td></tr><tr><td>4</td><td>20</td><td>20</td><td>20</td><td>60</td><td>120</td></tr></table>					ECTS credits	Contact hours		ISIS	SIS	Total hours	Lectures	Practice sessions	4	20	20	20	60	120																																
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	Quiz	5	Written	5 <sup>th</sup> week																																															
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2nd attestation	Reading material discussions	25	Presentation and discussion of oral reports based on the reading material	Once in two weeks																																															
	Quiz	5	Written	10 <sup>th</sup> week																																															
	2 <sup>nd</sup> attestation total	30																																																	
Final Exam		40	Oral	During final exam session																																															
Total for the course		100																																																	
Cumulative total for the course = 0,3 * 1 <sup>st</sup> Att + 0,3 * 2 <sup>nd</sup> Att + 0,4*Final = 100.																																																			
Requirements according to the examination regulations	<p><b>Course and university policies include:</b></p> <p><b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b></p> <p>Late submissions are not accepted.</p> <p><b>No cheating, duplication, falsification of data, plagiarism, and crib</b></p> <p><b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</p>																																																		

Recommended prerequisites	Psychology; Research Methodology (Bs modules)
Recommended Post-requisites	Teaching practice
Module objectives/intended learning outcomes	<p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• Higher education methodology, system, and processes;</li> <li>• Management in Higher Education: processes, faculty members and students;</li> <li>• educational programs design;</li> <li>• Teaching and learning outcomes, assessment methodology and methods of teaching and learning;</li> <li>• Organization of teaching and learning environments;</li> <li>• Regulation Acts in education on teaching in higher education;</li> <li>• Student-centered teaching approach and the roles of self-study;</li> <li>• Roles of IT technology in teaching and learning;</li> <li>• course and a lesson plan design;</li> <li>• research questions in higher education teaching and learning problems.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Give arguments for and against the concepts in higher education methodology, system, and processes and discuss them in the class.</li> </ul> <p>Design the content of educational programs.</p> <ul style="list-style-type: none"> <li>• Design assessment forms.</li> <li>• Define favorable learning environment.</li> <li>• Follow regulations in teaching and learning processes and learning environment.</li> <li>• Apply student-centered teaching approach and self-study assignments.</li> <li>• Design a course and a lesson plan</li> <li>• Research local problems in higher education problems</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Critically evaluate the concepts in methodology of pedagogical sciences;</li> <li>• Evaluate modern tendencies in higher education</li> <li>• Employ modern educational technologies</li> <li>• Apply teaching and learning methods</li> <li>• Define assessment forms based on the educational program content, goals and objectives;</li> <li>• Interpret the findings of research questions on higher education problems.</li> </ul>
Content	The course “Pedagogy of Higher Education” is designed for MA degree students to shape their knowledge about Higher Education systems,

	paradigm, university teacher competence, teaching and learning theories, assessment methodology and organization of teaching and learning processes.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<p><b>Basic Literature:</b></p> <ol style="list-style-type: none"> <li>1. Hartley, M.&amp;Ruby, A. (2017). <i>Higher Education Reform and Development: The Case of Kazakhstan</i>. Cambridge Press, UK.</li> <li>2. Silova, I.&amp;Niyozov, S. (2020). <i>Globalization on the Margins. Education and Post-Socialist Transformations in Central Asia</i>. Information Age Publishing Inc., USA.</li> <li>3. Shunk D. H.(2019). <i>Learning Theories: An Educational Perspective 8th Edition</i>. Pearson</li> <li>4. OECD. (2017). <i>Higher Education in Kazakhstan. Reviews of National Policies for Education</i>. OECD Publishing, Paris.</li> <li>5. UNESCO. (2021). <i>Thinking Higher and Beyond. Perspectives on the Futures of Higher Education to 2050</i>.</li> <li>6. Fry, H., Ketteridge, S.,&amp;Marshall, S. (2009). <i>A Handbook for Teaching and Learning in Higher Education</i>. Taylor&amp;Francis. NY., USA</li> </ol> <p><b>Supplementary literature:</b></p> <ol style="list-style-type: none"> <li>1. Мынбаева, А. (2008). <i>Основы педагогики высшей школы</i>. Учебное пособие. Алматы., Казахстан.</li> </ol>

Module name:	<b>Mathematics for Data Science</b>
Code	
Trimester	1
Person responsible for the module	Prof. Svitlana Biloshchytska, Doctor of Technical Sciences
Lecturer(s)	Prof. Svitlana Biloshchytska
Language	English, Russian
Relation to curriculum	Master program: Compulsory course
Type of teaching	<p><b>Teaching methods:</b></p> <p>Problem-based learning (PBL), a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem, group discussion, interactive-communicative learning.</p>



	<b>Forms of teaching:</b> <b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations. <b>Practice sessions (seminars)</b> are active sessions to develop student’s confidence through new examples and discussions on the problems. <b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material. <b>Student’s independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.																																														
Workload of course components and credits per trimester	<table><tr><td rowspan="2">ECTS credits</td><td colspan="2">Contact hours</td><td rowspan="2">ISIS</td><td rowspan="2">SIS</td><td rowspan="2">Total hours</td></tr><tr><td>Lectures</td><td>Practice sessions</td></tr><tr><td>5</td><td>30</td><td>20</td><td>30</td><td>70</td><td>150</td></tr></table>						ECTS credits	Contact hours		ISIS	SIS	Total hours	Lectures	Practice sessions	5	30	20	30	70	150																											
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Course assessment and forms of examination	<table><tr><td>Period</td><td>Assessment type</td><td>Number of points</td><td>Exam Form</td><td>Schedule (Week #)</td></tr><tr><td rowspan="3">1<sup>st</sup> attestation</td><td>laboratory work 1–4</td><td>60</td><td>Submission of written reports</td><td>Weekly</td></tr><tr><td>Mid-term Exam</td><td>40</td><td>Written</td><td>5<sup>th</sup> week</td></tr><tr><td><b>1<sup>st</sup> attestation total</b></td><td><b>100</b></td><td></td><td></td></tr><tr><td rowspan="3">2<sup>nd</sup> attestation</td><td>laboratory work 5-8</td><td>60</td><td>Submission of written reports</td><td>Weekly</td></tr><tr><td>End-term Exam</td><td>40</td><td>Written</td><td>10<sup>th</sup> week</td></tr><tr><td><b>2<sup>nd</sup> attestation total</b></td><td><b>100</b></td><td></td><td></td></tr><tr><td colspan="2">Final exam</td><td>100</td><td></td><td>During final exam session</td></tr><tr><td colspan="5">Cumulative total for the course = 0,3 * 1<sup>st</sup> Att + 0,3 * 2<sup>nd</sup> Att +0,4*Final=100.</td></tr></table>						Period	Assessment type	Number of points	Exam Form	Schedule (Week #)	1 <sup>st</sup> attestation	laboratory work 1–4	60	Submission of written reports	Weekly	Mid-term Exam	40	Written	5 <sup>th</sup> week	<b>1<sup>st</sup> attestation total</b>	<b>100</b>			2 <sup>nd</sup> attestation	laboratory work 5-8	60	Submission of written reports	Weekly	End-term Exam	40	Written	10 <sup>th</sup> week	<b>2<sup>nd</sup> attestation total</b>	<b>100</b>			Final exam		100		During final exam session	Cumulative total for the course = 0,3 * 1 <sup>st</sup> Att + 0,3 * 2 <sup>nd</sup> Att +0,4*Final=100.				
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Requirements according to the examination regulations	<b>Course and university policies include:</b> <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b> Late submissions are not accepted. <b>No cheating, duplication, falsification of data, plagiarism, and crib</b> <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.																																														

Recommended prerequisites	Linear Algebra, Calculus I/ II, Probability theory and statistics (Bs modules)
Recommended Post-requisites	Applied Project in Data Analytics
Module objectives/intended learning outcomes	<p>Formation of students' logical thinking and skills in the ability to use statistical models and methods in solving applied problems related to the performance of professional functions.</p> <p><b>By the end of this course students will attain the following learning outcomes.</b></p> <p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• principles and methods of collecting, processing and visual presentation of statistical information;</li> <li>• the essence of generalizing statistical indicators - absolute, relative and average values, indicators of variation, differentiation and concentration;</li> <li>• statistical indicators of the presence and tightness of the relationship, methods for quantitative description of the relationship of signs;</li> <li>• basics of statistical modeling and forecasting.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• formulate hypotheses and research questions involving quantitative data;</li> <li>• design experiments and statistical models to represent quantitative research questions;</li> <li>• apply ways to compare the levels of statistical indicators in time and space using indicators of dynamics and indices;</li> <li>• select and apply a variety of statistical tools to answer quantitative research questions and formalize certainty in those answers;</li> <li>• analyze and communicate the findings of statistical tools.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Apply appropriate statistical inference techniques to the analysis of data across a variety of domains;</li> <li>• Interpret the outputs from statistical software packages and programming languages;</li> <li>• Report and communicate statistical results in a comprehensive, ethical and professional manner;</li> <li>• Apply appropriate forecasting techniques to time series;</li> <li>• Identify patterns in data and implement dimension reduction techniques.</li> </ul>
Content	<p>Within the framework of the ten-week course, approaches to the description of data obtained in research, the main methods and principles of statistical analysis, interpretation and visualization of the results obtained are considered. Students will get acquainted with such methods of statistical analysis as variance, regression and cluster analysis. Students will learn how to compare groups with each other, calculate correlation coefficients and build regression equations. The main emphasis is on mathematical ideas, intuition and logic, which determine the methods and calculation formulas. The studied material will be</p>

