Module Handbook

Computer Science and Engineering

Astana IT University, 2023

Table of contents

1st term

<table>
<tr><td>Module name:</td><td>History and Philosophy of Science</td></tr>
<tr><td>Code</td><td></td></tr>
<tr><td>Trimester</td><td>1 (all master’s level programs)</td></tr>
<tr><td>Person responsible for the module</td><td>Assoc. Prof. A. Uyzbayeva, PhD</td></tr>
<tr><td>Lecturer(s)</td><td>Assoc. Prof. A. Uyzbayeva, PhD</td></tr>
<tr><td>Language</td><td>Russian, English</td></tr>
<tr><td>Relation to curriculum</td><td>Bachelor programmes: Philosophy
Compulsory course.</td></tr>
<tr><td>Type of teaching</td><td>Lectures serve to introduce new concepts and provide theoretical and methodological foundations.
Practice sessions (seminars) are active sessions to develop student’s confidence through new examples and discussions on the problems.
Instructor-supervised independent study (ISIS) deals with review and exploration in greater depth of the course material.
Student’s independent study (SIS): Self-study time including the time required to prepare for and complete all course assessments.</td></tr>
<tr><td>Workload of course components and credits per trimester</td><td>
<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>
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<table>
<tr><td>Course assessment and forms of examination</td><td>
<table>
<tr><th>Period</th><th>Assessment type</th><th>Number of points</th><th>Exam Form</th><th>Schedule (Week #)</th></tr>
<tr><td rowspan="4">1st attestation</td><td>Oral presentation</td><td>35</td><td>Oral defense</td><td>3rd week</td></tr>
<tr><td>Oral presentation</td><td>35</td><td>Oral defense</td><td>4th week</td></tr>
<tr><td>Mid-term MCQ (Multiply Choice Quiz)</td><td>30</td><td>Test</td><td>5th week</td></tr>
<tr><td>1st attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td rowspan="4">2nd attestation</td><td>Oral presentation</td><td>35</td><td>Oral defense</td><td>7th week</td></tr>
<tr><td>Oral presentation</td><td>35</td><td>Oral defense</td><td>9th week</td></tr>
<tr><td>Mid-term MCQ (Multiply Choice Quiz)</td><td>30</td><td>Test</td><td>10th week</td></tr>
<tr><td>2nd attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam MCQ</td><td>100</td><td>Test</td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
</table>
</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>Philosophy</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>By the end of this course students will attain the following learning outcomes.
The student will show a working knowledge in:
• Application of philosophical knowledge in complex research;
• Critical analysis and evaluation modern scientific achievements;
• Searching for scientific literature on the philosophy of science;</td></tr>
</table>

	• Writing reviews of scientific articles. **Students will have the skill to** • Know the genesis and history of science from the formation of its models, images and styles of thinking; • see the relationship of scientific and philosophical thoughts; • know the fundamental basis and conceptual apparatus of the history and philosophy of science; • understand basic principles of research activities. **In terms of Competences, students will be able to** • formulate and solve problems that arise in the course of research activities and require in-depth professional knowledge; • choose the necessary research methods, modify existing and develop new methods based on the objectives of a particular study; • analyze and comprehend the realities of modern theory and practice on the basis of the history and philosophy of science, the methodology of natural science, socio-humanitarian and technical knowledge.
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	**Basic Literature:** 1. History and philosophy of science. Ed. Kryaneva Yu.V., Motorina L.E. - M.: INFRA-M, 2011. - 416 p. 2. Stepin V.S. History and philosophy of science. - M.: Academic Project, 2011. - 423 p. 3. Khasanov M.Sh., Petrova V.F. History and philosophy of science. - Almaty: Kazakh University, 2013. - 150 p. 4. Philosophy of science. Edited by A.I. Lipkin. - M.: Eksmo, 2009. - 608 p. **Supplementary literature:** 1. Myrzaly S. Philosophy, 2018. 2. Lebedev S.A., Ilyin V.V. Introduction to the philosophy and history of science. - M.: Editorial URSS, 2009. - 344 p. 3. Kokhanovsky V.P. etc. Fundamentals of philosophy of science. - M.: Phoenix, 2010. - 603 p. 4. Nurysheva G.Zh. Philosophy. - Almaty, 2016.

<table>
<tr><td>Module name:</td><td>Pedagogy of Higher Education</td></tr>
<tr><td>Code</td><td></td></tr>
<tr><td>Trimester</td><td>1</td></tr>
<tr><td>Person responsible for the module</td><td>Assoc. Prof. Zh.Tleshova, Candidate of Pedagogical Sciences</td></tr>
<tr><td>Lecturer(s)</td><td>Assoc. Prof. Zh.Tleshova, Candidate of Pedagogical Sciences</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Master degree programmes: 7M04102 Project Management, 7M06103 Applied Data Analytics, 7M06104 Computational Sciences, 7M06105 Computer Science and Engineering, 7M04102 Digital Public Administration and Services</td></tr>
<tr><td>Type of teaching</td><td>Lectures serve to introduce new concepts and provide theoretical and methodological foundations.
Practice sessions (seminars) are active sessions to develop student’s confidence through new examples and discussions on the problems of higher education and didactics.
Instructor-supervised independent study (ISIS) focuses on the review of reviewing research papers, theories, and practices. It is designed to explors in greater depth of the course material.
Student’s independent study (SIS): Self-study time including the time required to prepare for and complete all course assignments.</td></tr>
<tr><td>Workload of course components and credits per trimester</td><td>
<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>10</td><td>70</td><td>120</td></tr>
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<tr><td>Course assessment and forms of examination</td><td>
<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">1st attestation</td><td>Reading material discussions</td><td>25</td><td>Presentation and discussion of oral reports based on the reading material</td><td>Once in two weeks</td></tr>
<tr><td>Quiz</td><td>5</td><td>Written</td><td>5th week</td></tr>
<tr><td>1st attestation total</td><td>30</td><td></td><td></td></tr>
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<table>
<tr><td rowspan="3">2nd attestation</td><td>Reading material discussions</td><td>25</td><td>Presentation and discussion of oral reports based on the reading material</td><td>Once in two weeks</td></tr>
<tr><td>Quiz</td><td>5</td><td>Written</td><td>10th week</td></tr>
<tr><td>2nd attestation total</td><td>30</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>40</td><td>Oral</td><td>During final exam session</td></tr>
<tr><td colspan="2">Total for the course</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
</table>
</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>History and Philosophy of Education; Psychology; Introduction to Research Methodology</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>Upon the completion of the course “Pedagogy of Higher Education, MA students will attain the following learning outcomes. The student will show a working knowledge in:
1. Higher education methodology, system, and processes
2. Management in Higher Education: processes, faculty members and students.
3. Design of educational programs.
4. Teaching and learning outcomes, assessment methodology and methods of teaching and learning.
5. Organization of teaching and learning environments.
6. Regulation Acts in education on teaching in higher education.
7. Student-centered teaching approach and the roles of self-study.
8. Roles of IT technology in teaching and learning.
9. Design of a course and a lesson plan
10. Research questions in higher education teaching and learning problems
Students will have the skill to</td></tr>
</table>

	1. Give arguments for and against the concepts in higher education methodology, system, and processes and discuss them in the class. 2. Design the content of educational programs. 3. Design assessment forms. 4. Define favorable learning environment. 5. Follow regulations in teaching and learning processes and learning environment. 6. Apply student-centered teaching approach and self-study assignments. 7. Design a course and a lesson plan 8. Research local problems in higher education problems **In terms of Competences, students will be able to** • Critically evaluate the concepts in methodology of pedagogical sciences; • Evaluate modern tendencies in higher education • Employ modern educational technologies • Apply teaching and learning methods • Define assessment forms based on the educational program content, goals and objectives; • Interpret the findings of research questions on higher education problems.
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, projector and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Basic Literature:** 1. Hartley, M.&Ruby, A. (2017). *Higher Education Reform and Development: The Case of Kazakhstan*. Cambridge Press, UK. 2. Silova, I.&Niyozov, S. (2020). *Globalization on the Margins. Education and Post-Socialist Transformations in Central Asia.* Information Age Publishing Inc., USA. 3. Shunk D. H.(2019). Learning Theories: An Educational Perspective 8th Edition. Pearson 4. OECD. (2017). *Higher Education in Kazakhstan. Reviews of National Policies for Education.* OECD Publishing, Paris. 5. UNESCO. (2021). Thinking Higher and Beyond. Perspectives on the Futures of Higher Education to 2050. **6.** Fry, H., Ketteridge, S.,&Marshal, S. (2009). A Handbook for Teaching and Learning in Higher Education. Taylor&Francis. NY., USA **Supplementary literature:** 1. Мынбаева, А. (2008). *Основы педагогики высшей школы*. Учебное пособие. Алматы., Казахстан.

<table>
<tr><td>Module name:</td><td>Foreign Language (Professional)</td></tr>
<tr><td>Code</td><td></td></tr>
<tr><td>Trimester</td><td>1</td></tr>
<tr><td>Person responsible for the module</td><td>Aliya Ayazbayeva, Assistant Professor, Candidate pf Philological Sciences
Elmira Gerfanova, Assistant Professor, PhD</td></tr>
<tr><td>Lecturer(s)</td><td>Aliya Ayazbayeva, Assistant Professor, Candidate pf Philological Sciences
Elmira Gerfanova, Assistant Professor, PhD
Diana Zhanabilova, Senior lecturer, MA, Candidate to PhD degree</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Master degree programmes: 7M04102 Project Management, 7M06103 Applied Data Analytics, 7M06104 Computational Sciences, 7M06105 Computer Science and Engineering, 7M04102 Digital Public Administration and Services</td></tr>
<tr><td>Type of teaching</td><td>Practice sessions (seminars) are active sessions to develop Master program student skills in interpreting information, understanding spoken and written authentic texts, identifying relevant information, synthesising information from listening and reading professionally oriented texts, understanding the professional context.
Instructor-supervised independent study (ISIS) comprises review of the professionally oriented material, discussion of issues related to students' professional fields.
Student's independent study (SIS) includes the time required to prepare for and complete all course assignments.</td></tr>
<tr><td>Workload of course components and credits per trimester</td><td>
<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>
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</td></tr>
<tr><td>Course assessment and forms of examination</td><td>
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<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">1st attestation</td><td>Preparing and defending presentations</td><td>15</td><td>Presentation defence</td><td>Week 3</td></tr>
<tr><td>Quiz</td><td>15</td><td>Computer-based</td><td>Week 5</td></tr>
<tr><td>1st attestation total</td><td>30</td><td></td><td></td></tr>
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<table>
<tr><td rowspan="3">2nd attestation</td><td>Preparing and defending presentations</td><td>15</td><td>Presentation defence</td><td>Week 8</td></tr>
<tr><td>Quiz</td><td>15</td><td>Written</td><td>Week 10</td></tr>
<tr><td>2nd attestation total</td><td>30</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>40</td><td>Oral</td><td>During final exam sessions</td></tr>
<tr><td colspan="2">Total for the course</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
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Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>English for Academic Purposes</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>Upon the completion of the course “Foreign Language (Professional)”, MA students will attain the following learning outcomes. The student will show a working knowledge in:
• reading authentic professionally oriented texts and identifying reading structures
• reading authentic professionally oriented texts for understanding main ideas and identifying supporting details
• listening effectively to a range of formal and informal discussions presented in the relevant professional fields
• developing adequate speaking skills to communicate effectively in a professional setting
Students will have the skill to:
• synthesize, draw conclusions, evaluate and discuss ideas from a reading
• follow and comprehend professional discourse
• plan and deliver oral presentations based on course project and answer questions
• analyze written professionally oriented texts
In terms of Competences, students will be able to:
• write texts on professional topics</td></tr>
</table>

	• read and understand a range of vocabulary and stylistics in authentic sources • listen to lectures and presentations related to professional fields • participate in group discussions, prepare and give presentations • recognize and use grammar and specific vocabulary • self-reflect and evaluate reasoning
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	*Main:* Esteras, S.R.., & Fabre, E.M. (2010). Professional English in Use –ICT. Cambridge University Press *Additional:* Paterson, K. (2013). Oxford Grammar for EAP. London: Oxford University Press. Chazal, E. &Moore, J. (2022). Oxford EAP. A Course in English for Academic Purposes. London: Oxford University Press. Swales, J.& Feak Ch. (2012). Academic Writing for Graduate Students. Michigan Series in English for Academic and Professional Purposes

Module name:	**Management Psychology**
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 programmes: all educational programmes
Type of teaching	**Lectures** serve to introduce new concepts and provide theoretical and methodological foundations.