	applicable to solving a wide range of problems arising in the framework of research work in almost any direction.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; audio-visual software packages such as PowerPoint or pdf to highlight key points of text; Microsoft Teams; LMS Moodle.
Reading list	<p><b>Basic Literature:</b></p> <ol style="list-style-type: none"> <li>1. Peter Bruce and Andrew Bruce. Practical Statistics for Data Scientists. 2017, 303.</li> <li>2. Paul Orland. Math for Programers. V. 11. 2020</li> <li>3. Trevor Hastie, Robert Tibshirani, Jerome Friedman. The Elements of Statistical Learning. Data Mining, Inference, and Prediction. Second Edition. – Springer. 2017. – 764 с.</li> <li>4. Вентцель Е.С., Овчаров Л.А. Теория вероятностей и ее инженерные приложения / Е.С. Вентцель, Л.А. Овчаров. – 3-е изд., стер. – М.: Академия, 2003. – 464 с.</li> <li>5. Гмурман В. Е. Руководство к решению задач по теории вероятностей и математической статистике / В. Е. Гмурман. – М. : Высшая школа, 2001. – 575</li> </ol> <p><b>Supplementary literature:</b></p> <ol style="list-style-type: none"> <li>6. Ross, Sheldon M. Introduction to probability models / Sheldon M. Ross.- 6th ed. 1997.- 669.</li> <li>7. Gregory Hartman. Fundamentation Matrix Algebra. 2011. 236.</li> </ol>

Module name:	<b>Programming for Data Analysis and Databases</b>
Code	
Trimester	1
Person responsible for the module	Turar Olzhas, PhD
Lecturer(s)	Turar Olzhas, PhD
Language	English
Relation to curriculum	Master Program: Compulsory course.
Type of teaching	<p><b>Teaching methods:</b></p> <p>Problem-based learning (PBL), a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem, group discussion, interactive-communicative learning.</p>

	<p><b>Forms of teaching:</b></p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student’s confidence through new examples and discussions on the problems.</p> <p><b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.</p> <p><b>Student’s independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>																																														
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Requirements according to the examination regulations	<p><b>Course and university policies include:</b></p> <p><b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b></p> <p>Late submissions are not accepted.</p> <p><b>No cheating, duplication, falsification of data, plagiarism, and crib</b></p>																																														

	<b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.
Recommended prerequisites	Probability and Statistics (Bs module)
Recommended Post-requisites	Business Analytics
Module objectives/intended learning outcomes	<p><b>By the end of this course students will attain the following learning outcomes.</b></p> <p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• Understand the fundamentals of programming languages and their application to data analysis and databases.</li> <li>• proficiency in a programming language, such as Python or R, and apply it to data analysis, data visualization, and database management.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Create and manipulate data sets using various data types, including structured, semi-structured, and unstructured data.</li> <li>• Design, implement and optimize complex database schemas, using SQL and other database management tools.</li> <li>• Use data cleaning and data preprocessing techniques to prepare data for analysis and apply exploratory data analysis techniques to gain insights from data.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <p>critical analysis and reflection on applied machine learning techniques, including supervised and unsupervised learning, to analyze and model complex data sets.</p> <p>selection of methods for applying data visualization tools and techniques to communication of results and insights to stakeholders.</p>
Content	<p>The "Programming for Data Analysis and Databases" course covers the following topics:</p> <ul style="list-style-type: none"> <li>• Introduction to programming languages for data analysis and databases</li> <li>• Data types and structures in Python and R</li> <li>• Data cleaning and preprocessing techniques</li> <li>• Data visualization and reporting</li> </ul>
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<ol style="list-style-type: none"> <li>1. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, 2017.</li> <li>2. Hadley Wickham, "R for Data Science: Import, Tidy, Transform, Visualize, and Model Data", O'Reilly Media, 2017.</li> </ol>

	<ol style="list-style-type: none"> <li>3. Jennifer Widom, "Database Systems: The Complete Book (2nd Edition)", Pearson, 2018.</li> <li>4. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly Media, 2016.</li> <li>5. Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, "An Introduction to Statistical Learning:</li> </ol>
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## 2<sup>nd</sup> term

Module name:	<b>Methods and Tools for Data Analysis</b>
Code	
Trimester	2
Person responsible for the module	Nugumanova Aliya, PhD
Lecturer(s)	Nugumanova Aliya, PhD
Language	English
Relation to curriculum	Master Program: Compulsory course.
Type of teaching	<p><b>Teaching methods:</b></p> <p>Interactive lecturing: the instructor uses mini-lectures about 20 minutes long and involves students in a range of brief content-related activities in between. Interaction may occur between instructor and students or between and among students.</p> <p>Inquiry-based learning promotes the idea of learning by investigation, where students can complete projects, ask questions and find answers by themselves. While teachers act as resources in these times, the goal is for students to solve problems and discover information on their own.</p> <p>Inquiry Guided Learning – Students learning or applying material to meet a challenge, answer a question, conduct an experiment, or interpret data.</p> <p><b>Forms of teaching:</b></p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student's confidence through new examples and discussions on the problems.</p> <p><b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.</p> <p><b>Student's independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>

Workload of course components and credits per trimester	<table><tr><td rowspan="2">ECTS credits</td><td colspan="2">Contact hours</td><td rowspan="2">ISIS</td><td rowspan="2">SIS</td><td rowspan="2">Total hours</td></tr><tr><td>Lectures</td><td>Practice sessions</td></tr><tr><td>5</td><td>30</td><td>20</td><td>30</td><td>70</td><td>150</td></tr></table>					ECTS credits	Contact hours		ISIS	SIS	Total hours	Lectures	Practice sessions	5	30	20	30	70	150
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		End-term Quiz	40	Written	10 <sup>th</sup> week														
		2 <sup>nd</sup> attestation total	100																
	Final Exam		100	Written	During final exam session														
	Cumulative total for the course = 0,3 * 1 <sup>st</sup> Att + 0,3 * 2 <sup>nd</sup> Att + 0,4*Final = 100.																		
Requirements according to the examination regulations	<b>Course and university policies include:</b> <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b> Late submissions are not accepted. <b>No cheating, duplication, falsification of data, plagiarism, and crib</b> <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.																		
Recommended prerequisites	Programming for Data Analysis and Databases																		
Recommended Post-requisites	Data Analytics application project, Master's research work, including internships and a master's thesis; Preparation and defense of a master's thesis																		
Module objectives/intended learning outcomes	<b>By the end of this course students will attain the following learning outcomes.</b> <b>The student will show a working knowledge in:</b> <ul style="list-style-type: none"><li>key methods and tools of data analysis, including data preprocessing, feature selection, model training, and evaluation.</li></ul>																		

	<ul style="list-style-type: none"> <li>different data analysis techniques and methods to solve real-world problems, including supervised and unsupervised learning, time series analysis, and text analytics.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>Use data analysis software tools and packages, such as scikit-learn, TensorFlow, and PyTorch, to build and evaluate machine learning models.</li> <li>Evaluate the quality and reliability of data, identify data issues and potential biases, and take appropriate steps to address these issues.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>Communicate data analysis results and insights to stakeholders, using appropriate data visualization techniques and effective storytelling.</li> <li>Show critical thinking and problem-solving skills, using data to inform decision-making in a rapidly changing and uncertain environment.</li> </ul>
Content	Data preprocessing and feature selection Linear regression and classification Stationarity and autocorrelation Text preprocessing and feature extraction Train-test split and cross-validation Deep learning and neural networks
Media employed	Multimedia classrooms equipped with computer, projection and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<ol style="list-style-type: none"> <li>Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly Media, 2016.</li> <li>Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", O'Reilly Media, 2019.</li> <li>Trevor Hastie, Robert Tibshirani, and Jerome Friedman, "The Elements of Statistical Learning: Data Mining, Inference, and Prediction", Springer, 2017.</li> <li>Max Kuhn and Kjell Johnson, "Applied Predictive Modeling", Springer, 2013.</li> <li>Dan Jurafsky and James H. Martin, "Speech and Language Processing (3rd ed. draft)", Pearson, 2020.</li> </ol>