<table>
<tr><td></td><td>Practice sessions (seminars) are active sessions to develop student's confidence through new examples and discussions on the problems.
Student's independent study (SIS): Self-study time including the time required to prepare for and complete all course assessments.</td></tr>
<tr><td>Workload of course components and credits per trimester</td><td>
<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>10</td><td>50</td><td>120</td></tr>
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<tr><td>Course assessment and forms of examination</td><td>
<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">1st attestation</td><td>Problem Sets</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. Individual project</td><td>5th week</td></tr>
<tr><td>1st attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td rowspan="3">2nd attestation</td><td>Problem Sets</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. Individual project</td><td>10th week</td></tr>
<tr><td>2nd attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>100</td><td>Quiz</td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
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<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>Psychology, Philosophy, History.</td></tr>
</table>

Module objectives/intended learning outcomes	By the end of this course students will attain the following learning outcomes. **The student will show a working knowledge in:** • Know the conceptual apparatus describing management activities; • Mastering the theoretical laws of life and dynamics of control systems; • Manage the ways of introspection, self-development and self-organization; • The ability to organize methods of organizing teamwork; • Apply the techniques of discussions, group work, independent analysis of cases arising in the practical work of a psychologist. **Students will have the skill to** • Independently navigate the various approaches existing in domestic and world science to psychological processes and phenomena arising in management; • Use socio-psychological mechanisms for managing group phenomena and processes; analyze employee motivation. **In terms of Competences, students will be able to** • To organize management activities; to explain the psychological phenomena of management, selection of diagnostic tools and corrective techniques in the analysis of cases arising in the practice of applied psychological work.
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; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Basic Literature:** 1. Akhtaeva N. S., Abdigapparova A. I., Bekbaeva Z. N. Management psychology. - Almaty: Kazakh University, 2018. 2. Essentials of Organizational Behavior / S. P. Robbins, T. A. Judge. - 14th ed. - Almaty : National Translation Bureau, 2019 3. Balzac R. Organizational Psychology for Managers / R. Balzac, R. Stephen. 2020 4. Looij, August van. Series: Psychology of Emotions, Motivations and Actions. New York : Nova. 2019. 5. Susan W. Weinschenk. 100 Things Every Desinger Needs To Know About People / W. W. Susan. - USA : Pearson, 2020. 6. Social Psychology: Handbook of Basic Principles / Van Lange A.M. Paul, H.E. Tory, W. A. Kruglanski. - New York : The Guilford Press, 2021. 7. Psychology/ G.M. David, C. Nathan DeWall. - 13 ed. - New York: Macmillan International Higher Education, 2021.

	8. Susan W. Weinschenk. 100 Things Every Desinger Needs To Know About People / W. W. Susan. - USA: Pearson, 2020 **Supplementary literature:** 1. Duane P. Schultz.Theories of Personality / P. S. Duane, E.S. Sydney. - 11 ed. - Mexico : Cengage, 2017. 2. Armstrong M. Strategic human resource management. - M.: INFRA-M., 2014. 3. Bakirova G.H. Human resource management. - St. Petersburg: Speech, 2008. 4. Becker G.S. Human capital: Theoretical and Empirical Analysis. - N-Y., 2011. 5. Dobrenkov V. I. Human resource management: a socio-psychological approach. Studies.manual. - M.: KDU, 2015. 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

2nd term

Module name:	**Advanced Databases**
Code	
Trimester	1
Person responsible for the module	A. Adamova, PhD
Lecturer(s)	A. Adamova, PhD
Language	English
Relation to curriculum	Master's program: Computer science and Engineering. Professional disciplines. The university component.
Type of teaching	**Lectures** serve to introduce new concepts and provide theoretical and methodological foundations. **Practice sessions (seminars)** are active sessions to develop student's confidence through new examples and discussions on the problems. **Instructor-supervised independent study (ISIS)** deals with review and exploration in greater depth of the course material. **Student's independent study (SIS):** Self-study time including the time required to prepare for and complete all course assessments**.**
Workload of course components and	

	Contact hours	ISIS	SIS	Total hours

<table>
<tr><td>credits per trimester</td><td>
<table>
<tr><td>ECTS credits</td><td>Lectures</td><td>Practice sessions</td><td></td><td></td><td></td></tr>
<tr><td>5</td><td>20</td><td>30</td><td>10</td><td>90</td><td>150</td></tr>
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<tr><td>Course assessment and forms of examination</td><td>
<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="4">1st attestation</td><td>Problem Sets</td><td>30</td><td>Project</td><td>2rd week</td></tr>
<tr><td>Problem sets</td><td>20</td><td>Report</td><td>4rd week</td></tr>
<tr><td>Mid-term Exam</td><td>50</td><td>Project</td><td>5th week</td></tr>
<tr><td>1st attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td rowspan="4">2nd attestation</td><td>Problem Sets</td><td>30</td><td>Submission of written reports</td><td>7th week</td></tr>
<tr><td>Problem Sets</td><td>30</td><td>Project</td><td>9th week</td></tr>
<tr><td>End-term Exam</td><td>50</td><td>Written</td><td>10th week</td></tr>
<tr><td>2nd attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>100</td><td>Written</td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
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<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>Linear Algebra, Calculus I, Calculus II, Discrete mathematics, Basic Knowledge about DBMS.</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>By the end of this course students will attain the following learning outcomes.
The student will show a working knowledge in
various distributed database classifications;
Redis or Key-Value Stores;
MongoDB or Document-oriented databases;
Understanding the concepts of Wide-Columnar Store- Data modeling in HBase;
Develop foundational knowledge of Big Data and gain hands-on lab experience using Apache Hadoop, MapReduce, Apache Spark, Spark SQL, and Kubernetes;
Neo4J as a Graph Database Management System;
data engineering capabilities to enable a data-driven organization.
Students will have the skill to:</td></tr>
</table>