Module name:	<b>Case study on data Analytics</b>																		
Code																			
Trimester	2																		
Person responsible for the module	Timur Akhmetov, PhD																		
Lecturer(s)	Timur Akhmetov, PhD																		
Language	English																		
Relation to curriculum	Master program: Compulsory course.																		
Type of teaching	<p><b>Teaching methods:</b> Problem-based learning (PBL), a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem, group discussion, interactive-communicative learning.</p> <p><b>Forms of teaching:</b></p> <p><b>Interactive teaching:</b> the instructor uses mini-lectures about 20 minutes long and involves students in a range of brief content-related activities in between. Interaction may occur between instructor and students or between and among students.</p> <p><b>Lecture-demonstration:</b> The content involves a demonstration of a process or activity. The lecture typically proceeds in chronological order, with the demonstration presented in a sequence of events that the lecturer highlights and explains.</p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student's confidence through new examples and discussions on the problems.</p> <p><b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.</p> <p><b>Student's independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>																		
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	1 <sup>st</sup> attestation	Mid-term project	100	Submission of the written project	5 <sup>th</sup> week
		1 <sup>st</sup> attestation total	100		
	2nd attestation	End-term project	60	Submission of the written project	8 <sup>th</sup> - 9 <sup>th</sup> week
		End-term Quiz	40	Written	10 <sup>th</sup> week
		2 <sup>nd</sup> attestation total	100		
	Final Exam		100	Written	During final exam session
Cumulative total for the course = 0,3 * 1 <sup>st</sup> Att + 0,3 * 2 <sup>nd</sup> Att + 0,4*Final = 100.					
Requirements according to the examination regulations	<b>Course and university policies include:</b> <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b> Late submissions are not accepted. <b>No cheating, duplication, falsification of data, plagiarism, and crib</b> <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.				
Recommended prerequisites	Programming for data analysis and databases				
Recommended Post-requisites	Data Analytics application project, Data processing and understanding				
Module objectives/intended learning outcomes	<b>By the end of this course students will attain the following learning outcomes.</b> <b>The student will show a working knowledge in:</b> <ul style="list-style-type: none"><li>• main approaches in clustering;</li><li>• solid understanding of the key concepts, methods, and techniques in data analytics and their application to big data analysis;</li><li>• analysis of large and complex data sets</li></ul> <b>Students will have the skill to</b> <ul style="list-style-type: none"><li>• use a range of statistical and computational techniques;</li><li>• select and apply appropriate statistical models, algorithms, and software tools;</li><li>• differentiate features, correlations, numerical and categorical data;</li></ul>				

	<ul style="list-style-type: none"> <li>extract insights from structured and unstructured data, including text, image, and video data.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>Evaluate graph construction</li> <li>select and apply models</li> <li>identify the quality and reliability of data, data issues and potential biases, and take appropriate steps to address these issues.</li> </ul>
Content	This course aims at discussing the key principles of knowledge discovery process through various case studies arising from different application areas. The students are expected to learn the main steps to traverse when they face new data analytics problems. With each case study, the tools for cleaning, processing and altering the data shall be visited. Particular attention will be given to data inspection, feature reduction and model selection. Each case study will be completed by a thorough discussion and interpretation of the results.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<p><b>Basic Literature:</b></p> <ol style="list-style-type: none"> <li>1. C. Andersson. A replicated empirical study of a selection method for software reliability growth models. Empirical Software Engineering, 12(2):161–182, 2007</li> <li>2. Bertrand Meyer, Object ‘Oriented Software Construction. Prentice Hall, 2000.</li> </ol>

Module name:	<b>Business Process Analysis</b>
Code	
Trimester	2
Person responsible for the module	Timur Akhmetov, PhD
Lecturer(s)	Timur Akhmetov, PhD
Language	English
Relation to curriculum	Master Program: Compulsory course.

Type of teaching	<p><b>Teaching methods:</b> Problem-based learning (PBL), a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem, group discussion and interactive-communicative learning.</p> <p><b>Forms of teaching:</b></p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student's confidence through new examples and discussions on the problems.</p> <p><b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.</p> <p><b>Student's independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>																																									
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Requirements according to the examination regulations	<p><b>Course and university policies include:</b></p> <p><b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b></p> <p>Late submissions are not accepted.</p> <p><b>No cheating, duplication, falsification of data, plagiarism, and crib</b></p> <p><b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</p>
Recommended prerequisites	Business analytics. Digital Finance. Digital business ecosystem
Recommended post - requisites	Master's research work, including research internships and a master's thesis writing.
Module objectives/intended learning outcomes	<p><b>By the end of this course students will attain the following learning outcomes.</b></p> <p><b>The student will show a working knowledge in:</b></p> <ol style="list-style-type: none"> <li>1. Understand the key concepts and principles of business process analytics and their application to big data analysis.</li> <li>2. Analyze and evaluate the effectiveness and efficiency of business processes, using various data analytics techniques and tools, including process mining, data visualization, and statistical analysis.</li> </ol> <p><b>Students will have the skill to</b></p> <ol style="list-style-type: none"> <li>3. Identify and quantify process bottlenecks, inefficiencies, and deviations, and develop actionable recommendations to improve business processes.</li> <li>4. Apply advanced data analytics methods to identify patterns, trends, and anomalies in business process data, and use this information to optimize and automate business processes.</li> </ol> <p><b>In terms of Competences, students will be able to</b></p> <ol style="list-style-type: none"> <li>5. Show critical thinking and problem-solving skills, using data to inform decision-making related to business process management.</li> <li>6. Evaluate the impact of emerging technologies, such as artificial intelligence and machine learning, on business process analytics and apply best practices to leverage these technologies for process improvement.</li> </ol>
Content	The course is designed to introduce the most important and basic concepts and methods in business analysis. In addition, students will also learn how to compare results between different samples.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<p><b>Basic Literature:</b></p> <ol style="list-style-type: none"> <li>1. Bertrand Meyer, Object'oriented Software Construction. Prentice Hall, 2000.</li> <li>2. James Martin and James J. Odell, Object'oriented Methods: A Foundation (UML Edition), Prentice Hall, 1998.</li> </ol>

	<ol style="list-style-type: none"> <li>3. Michael Pont, Patterns for Time'Triggered Embedded Systems, AddisonWesley, 2001.</li> <li>4. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, and Michael Stal, Pattern'Oriented Software Architecture: A System of Patterns, Wiley, 1996.</li> <li>5. Douglas Schmidt, Michael Stal, Hans Rohnert, and Frank Buschmann, Pattern'Oriented Software Architecture Volume 2: Patterns for Concur'rent and Networked Objects, Wiley, 2000.</li> <li>6. James Rumbaugh, OMT Insights, SIGS Books, 1996.</li> </ol>
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Module name:	<b>Business Analytics</b>
Code	
Trimester	2
Person responsible for the module	Timur Akhmetov, PhD
Lecturer(s)	Timur Akhmetov, PhD
Language	English
Relation to curriculum	Master program: Elective course.
Type of teaching	<p><b>Teaching methods:</b> Problem-based learning (PBL), a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem, group discussion, interactive-communicative learning.</p> <p><b>Forms of teaching:</b></p> <p><b>Interactive teaching:</b> the instructor uses mini-lectures about 20 minutes long and involves students in a range of brief content-related activities in between. Interaction may occur between instructor and students or between and among students.</p> <p><b>Lecture-demonstration:</b> The content involves a demonstration of a process or activity. The lecture typically proceeds in chronological order, with the demonstration presented in a sequence of events that the lecturer highlights and explains.</p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student's confidence through new examples and discussions on the problems.</p>

	<b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material. <b>Student's independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.																																													
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Recommended prerequisites	Mathematics for data science																																													
Recommended Post-requisites	Business process analysis, Master thesis writing																																													

Module objectives/intended learning outcomes	<p>By the end of this course students will attain the following learning outcomes.</p> <p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• solid understanding of the key concepts, methods, and techniques in business analytics and their application to big data analysis.</li> <li>• Analysis of large and complex data sets, using a range of statistical and computational techniques, to derive meaningful insights and inform business decision-making.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Select and apply appropriate statistical models, algorithms, and software tools</li> <li>• extract insights from structured and unstructured data, including text, image, and video data.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Evaluate the quality and reliability of data, identify data issues and potential biases, and take appropriate steps to address these issues.</li> <li>• Communicate insights and recommendations to stakeholders, using appropriate data visualization techniques and effective storytelling.</li> </ul>
Content	The course is designed to introduce the most important and basic concepts, methods in business analysis. In addition, students will also learn how to compare results between different samples.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<p><b>Basic Literature:</b></p> <ol style="list-style-type: none"> <li>3. Bertrand Meyer, Object 'Oriented Software Construction. Prentice Hall, 2000.</li> <li>2. James Martin and James J. Odell, Object' Oriented Methods: A Foundation (UML Edition), Prentice Hall, 1998.</li> <li>3. Michael Pont, Patterns for Time' Triggered Embedded Systems, Addison Wesley, 2001.</li> <li>4. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, and Michael Stal, Pattern' Oriented Software Architecture: A System of Patterns, Wiley, 1996.</li> <li>5. Douglas Schmidt, Michael Stal, Hans Rohnert, and Frank Buschmann, Pattern' Oriented Software Architecture Volume 2: Patterns for Concurrent and Networked Objects, Wiley, 2000.</li> </ol>

Module name:	<b>Digital Finance</b>
Code	
Trimester	2
Person	Turar Olzhas, Computational & Data Science Department Director, PhD



responsible for the module																				
Lecturer(s)	-																			
Language	English																			
Relation to curriculum	Master Program: Elective course.																			
Type of teaching	<p><b>Teaching methods:</b></p> <p>Interactive lecturing: the instructor uses mini-lectures about 20 minutes long and involves students in a range of brief content-related activities in between. Interaction may occur between instructor and students or between and among students.</p> <p>Inquiry-based learning promotes the idea of learning by investigation, where students can complete projects, ask questions and find answers by themselves. While teachers act as resources in these times, the goal is for students to solve problems and discover information on their own.</p> <p><b>Forms of teaching:</b></p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student’s confidence through new examples and discussions on the problems.</p> <p><b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.</p> <p><b>Student’s independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>																			
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	Final Exam	100	Written	During final exam session
	Cumulative total for the course = $0,3 * 1^{st} \text{ Att} + 0,3 * 2^{nd} \text{ Att} + 0,4 * \text{Final} = 100$ .			
Requirements according to the examination regulations	<b>Course and university policies include:</b> <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b> Late submissions are not accepted. <b>No cheating, duplication, falsification of data, plagiarism, and crib</b> <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.			
Recommended prerequisites	Psychology of management, Programming for data analysis and databases			
Recommended Post-requisites	Business process analysis, Master thesis writing			
Module objectives/intended learning outcomes	<p><b>By the end of this course students will attain the following learning outcomes.</b></p> <p><b>The student will show a working knowledge in:</b></p> <p>fundamental concepts of digital finance and how they are transforming the financial industry.</p> <ul style="list-style-type: none"> <li>• impact of emerging technologies on financial markets, including blockchain, artificial intelligence, and machine learning.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Evaluate the risks and opportunities of digital finance and develop strategies to manage and mitigate these risks.</li> <li>• Develop a deep understanding of financial data and analytics, including data acquisition, analysis, and interpretation.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Show critical thinking and problem-solving skills, using data and analytics to inform decision-making in a rapidly changing and uncertain environment.</li> </ul>			
Content	Introduction to digital finance Digital finance applications and technologies Financial data and analytics			