	• work with NoSQL databases to insert, update, delete, query, index, aggregate, and shard/partition data; • to handle big data in cloud environments using technologies like Hadoop, that spans from traditional relational databases (RDBMS) through NoSQL databases; • develop hands-on NoSQL experience working with MongoDB, Apache Cassandra, and IBM Cloudant; PerformExtract; • transform and Load (ETL) processing and Machine Learning model training and deployment with Apache Spark. **In terms of competences, students will be able to:** • understand the main tools used by many data scientists worldwide; • apply NoSQL to solve real world data science problems; • use various APIs and data collection techniques required for data science projects; • implement data visualization in data science projects.
Content	This course covers the fundamental statistical concepts and is related to the computer science engineering. Topics include: Types of NoSQL databases, Distributed Data Processing, Principles of NoSQL Databases, Key-value Stores, Document Databases Data Formats, Column-family Stores, Graph Databases, Schema Migrations.
Media employed	Multimedia classrooms equipped with computer, projector and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Basic Literature:** - Redmond, E. & Wilson, J. (2012). Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement (1st Ed.). Raleigh, NC: The Pragmatic Programmers, LLC. ISBN-13: 978-1934356920 ISBN-10: 1934356921 - Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019 - Christof Strauch. NoSQL Databases. (can be downloaded here - NoSQL Databases (christof-strauch.de)) - NoSQL. Theory and examples. PIOTR FULMAŃSKI (can be downloaded here - nosql_theory_and_examples_excerpt.pdf (yandex.kz)) - Vera-Olivera, H.; Guo, R.; Huacarpuma, R.C.; Da Silva, A.P.B.; Mariano, A.M.; Maristela, H. Data Modeling and NoSQL Databases—A Systematic Mapping Review. ACM Comput. Surv. 2021, 54, 1–26. [Google Scholar] [CrossRef] - Atzeni, P.; Bugiotti, F.; Cabibbo, L.; Torlone, R. Data Modeling in the NoSQL World. Comput. Stand. Interfaces 2020, 67, 103149. [Google Scholar] [CrossRef]. NoSQL Databases. Christof Strauch **Supplementary literature:** - Raj, Pethuru, Pethuru Raj, and Ganesh Chandra Deka. A Deep Dive into NoSQL Databases : the Use Cases and Applications. Ed. Pethuru Raj and Ganesh Chandra Deka. First edition. Cambridge, MA: Academic Press, is an imprint of Elsevier, 2018. Print.

	- Celko, Joe. Joe Celko's Complete Guide to NoSQL What Every SQL Professional Needs to Know About Non-Relational Databases. Saint Louis: Elsevier Science, 2013. Print. **Available on the internet for free:** MongoDB. Available online: **https://www.mongodb.com/** Apache Cassandra. Available online: **http://cassandra.apache.org/** Redis. Available online: **https://redis.io/** neo4j. Available online: **https://neo4j.com/**

Module name:	**Fault tolerance and reliability**
Code	
Trimester	2
Person responsible for the module	Assoc. Prof. S. Aubakirov, PhD
Lecturer(s)	S. Aubakirov
Language	English
Relation to curriculum	Masters program: Computer science and Engineering. Basic disciplines. Component of choice.
Type of teaching	**Lectures** serve to introduce new concepts and provide theoretical and methodological foundations. **Practice sessions (seminars)** are active sessions to develop student's confidence through new examples and discussions on the problems. **Instructor-supervised independent study (ISIS)** deals with review and exploration in greater depth of the course material. **Student's independent study (SIS):** 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		ISIS	SIS	Total hours
	Lectures	Practice sessions			
5	20	30	10	90	150

Course assessment and forms of examination

Period	Assessment type	Number of points	Exam Form	Schedule (Week #)
	Quiz	60	Written	3rd week
	Mid-term Exam	40	Report	5th week
	1st attestation total	**100**		

<table>
<tr><td></td><td>
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<tr><td></td><td>End-term Exam, Final Project</td><td>40</td><td>Presentation</td><td>10th week</td></tr>
<tr><td></td><td>2nd attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>100</td><td>Final Project</td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
</table>
</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>Programming, Cloud Native Applications, Database, Operating System, Computer Networks</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>By the end of this course students will attain the following learning outcomes.
The student will show a working knowledge in:
understand the risk of computer failures and their peculiarities compared with other equipment failures;
know the different advantages and limits of fault avoidance and fault tolerance techniques;
understand the basics of redundant design of microservices architecture;
know the different forms of redundancy and their applicability to different classes of dependability requirements;
understand the relevant factors in evaluating alternative system designs for a specific set of requirements;
Students will have the skill to
be able to choose among patterns (fault-tolerant or non fault-tolerant) on the basis of dependability requirements;
be able to specify the use of fault tolerance in the design of application software based on microservices architecture;
formulate cost-dependability trade-offs and the limits of computer system dependability
describe type of failures and find potential point of failures</td></tr>
<tr><td>Content</td><td>Course introduces basic concepts of design and implementation of fault tolerance mechanisms in microservices architecture. Specific kind of fault tolerance are addressed, such as physical fault tolerance, fault tolerance for information and temporal fault tolerance. The purpose of this course is to establish fault tolerance as a measure to improve the dependability of systems in the presence of faults and correlating this dependability with the effects to the system and functional safety.</td></tr>
<tr><td>Media employed</td><td>Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.</td></tr>
</table>

<table>
<tr><td></td><td></td></tr>
<tr><td>Reading list</td><td>Basic Literature:
1. Israel Koren, C. Krishna. Fault-Tolerant Systems, 2020
2. Boris Scholl, Trent Swanson, Daniel Fernandez. Microservices with Docker on Microsoft Azure, 2016.
3. Paulo Pereira. Microservices Stability. Design For Failure, Deploy with Confidence. 2020
Supplementary literature:
1. "Ahead in the Cloud: Best Practices for Navigating the Future of Enterprise IT" by Stephen Orban et al. CreateSpace Independent Publishing Platform; lst edition (2018), 334
2. Mikolaj Pawlikowski. Chaos Engineering Site reliability through controlled disruption. 2021</td></tr>
</table>

<table>
<tr><td>Module name:</td><td>Software Design Patterns</td></tr>
<tr><td>Code</td><td></td></tr>
<tr><td>Trimester</td><td>2</td></tr>
<tr><td>Person responsible for the module</td><td>Kuatbayeva Akmaral Alikhanovna
Ph.D. in Computer science</td></tr>
<tr><td>Lecturer(s)</td><td>Kuatbayeva Akmaral Alikhanovna
Ph.D. in Computer science</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Masters programm: Computer science and Engineering.
Basic disciplines. Component of choice</td></tr>
<tr><td>Type of teaching</td><td>Lectures serve to introduce new concepts and provide theoretical and methodological foundations.
Practice sessions (seminars) are active sessions to develop student’s confidence through new examples and discussions on the problems.
Instructor-supervised independent study (ISIS) deals with review and exploration in greater depth of the course material.
Student’s independent study (SIS): Self-study time including the time required to prepare for and complete all course assessments.</td></tr>
<tr><td>Workload of course components and credits per trimester</td><td>
<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>20</td><td>30</td><td>10</td><td>90</td><td>150</td></tr>
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</td></tr>
<tr><td>Course assessment and forms of examination</td><td>
<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>1st attestation</td><td>Assignment 1
Assignment 2
Quiz 1</td><td>20
20
20</td><td></td><td>2nd week
3rd week
4th week</td></tr>
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<tr><td></td><td>
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<tr><td></td><td>Mid-term Exam</td><td>40</td><td>Project</td><td>5th week</td></tr>
<tr><td></td><td>1st attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td>2nd attestation</td><td>Assignment 3
Assignment 4
Quiz 2</td><td>20
20
20</td><td></td><td>7th week
8th week
9th week</td></tr>
<tr><td></td><td>End-term Exam</td><td>40</td><td>Project</td><td>10th week</td></tr>
<tr><td></td><td>2nd attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>100</td><td>Project</td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
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<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>Linear Algebra, Calculus I, Calculus II, Discrete mathematics, programming, DevOps, software development, and the software development lifecycle.</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>By the end of this course students will attain the following learning outcomes.
The student will show a working knowledge in:
- different aspects of modern software development
- various design patterns commonly used in software development
- ability to select appropriate design patterns based on specific software design problems or requirements
- understanding how to integrate design patterns into larger software systems
- refactoring existing code and designs to incorporate design patterns

Students will have the skill to
- Identify and Apply Design Patterns
- Improve Software Design
- Enhance Code Reusability
- Solve Design Challenges
- Adapt to Changing Requirements

In terms of Competences, students will be able to
- Identify and retain the goals of software design
- Apply the principle design patterns in software design projects
- Implement procedures reliably and flexibly
- Perform object-oriented analysis and design
- Design software design patterns in Java, Python and Web 3JS.
- Design decentralized applications in Blockchain – DAPPs</td></tr>
</table>

Content	The course emphasizes the object-oriented design pattern concepts independent of programming language. All examples in class use Java and Python programs. Students need to know Java programming language to implement the homework or project assignments.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Basic Literature:** 1. Tim Burglund, Matthew McCullough, Building and Testing with Gradle, O'Reilly, 2011. Hubert Klein Ikkink, Gradle Effective Implementation Guide. 2012. http://stackoverflow.com/questions/1163173/why-use-gradle-instead-of ant-or-maven 2. E.Gamma et al. Design Patterns. Elements of Reusable Object-Oriented Software https://javier8a.com/itc/bd1/articulo.pdf 3. Design Patterns: Elements of Reusable Object-Oriented Software" by Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides 4. "Head First Design Patterns" by Eric Freeman, Elisabeth Robson, Bert Bates, and Kathy Sierra

Module name:	**Advanced Software Architecture**
Code	
Trimester	2
Person responsible for the module	Assistant- professor Kuatbayeva A.A., Ph.D. in Computer science
Lecturer(s)	Assistant prof. Kuatbayeva A.A., Ph.D. in Computer science
Language	English
Relation to curriculum	Masters programme: Computer science and Engineering. Basic disciplines. Compulsory course.
Type of teaching	**Lectures** serve to introduce new concepts and provide theoretical and methodological foundations. **Practice sessions (seminars)** are active sessions to develop student's confidence through new examples and discussions on the problems. **Instructor-supervised independent study (ISIS)** deals with review and exploration in greater depth of the course material. **Student's independent study (SIS):** Self-study time including the time required to prepare for and complete all course assessments.
Workload of	Contact hours | SIS