	Regulatory and ethical considerations Emerging trends in digital finance
Media employed	Multimedia classrooms equipped with computer, projection and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<ol style="list-style-type: none"> <li>1. Don Tapscott and Alex Tapscott, "Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World", Penguin Random House, 2016.</li> <li>2. Marcos Lopez de Prado, "Advances in Financial Machine Learning", Wiley, 2018.</li> <li>3. Andrew W. Lo, "Adaptive Markets: Financial Evolution at the Speed of Thought", Princeton University Press, 2018.</li> <li>4. David Easley and Marcos M. Lopez de Prado, "Microstructure and Noise in Financial Markets: A Comprehensive Overview", Elsevier, 2018.</li> <li>5. Kevin Werbach, "The Blockchain and the New Architecture of Trust", MIT Press, 2018.</li> </ol>

Module name:	<b>Digital Business ecosystem</b>
Code	
Trimester	2
Person responsible for the module	Turar Olzhas, Computational & Data Science Department Director, PhD
Lecturer(s)	-
Language	English
Relation to curriculum	Master Program: Elective course
Type of teaching	<p><b>Teaching methods:</b> Interactive teaching: the instructor uses mini-lectures about 20 minutes long and involves students in a range of brief content-related activities in between. Interaction may occur between instructor and students or between and among students. Problem-based learning (PBL) is a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem. Group discussion and interactive-communicative learning.</p> <p><b>Forms of teaching:</b>  <b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p>

	<b>Practice sessions (seminars)</b> are active sessions to develop student’s confidence through new examples and discussions on the problems. <b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material. <b>Student’s independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.																			
Workload of course components and credits per trimester	<table><tr><td rowspan="2">ECTS credits</td><td colspan="2">Contact hours</td><td rowspan="2">ISIS</td><td rowspan="2">SIS</td><td rowspan="2">Total hours</td></tr><tr><td>Lectures</td><td>Practice sessions</td></tr><tr><td>5</td><td>30</td><td>20</td><td>30</td><td>70</td><td>150</td></tr></table>						ECTS credits	Contact hours		ISIS	SIS	Total hours	Lectures	Practice sessions	5	30	20	30	70	150
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Course assessment and forms of examination	Period	Assessment type	Number of points	Exam Form	Schedule (Week #)															
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Requirements according to the examination regulations	<b>Course and university policies include:</b> <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b> Late submissions are not accepted. <b>No cheating, duplication, falsification of data, plagiarism, and crib</b> <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class																			
Recommended prerequisites	Background knowledge of Management, Psychology of management																			
Post-requisites	Business process analysis, Master thesis writing																			

Module objectives/intended learning outcomes	<p>By the end of this course students will attain the following learning outcomes.</p> <p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• Understand the concept of digital business ecosystems and how they are transforming traditional business models.</li> <li>• Analyze the key drivers and challenges of digital business ecosystems, including emerging technologies, data analytics, and platform strategies.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Evaluate the competitive landscape of digital business ecosystems,</li> <li>• develop strategies to compete and collaborate within them.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Develop a deep understanding of the role of data and analytics in digital business ecosystems, including data acquisition, analysis, and sharing.</li> <li>• Show critical thinking and problem-solving skills, using data and analytics to inform decision-making in a rapidly changing and uncertain environment.</li> </ul>
Content	<p>Introduction to digital business ecosystems</p> <p>Digital platform strategies</p> <p>Data and analytics in digital business ecosystems</p> <p>Managing digital business ecosystems</p> <p>Emerging trends in digital business ecosystems</p>
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<ol style="list-style-type: none"> <li>1. Marshall Van Alstyne, Geoffrey G. Parker, and Sangeet Paul Choudary, "Platform Revolution: How Networked Markets Are Transforming the Economy and How to Make Them Work for You", W. W. Norton &amp; Company, 2016.</li> <li>2. Andreas Kaplan and Michael Haenlein, "Siri, Siri in my hand, who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence", Business Horizons, Vol. 62, No. 1, 2019.</li> <li>3. Marco Iansiti and Karim R. Lakhani, "Competing in the Age of AI", Harvard Business Review Press, 2020.</li> <li>4. Andrew McAfee and Erik Brynjolfsson, "Machine, Platform, Crowd: Harnessing Our Digital Future", W. W. Norton &amp; Company, 2017.</li> </ol>

	5. Michael E. Porter and James E. Heppelmann, "How Smart, Connected Products Are Transforming Competition", Harvard Business Review, November 2014.
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Module name:	Teaching Internship																		
Code																			
Trimester	2																		
Person responsible for the module	Assoc. Prof. Zh. Tleshova, Candidate of Pedagogical Sciences																		
Lecturer(s)	Assoc. Prof. Zh. Tleshova, Candidate of Pedagogical Sciences																		
Language	English																		
Relation to curriculum	Master degree program: Compulsory course.																		
Type of teaching	<b>Instructor-supervised teaching practice</b> <b>Methods used:</b> 1. Analysis of curriculum and syllabi of the related majors and disciplines 2. Class visitation and observation of the teaching and learning process. 3. Organization an event/meeting with students on students 4. Developing lesson plans and conducting at least 3 classes (a lecture, practical session, seminar or a lab). 5. Development teaching philosophy statement based on the teaching practice																		
Workload of course components and credits per trimester	<table><tr><th rowspan="2">ECTS credits</th><th colspan="2">Contact hours</th><th rowspan="2">ISI S</th><th rowspan="2">SIS</th><th rowspan="2">Total hours</th></tr><tr><th>Lectures</th><th>Practice sessions</th></tr><tr><td>4</td><td>-</td><td>-</td><td>40</td><td>80</td><td>120 (8-week period of internship)</td></tr></table>					ECTS credits	Contact hours		ISI S	SIS	Total hours	Lectures	Practice sessions	4	-	-	40	80	120 (8-week period of internship)
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		for BA students				
		Class and lesson observation	100	Report defense	1-3 weeks	
		Three lessons that MA students give	100		4-8 weeks	
		A teaching Philosophy statement	100	Written	4-8 weeks	
		Discipline instructor's grade	100	Written	4-8 weeks	
Requirements according to the examination regulations	<p><b>Course and university policies include:</b>  <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b>  Late submissions are not accepted.  <b>No cheating, duplication, falsification of data, plagiarism, and crib</b>  <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</p>					
Recommended prerequisites	Pedagogy of Higher Education, Psychology of Management					
Recommended post -requisites	Master's research work, including research internships and a master's thesis					
Module objectives/intended learning outcomes	<p>Upon the completion of “Teaching Internship”, MA students will attain the following learning outcomes. <b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• pedagogy of a major discipline;</li> <li>• methodology of teaching a major discipline;</li> <li>• methodology of assessment;</li> <li>• management in Higher Education;</li> <li>• design of educational programs;</li> <li>• teaching and learning outcomes, assessment methodology and methods of teaching and learning;</li> <li>• organization of teaching and learning environments.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• demonstrate hard and soft skills in a major discipline and pedagogy;</li> <li>• apply the principles of learning and teaching processes;</li> <li>• apply methods and approaches in teaching;</li> <li>• apply various IT technologies;</li> </ul>					

	<ul style="list-style-type: none"> <li>• apply approaches of motivation (engagement) of students to study.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• work with students as tutors;</li> <li>• evaluate student behaviour and their response to teaching and content;</li> <li>• employ modern educational technologies;</li> <li>• apply teaching and learning methods;</li> <li>• assess student knowledge and skills;</li> <li>• define their own teaching philosophy.</li> </ul>
Content	Teaching Internship is designed for MA degree students to shape their knowledge and develop their skills of working with students to deliver knowledge, apply various teaching methods and approaches, and cooperate with discipline instructors to develop MA student competences in pedagogy of teaching.
Media employed	Multimedia classrooms equipped with computer, projection, and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<p><b>Main literature:</b></p> <ol style="list-style-type: none"> <li>1. Оқыту теориясы. Д. Х Шунк. Тараулар 1, 3,4,5,6,7, 8,9,10,11 және 12. Баспа: Pearson, 2019</li> <li>2. Рефлексивті оқыту негіздері. Э.Поллард. Бөлімдер 2, 3, и 4. Баспа: Bloomsbury Academic, 2019</li> </ol> <p><b>Additional resources:</b></p> <p>For the reading list and Resources, please find the attached links. These are the open sources by Massachusetts Institute of Technology (MIT), the US.</p> <p>Mito open course ware <a href="https://ocw.mit.edu/courses/chemistry/5-95j-teaching-college-level-science-and-engineering-fall-2015/instructor-insights/">https://ocw.mit.edu/courses/chemistry/5-95j-teaching-college-level-science-and-engineering-fall-2015/instructor-insights/</a></p>