<table>
<tr><td>course components and credits per trimester</td><td>
<table>
<tr><th>ECTS credits</th><th>Lectures</th><th>Practice sessions</th><th>ISIS</th><th></th><th>Total hours</th></tr>
<tr><td>5</td><td>20</td><td>30</td><td>10</td><td>90</td><td>150</td></tr>
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<tr><td>Course assessment and forms of examination</td><td>
<table>
<tr><th>Period</th><th>Assessment type</th><th>Number of points</th><th>Exam Form</th><th>Schedule (Week #)</th></tr>
<tr><td rowspan="5">1st attestation</td><td>Problem Sets</td><td>20</td><td>Submission of written reports</td><td>Weekly</td></tr>
<tr><td>Quizzes</td><td>20</td><td>Submission of written reports</td><td>3rd week</td></tr>
<tr><td>Certificates</td><td>20</td><td>Submission of written certificates</td><td>4th week</td></tr>
<tr><td>Mid-term Exam</td><td>40</td><td>Project</td><td>5th week</td></tr>
<tr><td>1st attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td rowspan="5">2nd attestation</td><td>Problem Sets</td><td>20</td><td>Submission of written reports</td><td>Weekly</td></tr>
<tr><td>Quizzes</td><td>20</td><td>Submission of written reports</td><td>6th week</td></tr>
<tr><td>Certificates</td><td>20</td><td>Written</td><td>8th week</td></tr>
<tr><td>End-term Exam</td><td>40</td><td>Project</td><td>10th week</td></tr>
<tr><td>2nd attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>100</td><td>Written</td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
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<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>“Data Structures with C++ or Java”, Advanced Programming Techniques.</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>By the end of this course students will attain the following learning outcomes.

The student will show a working knowledge in:
• understanding of microservices and service-oriented architectures.</td></tr>
</table>

	• understanding of advanced architectural concepts and principles used in the design of complex software systems; • understanding how architectural decisions impact software quality attributes such as performance, security, scalability, maintainability, and testability. **Students will have the skill to** • design and implement distributed and scalable architectures; • develop effective communication and collaboration skills in the context of software architecture. **In terms of competences, students will be able to:** • lead architectural design activities; • evaluate and analyze software architectures; • effectively document software architectures; • analyze best practices to adapt to new architectural paradigms and technologies.
Content	This course aims to present the most industry-relevant techniques in the area of architectural design and provide the means to document software architectures with standards like UML, AADL, MARTE, BPMN, blockchain tech systems. It also provides the participants with the necessary knowledge to reduce the technical debt in the software development projects they work on. Moreover, the course has a hands-on approach, which translates into actionable know-how that is relevant to the professional practice of software design.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	1. Clean Code: A Handbook of Agile Software Craftsmanship – Robert C. Martin 2. Mastering Python Design Patterns: A guide to creating smart, efficient, and reusable software – Kamon Ayeva and Sakis Kasampalis 3. Software Architecture: The Hard Parts: Modern Trade-Off Analyses for Distributed Architectures – Neal Ford, Mark Richards, Pramod Sadalage, Zhamak Dehghani 4. Fundamentals of Software Architecture: An Engineering Approach – Mark Richards and Neal Ford 5. Software Architecture with C++: Design modern systems using effective architecture concepts, design patterns, and techniques with C++ – Adrian Ostrowski, Piotr Gaczkowski 6. Modern Software Engineering: Doing What Works to Build Better Software Faster – David Farley 7. The Python Workshop: Learn to code in Python and kickstart your career in software development or data science – Multiple authors

<table>
<tr><td></td><td>8. Software Architect's Handbook – Joseph Ingeno
9. Software Architecture in Practice (SEI Series in Software Engineering) – Len Bass, Paul Clements, Rick Kazman
10. Software Systems Architecture: Working With Stakeholders Using Viewpoints and Perspectives – Nick Rozanski, Eóin Woods

Certificates list:

CISCO NETACAD SELF-paced courses</td></tr>
</table>

<table>
<tr><td>Module name:</td><td>Data-Driven Decision Making</td></tr>
<tr><td>Code</td><td></td></tr>
<tr><td>Trimester</td><td>2</td></tr>
<tr><td>Person responsible for the module</td><td>Associate. Prof. D.Yedilkhan, PhD</td></tr>
<tr><td>Lecturer(s)</td><td>Associate. Prof. D.Yedilkhan, PhD</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Masters program: Computer science and Engineering.
Basic disciplines. Component of choice.</td></tr>
<tr><td>Type of teaching</td><td>Lectures serve to introduce new concepts and provide theoretical and methodological foundations.
Practice sessions (seminars) are active sessions to develop student's confidence through new examples and discussions on the problems.
Instructor-supervised independent study (ISIS) deals with review and exploration in greater depth of the course material.
Student's independent study (SIS): Self-study time including the time required to prepare for and complete all course assessments.</td></tr>
<tr><td>Workload of course components and credits per trimester</td><td>
<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>20</td><td>30</td><td>10</td><td>90</td><td>150</td></tr>
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<tr><td>Course assessment and</td><td></td></tr>
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<table>
<tr><td>forms of examination</td><td>
<table>
<tr><th>Period</th><th>Assessment type</th><th>Number of points</th><th>Total</th></tr>
<tr><td>1st attestation</td><td>Essay on midterm exam</td><td>100</td><td>100</td></tr>
<tr><td>2nd attestation</td><td>Defense presentation
+ essay 2nd</td><td>60
40</td><td>100</td></tr>
<tr><td colspan="2">Final Exam</td><td></td><td>100</td></tr>
<tr><td>Total</td><td>0.3*1st Att+0.3*2nd Att+0.4*Final</td><td></td><td>100</td></tr>
</table>
</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>Linear Algebra, Discrete mathematics, big data processing</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>By the end of this course students will attain the following learning outcomes.
The student will show a working knowledge in:
understanding of various data analysis techniques, including descriptive statistics, exploratory data analysis, data visualization, hypothesis testing, regression analysis, and predictive modeling
working knowledge of statistical concepts and methods
ability to make informed decisions based on data analysis
Students will have the skill to
draw correct inferences from data sampling;
construct confidence intervals and formulate hypothesis tests involving population means, proportions and variance;
Describe a type I and type II error and the role these errors play in interpreting results.apply standards and principles to write really readable code.
design a class that serves as a software module or package.
to give a general idea of DDDM, solving simple programming questions
In terms of Competences, students will be able to
Critically evaluate the data and information;
Use various test statistics to assess the significance of a model;
Employ confidence interval and regression analysis to construct a predictive model;
Use statistical techniques in decision making;</td></tr>
</table>