### 3d term

Module name:	<b>Machine Learning and Artificial Intelligence</b>
Code	
Trimester	3
Person responsible for the module	Akhmetov Timur, PhD
Lecturer(s)	Akhmetov Timur, PhD
Language	English



Relation to curriculum	Master Program: Compulsory course.																																									
Type of teaching	<p><b>Teaching methods:</b></p> <p>Problem-based learning (PBL), a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem, group discussion, interactive-communicative learning.</p> <p><b>Forms of teaching:</b></p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student's confidence through new examples and discussions on the problems.</p> <p><b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.</p> <p><b>Student's independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>																																									
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Requirements according to the examination regulations	<p><b>Course and university policies include:</b>  <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b>  Late submissions are not accepted.  <b>No cheating, duplication, falsification of data, plagiarism, and crib</b>  <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</p>
Recommended prerequisites	Programming for data analysis and databases, Data processing and understanding
Recommended post - requisites	Master's research work, including research internships and a master's thesis writing.
Module objectives/intended learning outcomes	<p><b>By the end of this course students will attain the following learning outcomes.</b>  <b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• fundamental concepts of machine learning and artificial intelligence and their applications in different domains.</li> <li>• different machine learning and artificial intelligence algorithms and select the most appropriate one for a given task.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Develop and implement machine learning and artificial intelligence models using programming languages and tools.</li> <li>• Evaluate the performance of machine learning and artificial intelligence models and interpret the results.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Demonstrate a deep understanding of data-driven decision making and the role of data and analytics in machine learning and artificial intelligence.</li> <li>• Demonstrate critical thinking and problem-solving skills, using machine learning and artificial intelligence to inform decision-making in a rapidly changing and uncertain environment.</li> </ul>
Content	<p>Introduction to machine learning and artificial intelligence  Supervised learning algorithms, including regression and classification  Unsupervised learning algorithms, including clustering and dimensionality reduction  Reinforcement learning algorithms and their applications in different domains  Natural language processing algorithms and their applications  Computer vision algorithms and their applications  Deep learning algorithms and their applications in different domains  Machine learning and artificial intelligence tools and technologies  Data-driven decision making with machine learning and artificial intelligence</p>

Media employed	Multimedia classrooms equipped with computer, projection and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<ol style="list-style-type: none"> <li>1. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, "The Elements of Statistical Learning: Data Mining, Inference, and Prediction", Springer, 2017.</li> <li>2. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning", MIT Press, 2016.</li> <li>3. Sebastian Raschka and Vahid Mirjalili, "Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow", Packt Publishing, 2017.</li> <li>4. Peter Norvig and Stuart Russell, "Artificial Intelligence: A Modern Approach", Pearson, 2021</li> </ol>

Module name:	<b>Data Analytics application project</b>
Code	
Trimester	3
Person responsible for the module	Shomanov Aday, PhD
Lecturer(s)	Shomanov Aday, PhD
Language	English
Relation to curriculum	Master Program: Compulsory course.
Type of teaching	<p><b>Methods of teaching:</b>  Problem-solving, outlining the main problem.  Inquiry Guided Learning – Students learning or applying material to meet a challenge, answer a question, conduct an experiment, or interpret data. Group discussion and interactive-communicative learning.</p> <p><b>Forms of teaching:</b></p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.  <b>Practice sessions (seminars)</b> are active sessions to develop student's confidence through new examples and discussions on the problems.  <b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.  <b>Student's independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>

Workload of course components and credits per trimester	ECTS credits		Contact hours		ISIS	SIS	Total hours	
			Lectures	Practice sessions				
	4	20	20	20	60	120		
Course assessment and forms of examination	Period	Assessment type	Number of points	Exam Form	Schedule (Week #)			
	1 <sup>st</sup> attestation	Mid-term project	100	Submission of the written project	5 <sup>th</sup> week			
		1 <sup>st</sup> attestation total	100					
	2nd attestation	End-term project	60	Submission of the written project	8 <sup>th</sup> - 9 <sup>th</sup> week			
		End-term Quiz	40	Written	10 <sup>th</sup> week			
		2 <sup>nd</sup> attestation total	100					
	Final Exam		100	Written	During final exam session			
	Cumulative total for the course = 0,3 * 1 <sup>st</sup> Att + 0,3 * 2 <sup>nd</sup> Att + 0,4*Final = 100.							
	Requirements according to the examination regulations	<b>Course and university policies include:</b> <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b> Late submissions are not accepted. <b>No cheating, duplication, falsification of data, plagiarism, and crib</b> <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.						
Recommended prerequisites	Data processing and understanding, Data Driven Decision Making							
Recommended Post-requisites	Master's research work, including research internships and a master's thesis writing.							
Module objectives/intended learning outcomes	By the end of this course students will attain the following learning outcomes. <b>The student will show a working knowledge in:</b> <ul style="list-style-type: none"><li>Aspects of work in a multidisciplinary team, collaborate with industry partners, and apply project management principles.</li></ul> <b>Students will have the skill to</b> <ul style="list-style-type: none"><li>Apply the scientific method to a research problem, including problem</li></ul>							

	<p>identification, hypothesis generation, data collection and analysis, and interpretation of results.</p> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Develop and implement a data-driven solution to a real-world problem, using appropriate statistical and computational tools.</li> <li>• Communicate the results of a data-driven project effectively to a diverse audience, including industry partners, stakeholders, and peers.</li> </ul>
Content	<p>Project management principles and best practices</p> <p>Scientific method and research design</p> <p>Data collection and analysis</p> <p>Interpretation of results and drawing conclusions</p> <p>Writing research reports and papers</p> <p>Data-driven solution development</p> <p>Scaling the solution for larger data sets and different problem domains</p> <p>Writing reports and papers for industry partners, stakeholders, and peers</p> <p>Developing and delivering presentations and talks</p> <p>Ethics and privacy considerations</p>
Media employed	Multimedia classrooms equipped with computer, projection and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	The reading list for the course will depend on the specific project and the needs of the industry partner. However, students may be required to read relevant research papers, reports, and books in the area of the project. The course instructor and the industry partner will provide guidance on the required reading materials.

Module name:	<b>Data Processing and Understanding</b>
Code	
Trimester	3
Person responsible for the module	Kuchanskiy Alexandr, PhD
Lecturer(s)	-
Language	English
Relation to curriculum	Master Program: Elective course.
Type of teaching	<b>Teaching methods:</b>

	<p>Interactive teaching: the instructor uses mini-lectures about 20 minutes long and involves students in a range of brief content-related activities in between. Interaction may occur between instructor and students or between and among students.</p> <p>Inquiry Guided Learning – Students learning or applying material in order to meet a challenge, answer a question, conduct an experiment, or interpret data</p> <p>Problem-based learning (PBL) is a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem</p> <p><b>Forms of teaching:</b></p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student’s confidence through new examples and discussions on the problems.</p> <p><b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.</p> <p><b>Student’s independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>																																									
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Requirements according to the examination regulations	<p><b>Course and university policies include:</b>  <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b>  Late submissions are not accepted.  <b>No cheating, duplication, falsification of data, plagiarism, and crib</b>  <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</p>
Recommended prerequisites	Programming for Data Analysis and Databases
Recommended Post-requisites	Master's research work, including research internships and a master's thesis writing;
Module objectives/intended learning outcomes	<p><b>By the end of this course students will attain the following learning outcomes.</b>  <b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• fundamental concepts of data processing and how they are used in data analytics.</li> <li>• impact of data preprocessing on data quality and the accuracy of machine learning models.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Evaluate different data processing techniques, including feature selection, feature engineering, and data transformation.</li> <li>• Develop a deep understanding of statistical techniques for data processing, including probability distributions, hypothesis testing, and regression analysis.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Demonstrate critical thinking and problem-solving skills, using data and analytics to inform decision-making in a rapidly changing and uncertain environment.</li> </ul>
Content	<p>Introduction to data processing  Feature selection and engineering  Data transformation  Statistical techniques for data processing  Ethics and privacy considerations  Case studies in data processing</p>
Media employed	Multimedia classrooms equipped with computer, projection and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<ol style="list-style-type: none"> <li>1. Ian H. Witten, Eibe Frank, and Mark A. Hall, "Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann Publishers, 2016.</li> </ol>

	<ol style="list-style-type: none"> <li>2. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, "The Elements of Statistical Learning: Data Mining, Inference, and Prediction", Springer, 2009.</li> <li>3. Dursun Delen, "Predictive Analytics and Data Mining: Concepts and Practice with RapidMiner", Elsevier, 2014.</li> <li>4. Mark J. Embrechts, Claudia Klüppelberg, and Thomas Mikosch, "Modeling Extremal Events for Insurance and Finance", Springer, 1997.</li> <li>5. John W. Tukey, "Exploratory Data Analysis", Addison-Wesley, 1977.</li> </ol>
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Module name:	<b>Making Decision based on data</b>									
Code										
Trimester	3									
Person responsible for the module	Turar Olzhas, Computational & Data Science Department Director, PhD									
Lecturer(s)	Turar Olzhas									
Language	English									
Relation to curriculum	Master Program: Elective course.									
Type of teaching	<p><b>Teaching methods:</b></p> <p>Inquiry Guided Learning – Students learning or applying material in order to meet a challenge, answer a question, conduct an experiment, or interpret data.</p> <p>Problem-based learning (PBL) is a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem. Group discussion and interactive-communicative learning.</p> <p><b>Forms of teaching:</b></p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student’s confidence through new examples and discussions on the problems.</p> <p><b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.</p> <p><b>Student’s independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>									
Workload of course components	<table><tr><td></td><td>Contact hours</td><td>ISIS</td><td>SIS</td><td>Total hours</td></tr></table>						Contact hours	ISIS	SIS	Total hours
	Contact hours	ISIS	SIS	Total hours						



and credits per trimester	ECTS credits	Lectures	Practice sessions			
	5	30	20	30	70	150
Course assessment and forms of examination	Period	Assessment type	Number of points	Exam Form	Schedule (Week #)	
	1 <sup>st</sup> attestation	Mid-term project	100	Submission of the written project	5 <sup>th</sup> week	
		<b>1<sup>st</sup> attestation total</b>	<b>100</b>			
	2nd attestation	End-term project	60	Submission of the written project	8 <sup>th</sup> - 9 <sup>th</sup> week	
		End-term Quiz	40	Written	10 <sup>th</sup> week	
		<b>2<sup>nd</sup> attestation total</b>	<b>100</b>			
	Final Exam		100	Written	During final exam session	
	Cumulative total for the course = 0,3 * 1 <sup>st</sup> Att + 0,3 * 2 <sup>nd</sup> Att + 0,4*Final = 100.					
Requirements according to the examination regulations	<b>Course and university policies include:</b> <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b> Late submissions are not accepted. <b>No cheating, duplication, falsification of data, plagiarism, and crib</b> <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.					
Recommended prerequisites	Programming for Data Analysis and Databases, Methods and tools for data analysis					
Recommended Post-requisites	Master's research work, including internships and a master's thesis writing.					
Module objectives/intended learning outcomes	By the end of this course students will attain the following learning outcomes. <b>The student will show a working knowledge in:</b> <ul style="list-style-type: none"> <li>fundamental concepts of data-driven decision making and how it is used in different industries.</li> <li>impact of data and analytics on decision-making processes, including problem definition, data collection, analysis, and interpretation.</li> </ul>					

	<p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Evaluate different decision-making models and their applications in different domains, including business, healthcare, and social sciences.</li> <li>• Develop a deep understanding of statistical techniques for decision making, including probability distributions, hypothesis testing, and regression analysis.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Demonstrate critical thinking and problem-solving skills, using data and analytics to inform decision-making in a rapidly changing and uncertain environment.</li> </ul>
Content	<p>Introduction to data-driven decision making;  Decision-making models and frameworks;  Statistical techniques for decision making;  Probability distributions and their applications in decision making;  Hypothesis testing for decision making;  Regression analysis for decision making;  Ethics and privacy considerations;  Case studies in data-driven decision making.</p>
Media employed	<p>Multimedia classrooms equipped with computer, projector and audio system;  Whiteboard; Microsoft Teams; LMS Moodle.</p>
Reading list	<ol style="list-style-type: none"> <li>1. W. Edwards Deming, "Out of the Crisis", MIT Press, 1986.</li> <li>2. Jay Liebowitz, "Big Data and Business Analytics", CRC Press, 2013.</li> <li>3. Daniel Kahneman, "Thinking, Fast and Slow", Farrar, Straus and Giroux, 2011.</li> <li>4. Noreen R. Sharpe, Richard D. De Veaux, and Paul F. Velleman, "Business Statistics", Pearson, 2019.</li> <li>5. Gary Klein, "Sources of Power: How People Make Decisions", MIT Press, 1999.</li> </ol>

Module name:	<b>Product Management</b>
Code	
Trimester	3
Person responsible for the module	Mukhamedkarimova Aneliya, PhD

Lecturer(s)	Mukhamedkarimova Aneliya, PhD																																			
Language	English																																			
Relation to curriculum	Master Program: Elective course																																			
Type of teaching	<p><b>Teaching methods:</b> Problem-based learning (PBL) is a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem. Inquiry Guided Learning – Students learning or applying material to meet a challenge, answer a question, conduct an experiment, or interpret data</p> <p><b>Forms of teaching:</b></p> <p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student’s confidence through new examples and discussions on the problems.</p> <p><b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.</p> <p><b>Student’s independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>																																			
Workload of course components and credits per trimester	<table><tr><td rowspan="2">ECTS credits</td><td colspan="2">Contact hours</td><td rowspan="2">ISI S</td><td rowspan="2">SIS</td><td rowspan="2">Total hours</td></tr><tr><td>Lectures</td><td>Practice sessions</td></tr><tr><td>5</td><td>30</td><td>20</td><td>30</td><td>70</td><td>150</td></tr></table>					ECTS credits	Contact hours		ISI S	SIS	Total hours	Lectures	Practice sessions	5	30	20	30	70	150																	
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	Final Exam	100	Written	During final exam session
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Requirements according to the examination regulations	<b>Course and university policies include:</b> <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b> Late submissions are not accepted. <b>No cheating, duplication, falsification of data, plagiarism, and crib</b> <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.			
Recommended prerequisites	Psychology of Management, Case study on data analytics			
Recommended post-requisites	Master's research work, including internships and a master's thesis writing.			
Module objectives/intended learning outcomes	<p>By the end of this course students will attain the following learning outcomes.</p> <p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• fundamental concepts of product management and its role in driving innovation and growth in companies.</li> <li>• customer needs and market trends to develop successful product strategies and roadmaps.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Evaluate different product management frameworks and methodologies, including agile and lean development, and apply them to real-world situations.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Demonstrate a deep understanding of data-driven decision making and the role of data and analytics in product management.</li> <li>• Demonstrate critical thinking and problem-solving skills, using data and analytics to inform decision-making in a rapidly changing and uncertain environment.</li> </ul>			
Content	Overview of product management and its importance in driving innovation and growth The role of product managers in different industries and organizations Analyzing customer needs and market trends to develop successful product strategies and roadmaps Conducting market research and user testing			

	<p>Understanding the competitive landscape and positioning products for success</p> <p>Data-driven decision making in product management</p> <p>Conducting A/B testing and experimentation to validate product ideas</p> <p>Complying with legal and regulatory frameworks</p> <p>Case studies in product management</p>
Media employed	Multimedia classrooms equipped with computer, projection and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<ol style="list-style-type: none"> <li>1. Marty Cagan, "Inspired: How to Create Tech Products Customers Love", John Wiley &amp; Sons, 2017.</li> <li>2. Eric Ries, "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses", Crown Business, 2011.</li> <li>3. Jeff Patton, "User Story Mapping: Discover the Whole Story, Build the Right Product", O'Reilly Media, 2014.</li> <li>4. Steve Blank and Bob Dorf, "The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company", K &amp; S Ranch, 2012.</li> <li>5. Martin Eriksson, "Product Leadership: How Top Product Managers Launch Awesome Products and Build Successful Teams", O'Reilly Media, 2017.</li> </ol>

Module name:	<b>Industry 4.0</b>
Code	
Trimester	3
Person responsible for the module	Neftissov Alexandr, PhD
Lecturer(s)	Neftissov Alexandr, PhD
Language	English
Relation to curriculum	Master Program: Elective course
Type of teaching	<p><b>Methods of teaching:</b></p> <p>Inquiry Guided Learning – Students learning or applying material to meet a challenge, answer a question, conduct an experiment, or interpret data</p> <p>Problem-based learning (PBL) is a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem. Group discussion and interactive-communicative learning.</p> <p><b>Forms of teaching:</b></p>

	<p><b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.</p> <p><b>Practice sessions (seminars)</b> are active sessions to develop student’s confidence through new examples and discussions on the problems.</p> <p><b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.</p> <p><b>Student’s independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>																																														
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Requirements according to the examination regulations	<p><b>Course and university policies include:</b></p> <p><b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b></p> <p>Late submissions are not accepted.</p> <p><b>No cheating, duplication, falsification of data, plagiarism, and crib</b></p> <p><b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</p>																																														

Recommended prerequisites	Programming for Data Analysis and Databases
Recommended post-requisites	Master's research work, including research internships and a master's thesis writing.
Module objectives/intended learning outcomes	<p>By the end of this course students will attain the following learning outcomes.</p> <p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• fundamental concepts of Industry 4.0 and its impact on the future of work.</li> <li>• components of Industry 4.0, including cyber-physical systems, the Internet of Things (IoT), and cloud computing.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Evaluate different Industry 4.0 technologies and their applications in different domains, including manufacturing, healthcare, and transportation.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Develop a deep understanding of data-driven decision making and the role of data and analytics in Industry 4.0.</li> <li>• Develop critical thinking and problem-solving skills, using data and analytics to inform decision-making in a rapidly changing and uncertain environment.</li> </ul>
Content	<p>Introduction to Industry 4.0</p> <p>Components of Industry 4.0</p> <p>Industry 4.0 technologies and applications</p> <p>Overview of different Industry 4.0 technologies, including robotics, automation, and artificial intelligence</p> <p>Application of Industry 4.0 technologies to different problem domains, including manufacturing, healthcare, and transportation</p> <p>Industry 4.0 case studies and best practices</p> <p>Future directions of Industry 4.0</p>
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<ol style="list-style-type: none"> <li>1. Henning Kagermann, Wolfgang Wahlster, and Johannes Helbig, "Recommendations for Implementing the Strategic Initiative INDUSTRIE 4.0", Springer, 2013.</li> <li>2. Alp Ustundag and Emre Cevikcan, "Industry 4.0: Managing the Digital Transformation", Springer, 2018.</li> <li>3. Andreas Tolk, Lakhmi C. Jain, and John R. Hill, "Modeling and Simulation for Industry 4.0 and Beyond", Springer, 2020.</li> </ol>