	• Interpret the results of statistical analysis to real world problems in different areas of application.
Content	This course covers the fundamental statistical concepts and is related to the computer science engineering. Topics include: descriptive statistics; probability and random variables; sampling; statistical distributions; confidence intervals; hypothesis testing; regression.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Basic Literature:** 1. Amar Sahay. Business Analytics, Volume I. A Data-Driven Decision-Making Approach for Business/ Harlow: Pearson, 2020. - 1286 p. - ISBN 9781631573316: 49900,00.004.43 - D 33 2. Mark Jeffery. Data driven marketing / 2019. — 384 с. ISBN 978-5-91657-666-5. 3. Carl Anderson. Creating a Data-Driven Organization: Practical Advice from the Trenches/ O Relly Media: 2020. - 302 p. - ISBN 9781491916919 (ISBN10: 1491916915) **Supplementary literature:** 1. L. Wasserman. All of Statistics. Springer, 2005 2. Lange, Applied Probability. Springer, 2015 3. Jobson: Applied Muhivariate Data Analysis, Volume I: Regression and Experimental Design.

Module name:	**Site Reliability Engineering**
Code	
Trimester	2
Person responsible for the module	T. Zhukabaeva, PhD, Associate Professor
Lecturer(s)	T. Zhukabaeva, PhD, Associate Professor
Language	English
Relation to curriculum	Masters programme: Computer science and Engineering. Professional disciplines. The university component.
Type of teaching	**Lectures** serve to introduce new concepts and provide theoretical and methodological foundations. **Practice sessions (seminars)** are active sessions to develop student's confidence through new examples and discussions on the problems. **Instructor-supervised independent study (ISIS)** deals with review and exploration in greater depth of the course material. **Student's independent study (SIS):** Self-study time including the time required to prepare for and complete all course assessments**.**
Workload of	

	Contact hours	ISIS	SIS	Total hours

<table>
<tr><td>course components and credits per trimester</td><td>
<table>
<tr><td>ECTS credits</td><td>Lectures</td><td>Practice sessions</td><td></td><td></td><td></td></tr>
<tr><td>5</td><td>20</td><td>30</td><td>10</td><td>90</td><td>150</td></tr>
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<tr><td>Course assessment and forms of examination</td><td>
<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">1st attestation</td><td>Problem Sets</td><td>50</td><td>Project</td><td>2rd week</td></tr>
<tr><td>Mid-term Exam</td><td>50</td><td>Project</td><td>5th week</td></tr>
<tr><td>1st attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td rowspan="3">2nd attestation</td><td>Problem Sets</td><td>50</td><td>Submission of written reports</td><td>7th week</td></tr>
<tr><td>End-term Exam</td><td>50</td><td>Written</td><td>10th week</td></tr>
<tr><td>2nd attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>100</td><td>Written</td><td>During final exam session</td></tr>
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No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>Linear Algebra, Calculus I, Calculus II, Discrete mathematics, programming, DevOps, software development, and the software development lifecycle.</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>By the end of this course students will attain the following learning outcomes.
The student will show a working knowledge in:
the history of SRE and its emergence at Google;
the inter-relationship of SRE with DevOps and other popular frameworks;
the underlying principles behind SRE;
service Level Objectives (SLO’s) and their user focus;
service Level Indicators (SLI’s) and the modern monitoring landscape;
error budgets and the associated error budget policies;
toil and its effect on an organization’s productivity;
some practical steps that can help to eliminate toil;
observability as something to indicate the health of a service;
SRE tools, automation techniques and the importance of security</td></tr>
</table>

	Students will have the skill to: • design and Implement Reliable Systems: Students will acquire the skills to design and implement highly reliable and scalable systems; • implement Automation and Infrastructure as Code: Students will develop skills in automating tasks and managing infrastructure using infrastructure-as-code principles. They will be able to write scripts, use configuration management tools, and leverage containerization and orchestration technologies to automate deployment, scaling, and management of systems. • ensure Security and Compliance: Students will acquire skills in ensuring the security and compliance of systems. They will understand security best practices, perform vulnerability assessments, implement access controls, and follow compliance requirements to protect data and maintain system integrity. **In terms of competences, students will be able to:** • develop competence in the field of system reliability engineering • possess competence in incident response and problem management • develop competence in collaborating with cross-functional teams and effectively communicating technical information • demonstrate competence in continuously improving systems and processes
Content	This course covers the fundamental and principles of Site Reliability Engineering concepts and is related to the computer science engineering. Topics include Site Reliability Engineering Principles and Practices, Service Level Objectives, Error Budgets, Kubernetes, Docker, and Terraform, Reducing Toil, Monitoring and Service Level Indicators, SRE Tools & Automation, Dynatrace, Shift Left, Alerting, Anti-Fragility & Learning Failure.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Basic Literature:** - Betsy Beyer, Chris Jones, Jennifer Petoff and Niall Richard Murphy. Site Reliability Engineering. Available online https://sre.google/books/ - Betsy Beyer, Niall Richard Murphy, David K. Rensin, Kent Kawahara and Stephen Thorne. The Site Reliability Workbook. Available online https://sre.google/books/ - Heather Adkins, Betsy Beyer, Paul Blankinship, Ana Oprea, Piotr Lewandowski, Adam Stubblefield. Building Secure & Reliable Systems. Copyright © 2020 Google LLC. Published by O'Reilly Media, Inc Available online https://sre.google/books/ - Thomas Limoncelli, Strata Chalup, The Practice of Cloud System Administration: DevOps and SRE Practices for Web Services. **Supplementary literature:** - Blokus, A. Multistate System Reliability with Dependencies. https://books.google.kz/books?id=sgHZDwAAQBAJ, 2020. Elsevier Science. - K.Misra New Trends in System Reliability Evaluation. Elsevier Science.