Module name:	<b>Information Security</b>																		
Code																			
Trimester	3																		
Person responsible for the module	Begimbayeva Englik, PhD																		
Lecturer(s)	Begimbayeva Englik, PhD																		
Language	English																		
Relation to curriculum	Master Program: Elective course																		
Type of teaching	<p><b>Teaching methods:</b> Group discussion, project-based approach, problem- solving.</p> <p><b>Forms of teaching:</b>  <b>Lectures</b> serve to introduce new concepts and provide theoretical and methodological foundations.  <b>Practice sessions (seminars)</b> are active sessions to develop student's confidence through new examples and discussions on the problems.  <b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the course material.  <b>Student's independent study (SIS):</b> Self-study time including the time required to prepare for and complete all course assessments.</p>																		
Workload of course components and credits per trimester	<table border="1"> <tr> <th rowspan="2">ECTS credits</th><th colspan="2">Contact hours</th><th rowspan="2">ISIS</th><th rowspan="2">SIS</th><th rowspan="2">Total hours</th></tr> <tr> <th>Lectures</th><th>Practice sessions</th></tr> <tr> <td>5</td><td>30</td><td>20</td><td>30</td><td>70</td><td>150</td></tr> </table>					ECTS credits	Contact hours		ISIS	SIS	Total hours	Lectures	Practice sessions	5	30	20	30	70	150
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Course assessment and forms of examination	Period	Assessment type	Number of points	Exam Form	Schedule (Week #)														
	1 <sup>st</sup> attestation	Mid-term project	100	Submission of the written project	5 <sup>th</sup> week														
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		End-term Quiz	40	Written	10 <sup>th</sup> week														



		<b>2<sup>nd</sup> attestation total</b>	<b>100</b>		
	Final Exam		100	Written	During final exam session
	Cumulative total for the course = $0,3 * 1^{st} \text{ Att} + 0,3 * 2^{nd} \text{ Att} + 0,4 * \text{Final} = 100$ .				
Requirements according to the examination regulations	<b>Course and university policies include:</b> <b>Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).</b> Late submissions are not accepted. <b>No cheating, duplication, falsification of data, plagiarism, and crib</b> <b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.				
Recommended prerequisites	Programming for data analysis and databases				
Recommended post-requisites	Master's research work, including research internships and a master's thesis writing.				
Module objectives/intended learning outcomes	<p><b>By the end of this course students will attain the following learning outcomes.</b></p> <p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• fundamental concepts of information security and its importance.</li> <li>• components of information security, including threat modeling, risk assessment, and vulnerability management.</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Evaluate different information security technologies and their applications in different domains, including cybersecurity, network security, and cloud security.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Develop a deep understanding of data-driven decision making and the role of data and analytics in information security.</li> <li>• Develop critical thinking and problem-solving skills, using data and analytics to inform decision-making in a rapidly changing and uncertain environment.</li> </ul>				
Content	Components of information security Information security technologies and applications Overview of different information security technologies, including cryptography, firewalls, and intrusion detection systems Application of information security technologies to different problem domains, including cybersecurity, network security, and cloud security				

	The role of data and analytics in information security Future directions of information security
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<ol style="list-style-type: none"> <li>1. Michael E. Whitman and Herbert J. Mattord, "Principles of Information Security", Cengage Learning, 2018.</li> <li>2. Bruce Schneier, "Applied Cryptography: Protocols, Algorithms, and Source Code in C", John Wiley &amp; Sons, 1995.</li> <li>3. Eric Conrad, Joshua Feldman, and Seth Misenar, "CISSP Study Guide", Syngress, 2020.</li> <li>4. Ross J. Anderson, "Security Engineering: A Guide to Building Dependable Distributed Systems", Wiley, 2008.</li> <li>5. D. J. Henry and S. R. Simon, "Cybersecurity and Cyberwar: What Everyone Needs to Know", Oxford University Press, 2014.</li> </ol>

### 4<sup>th</sup> term

Module name:	Research practice						
Code							
Trimester	4						
Person responsible for the module	Turar Olzhas, PhD						
Lecturer(s)	-						
Language	English						
Relation to curriculum	Master Program: Compulsory module.						
Type of teaching	<b>Methods used:</b> Performance of Research Practice: Simulation exercises can be used to simulate real-world industrial research projects and provide students with experience in making decisions and working under time constraints. Group projects: Assigning students to work in teams on a research project can provide hands-on experience in conducting research and working with others. Workshops and seminars: Workshops and seminars can provide students with practical skills training and information on industry-specific topics.						
Workload of course components		ECTS credits	Contact hours		ISIS	SIS	Total hours
			Lectures	Practice sessions			

and credits per trimester	<table><tr><td>16</td><td>-</td><td>-</td><td>90</td><td>33 0</td><td>420</td></tr></table>						16	-	-	90	33 0	420						
16	-	-	90	33 0	420													
Course assessment and forms of examination	<table><tr><td>Period</td><td>Assessment type</td><td>Number of points (%)</td><td>Exam Form</td><td colspan="2">Schedule</td></tr><tr><td>4<sup>th</sup> semester</td><td>Report defense</td><td>100</td><td>defense</td><td colspan="2">2<sup>nd</sup> year (4<sup>th</sup> sem.)</td></tr></table>						Period	Assessment type	Number of points (%)	Exam Form	Schedule		4 <sup>th</sup> semester	Report defense	100	defense	2 <sup>nd</sup> year (4 <sup>th</sup> sem.)	
Period	Assessment type	Number of points (%)	Exam Form	Schedule														
4 <sup>th</sup> semester	Report defense	100	defense	2 <sup>nd</sup> year (4 <sup>th</sup> sem.)														
Requirements according to the examination regulations	The defense of the practice report is carried out in the form of a mini-conference. Each master student makes a presentation of the results of the conducted research. The practice is assessed by the teacher responsible for organizing the research practice of master - students, based on the submitted: report, review of the supervisor of the practice.																	
Recommended prerequisites	Programming for Data Analysis and Databases, Methods and tools for data analysis																	
Recommended Post-requisites	Master's research work and a master's thesis writing																	
Module objectives/intended learning outcomes	<p>By the end of this course students will attain the following learning outcomes.</p> <p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"><li>principles of research methodology and design, including qualitative and quantitative research methods.</li></ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"><li>Formulate research questions and hypotheses related to a data analytics problem.</li><li>Develop and implement a research plan, including data collection and analysis.</li><li>Evaluate the quality of research and interpret the results of data analysis.</li></ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"><li>Demonstrate critical thinking and problem-solving skills, using data and analytics to inform decision-making in a research context.</li><li>Communicate research findings effectively to different audiences, including academic and industry stakeholders.</li></ul>																	
Content	The purpose of research practice is to ensure continuity and consistency in the acquisition of professional skills by master students in accordance with the requirements for the level of training program, the formation of professional competencies of master – students in: <ul style="list-style-type: none"><li>Data collection and analysis</li><li>Data visualization and presentation of research findings</li><li>Quality evaluation and interpretation of research</li></ul>																	

	<ul style="list-style-type: none"> <li>Ethics and privacy considerations in research</li> </ul>
Media employed	Multimedia classrooms equipped with computer, projection and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<ol style="list-style-type: none"> <li>Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams, "The Craft of Research", University of Chicago Press, 2008.</li> <li>Thomas K. Landauer, "The Trouble with Computers: Usefulness, Usability, and Productivity", MIT Press, 1995.</li> <li>Paul D. Allison, "Multiple Regression: A Primer", Pine Forge Press, 1999.</li> <li>Andrew Gelman and Jennifer Hill, "Data Analysis Using Regression and Multilevel/Hierarchical Models", Cambridge University Press, 2006.</li> <li>Diana C. Mutz, "Impersonal Influence: How Perceptions of Mass Collectives Affect Political Attitudes", Cambridge University Press, 1998.</li> </ol>

Module name:	<b>Master's research work</b>
Code	
Trimester	2, 3, 4, 5
Person responsible for the module	Turar Olzhas, Computational & Data Science Department Director, PhD
Lecturer(s)	-
Language	English
Relation to curriculum	Master Program: Compulsory module.
Type of teaching	<p><b>Methods used:</b></p> <ul style="list-style-type: none"> <li>Problem-solving, outlining the main problem;</li> <li>literature review;</li> <li>quantitative and qualitative methods;</li> <li>comparative analysis</li> </ul> <p><b>Forms used:</b></p> <ul style="list-style-type: none"> <li>Instructor-supervised independent study (ISIS) deals with review and exploration in greater depth of the course material.</li> <li>Student's independent study (SIS): Self-study time including the time required to prepare for and complete all course assessments.</li> </ul>

Workload of course components and credits per trimester	<table><tr><td rowspan="2">ECTS credits</td><td colspan="2">Contact hours</td><td rowspan="2">ISIS</td><td rowspan="2">SIS</td><td rowspan="2">Total hours</td></tr><tr><td>Lectures</td><td>Practice sessions</td></tr><tr><td>24</td><td>-</td><td>-</td><td>220</td><td>500</td><td>720</td></tr></table>					ECTS credits	Contact hours		ISIS	SIS	Total hours	Lectures	Practice sessions	24	-	-	220	500	720
ECTS credits	Contact hours		ISIS	SIS	Total hours														
	Lectures	Practice sessions																	
24	-	-	220	500	720														
Course assessment and forms of examination	Period	Assessment type	Number of points (%)	Exam Form	Schedule														
	1 <sup>st</sup> attestation	1 <sup>st</sup> attestation	100	Submission of the report	1 <sup>st</sup> year														
	2nd attestation	2 <sup>nd</sup> attestation	100	Submission of the report	2 <sup>nd</sup> year														
Requirements according to the examination regulations	<p>The results of research work of master student for the entire period of study are presented in writing (report), approved and assessed by the scientific supervisor (a grade is awarded)</p> <p>When assessing a research work of master student, the following is considered:</p> <ul style="list-style-type: none"><li>- preparation of articles/reports;</li><li>- speaking at seminars/conferences;</li><li>- report on the results of research work of master student;</li></ul> <p><b>Contacting the Lecturer:</b> students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</p>																		
Recommended prerequisites	All courses of the program																		
Recommended Post-requisites	Master's research work, including research internships and a master's thesis writing.																		
Module objectives/intended learning outcomes	<p>By the end of this course students will attain the following learning outcomes.</p> <p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"><li>• Subject and publications in the field of his research topic and in the fields of Big Data Analysis, Data Science and Machine Learning in general</li></ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"><li>• Formulate and develop a research question or problem related to data analysis and apply appropriate research methods to address it.</li><li>• Design and execute a research project, including data collection, analysis, and interpretation.</li><li>• Develop skills in academic writing and presentation, including the</li></ul>																		

	<p>ability to write a research paper and present research findings in a public forum.</p> <ul style="list-style-type: none"> <li>• Apply advanced research techniques and methods to a specific research problem or question in the field of data analysis.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Conduct independent research and take responsibility for the entire research process, including defining the problem, identifying the relevant literature, selecting research methods, and presenting the results.</li> <li>• Plan experiment with selection of necessary research methods,</li> <li>• Modify existing methods and develop new ones, necessary for obtaining specific results;</li> <li>• Conduct theoretical and experimental research using modern methods and technologies in science and technology;</li> <li>• Find the best approach to solving practical issues;</li> <li>• Analyze the discussion and evaluation of obtained results;</li> <li>• Formulate conclusions and recommendations based on the research results;</li> <li>• Present results of educational and research work (reviews, reports, articles, abstracts, presentations);</li> <li>• Participate in scientific discussion.</li> </ul>
Content	<ul style="list-style-type: none"> <li>• Preparatory session (choosing the direction of scientific research, defining the problem and the resulting goals and objectives, proposing a hypothesis for their solution, discussion of research methods).</li> <li>• Planning, preparation and carrying out experiments on the chosen topics.</li> <li>• Discussion of the obtained results (data analysis). Formulating conclusions on the work. Drawing up a report and preparing presentation material.</li> <li>• Defending the results of the research work: Formulating research questions and hypotheses Research design and execution Writing a research paper Presenting research findings Ethics in research</li> </ul>
Media employed	Multimedia classrooms equipped with computer, projection and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<ol style="list-style-type: none"> <li>1. Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams, "The Craft of Research", University of Chicago Press, 2016.</li> <li>2. Catherine Dawson, "Introduction to Research Methods: A Practical Guide for Anyone Undertaking a Research Project", How to Books, 2009.</li> <li>3. Alan Bryman and Emma Bell, "Business Research Methods", Oxford University Press, 2019.</li> <li>4. Margaret Greenhall and Yvonne N. Bui, "A Guide to the Dissertation Process: Practical Wisdom for Planning, Writing, and Defending Your Dissertation", Sage Publications, 2019.</li> </ol>

	5. Harold Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", Wiley, 2017.
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### Term 5

Module name:	The Master thesis/ project work preparation and defense																		
Code																			
Trimester	5																		
Person responsible for the module	Turar Olzhas, PhD																		
Lecturer(s)	-																		
Language	English																		
Relation to curriculum	Master Program: Compulsory.																		
Type of teaching	<b>Teaching and training methods:</b>  Master Theses/ project work is done with individual supervision: <ul style="list-style-type: none"><li>• Writing of a scientific report</li><li>• Quantitative and qualitative methods;</li><li>• Comparative analysis;</li><li>• Presentations to communicate and discuss the findings;</li><li>• Individual review and feedback on papers and presentations</li></ul> <b>Forms of instruction:</b> <b>Instructor-supervised independent study (ISIS)</b> deals with review and exploration in greater depth of the research work. <b>Student's independent study (SIS):</b> Self-study time including the time required to prepare for and complete all research goals.																		
Workload of course components and credits per trimester	<table><tr><td rowspan="2">ECTS credits</td><td colspan="2">Contact hours</td><td rowspan="2">ISIS</td><td rowspan="2">SIS</td><td rowspan="2">Total hours</td></tr><tr><td>Lectures</td><td>Practice sessions</td></tr><tr><td>12</td><td>-</td><td>-</td><td>110</td><td>250</td><td>360</td></tr></table>					ECTS credits	Contact hours		ISIS	SIS	Total hours	Lectures	Practice sessions	12	-	-	110	250	360
ECTS credits	Contact hours		ISIS	SIS	Total hours														
	Lectures	Practice sessions																	
12	-	-	110	250	360														
Course assessment and forms of examination	The results of the master's thesis/project defense are assessed using a point-rating system for assessing the academic achievements of master - students. <table><tr><td>Grade by alphabetic system</td><td>Numerical equivalent of grades</td><td>%-content</td><td colspan="2">Grade by traditional system</td></tr></table>					Grade by alphabetic system	Numerical equivalent of grades	%-content	Grade by traditional system										
Grade by alphabetic system	Numerical equivalent of grades	%-content	Grade by traditional system																

	A	4,0	95-100	Excellent
	A-	3,67	90-94	
	B+	3,33	85-89	Good
	B	3,0	80-84	
	B-	2,67	75-79	
	C+	2,33	70-74	
	C	2,0	65-69	Satisfactory
	C-	1,67	60-64	
	D+	1,33	55-59	
	D	1,0	50-54	
	F	0	0-49	Fail
Requirements according to the examination regulations	<p>When assessing a master's thesis/project work, the following is considered:</p> <ul style="list-style-type: none"> <li>– the volume of work performed;</li> <li>– independence of research;</li> <li>– use of new technologies in the work;</li> <li>– completeness of the literature review and the relevance of the sources used;</li> <li>– novelty of research results;</li> <li>– literacy and clarity of material presentation;</li> <li>– compliance with the requirements for design;</li> <li>– quality of the presentation at the dissertation/project defense (clarity, literacy, ability to use professional terms, quality of demonstration material, etc.);</li> <li>– correctness and completeness of answers to questions asked during the defense and to the reviewer's comments;</li> <li>– the number of publications on the work, including those published abroad, the master's student's reports at scientific conferences;</li> </ul> <p>The master- student defends the thesis/project if he/she receives:</p> <ul style="list-style-type: none"> <li>– a review by the supervisor, which provides a reasoned conclusion "admitted to defense";</li> <li>– a review of the thesis (project), which provides a comprehensive description of the thesis (project) submitted for defense and a reasoned conclusion indicating the assessment according to the point-rating letter system for assessing knowledge;</li> <li>– a decision by the coordinator of the educational program on a recommendation for defense (an order on admission to defense);</li> <li>– a certificate (in any form) on passing the check of the thesis (project) for plagiarism.</li> </ul>			
Recommended prerequisites	All courses of the program			
Recommended Post-requisites	-			
Module objectives/intended learning outcomes	<p>By the end of this course students will attain the following learning outcomes.</p> <p><b>The student will show a working knowledge in:</b></p> <ul style="list-style-type: none"> <li>• state of the art in a certain scientific field</li> <li>• open research questions in this field</li> <li>• relevant literature</li> </ul>			



	<ul style="list-style-type: none"> <li>• methodology and tools to execute project</li> <li>• how to document new findings according to scientific standards</li> </ul> <p><b>Students will have the skill to</b></p> <ul style="list-style-type: none"> <li>• Formulate and develop a research question or problem related to data analysis and apply appropriate research methods to address it.</li> <li>• Design and execute a research project, including data collection, analysis, and interpretation.</li> <li>• Develop skills in academic writing and presentation, including the ability to write a research paper and present research findings in a public forum.</li> <li>• Apply advanced research techniques and methods to a specific research problem or question in the field of data analysis.</li> </ul> <p><b>In terms of Competences, students will be able to</b></p> <ul style="list-style-type: none"> <li>• Conduct independent research and take responsibility for the entire research process, including defining the problem, identifying the relevant literature, selecting research methods, and presenting the results.</li> </ul>
Content	<p>The Master thesis/research project is intended to introduce master - students into scientific research work in a bigger context. The starting point is the definition of the research questions they want to answer and the selection of the appropriate methodology.</p> <p>The master - students will plan and execute their thesis/project independently with regular review and consulting. They will summarize their findings in a research project thesis (project report). The intention of the thesis/research project is to familiarize with the research methodology in a certain scientific field and to formulate the scientific state of the art and the research questions. The master - students prove the ability to execute their own and independent research on master level and with a certain complexity.</p>
Media employed	Multimedia classrooms equipped with computer, projection and audio system; interactive Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	<p>Academic policy of «Astana IT University» LLP, Astana 2022.  Rules for students' final certification in "Astana IT University" LLP, Astana 2022.</p> <p><b>References:</b>  According to topic</p>