Module name:	**Product Management**

<table>
<tr><td>Code</td><td></td></tr>
<tr><td>Trimester</td><td>2</td></tr>
<tr><td>Person responsible for the module</td><td>Prof. B. Amirgaliyev, PhD</td></tr>
<tr><td>Lecturer(s)</td><td>B. Amirgaliyev, PhD</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Master programmes: Computer Science and Engineering.
Compulsory course.</td></tr>
<tr><td>Type of teaching</td><td>Lectures serve to introduce new concepts and provide theoretical and methodological foundations.
Practice sessions (seminars) are active sessions to develop student’s confidence through new examples and discussions on the problems.
Instructor-supervised independent study (ISIS) deals with review and exploration in greater depth of the course material.
Student’s independent study (SIS): Self-study time including the time required to prepare for and complete all course assessments.</td></tr>
<tr><td>Workload of course components and credits per trimester</td><td>
<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>10</td><td>70</td><td>120</td></tr>
</table>
</td></tr>
<tr><td>Course assessment and forms of examination</td><td>
<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="4">1st attestation</td><td>Team Project 1</td><td>10</td><td>Written</td><td>3rd week</td></tr>
<tr><td>Team Project 2</td><td>10</td><td>Written</td><td>5rd week</td></tr>
<tr><td>Individual assignment 1</td><td>10</td><td>Written</td><td>5th week</td></tr>
<tr><td>1st attestation total</td><td>30</td><td></td><td></td></tr>
<tr><td rowspan="4">2nd attestation</td><td>Team Project 3</td><td>10</td><td>Written</td><td>7rd week</td></tr>
<tr><td>Team Project 4</td><td>10</td><td>Written</td><td>9th week</td></tr>
<tr><td>Individual assignment 2</td><td>10</td><td>Written</td><td>10th week</td></tr>
<tr><td>2nd attestation total</td><td>30</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>60</td><td>Capstone project and written</td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 1st Att + 2nd Att + Final = 100.</td></tr>
</table>
</td></tr>
<tr><td>Requirements according to the</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail)</td></tr>
</table>

examination regulations	**grade (or summer school).** Late submissions are not accepted. **No cheating, duplication, falsification of data, plagiarism, and crib** **Contacting the Lecturer**: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.
Recommended prerequisites	Marketing, Business.
Module objectives/intended learning outcomes	By the end of this course students will attain the following learning outcomes. **The student will show a working knowledge in:** • main frameworks, concepts, and models used in product management • the elements of the PM life cycle diverse strategies; • basic principles of designing, building, and maintaining a product • product managers' main responsibilities. **Students will have the skill to:** • to develop participants' innovative mindset to promote the exploration of new ideas for product development; • do agile Methodology Expertise; • use MVP to test main assumptions about value; • apply design thinking in product management context. **In terms of competences, students will be able to:** • prioritize tasks, product functionality development/testing; • adjust marketing research techniques for different types of products; • Perform financial planning for new products and product portfolio. • make regression analysis to construct a predictive model; Interpret the results of statistical analysis to real world problems in different areas of application.
Content	In this course, participants will explore the processes; procedures; tools and techniques; and results to create and execute an integrated product plan. Topics will include: creating a product charter; determining the requirements; defining, creating and managing the product scope; and validating the deliverables. Successfully managing change in a product will be discussed.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Basic Literature:** - Bruce T. Barkley, Project Management in New Product Development, McGraw-Hill © 2008 **Supplementary literature:** 1. McDowell, G. L., & Bavaro, J. (2014). Cracking the PM Interview: How to Land a Product Manager Job in (p. 364).

	2. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Sixth Edition, 2017. 3. Cadogan, John, et al. Cross-cultural and cross-national consumer research, Emerald Publishing Limited, 2015. ProQuest Ebook Central 4. Charles H. Noble, Serdar S. Durmusoglu and Abbie Griffin Open Innovation: New Product Development Essentials from the PDMA, John Wiley & Sons © 2014 5. https://shvatsky.notion.site/5fae2851c38b444fb6971b570a1d77 9d 6. https://vc.ru/hr/218371-bolshaya-podborka-dlya-menedzherovprodukta-150-poleznyh-materialov-dlya-obucheniya-i-rosta

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 programmes: 7M04102 Project Management, 7M06103 Applied Data Analytics, 7M06104 Computational Sciences, 7M06105 Computer Science and Engineering, 7M04102 Digital Public Administration and Services
Type of teaching	**Instructor-supervised teaching practicum**
Workload of course components and credits per trimester	

ECTS credits	Contact hours		ISIS	SIS	Total hours
	Lectures	Practice sessions			
4			60	60	8-week period of internship

<table>
<tr><td>Course assessment and forms of examination</td><td>
<table>
<tr><th>Period</th><th>Assessment type</th><th>Number of points</th><th>Exam Form</th><th>Schedule (Week #)</th></tr>
<tr><td rowspan="6">Final grade</td><td>Organizing a tutorial hour with BA students</td><td>100</td><td>Report on a tutorial hour</td><td>1-3 weeks</td></tr>
<tr><td>Class and lesson observation</td><td>100</td><td>Report</td><td>1-3 weeks</td></tr>
<tr><td>Three lessons that MA students give</td><td>100</td><td></td><td>4-8 weeks</td></tr>
<tr><td>A teaching Philosophy statement</td><td>100</td><td>Written</td><td>4-8 weeks</td></tr>
<tr><td>Discipline instructor’s grade</td><td>100</td><td>Written</td><td>4-8 weeks</td></tr>
<tr><td></td><td>Total</td><td>100</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>Pedagogy of Higher Education, Psychology of Management; Methodology and Methods of Research</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>Upon the completion of “Teaching Internship”, MA students will attain the following learning outcomes. The student will show a working knowledge in:
1. pedagogy of a major discipline
2. methodology of teaching a major discipline
3. methodology of assessment
3. management in Higher Education
4. design of educational programs
5. teaching and learning outcomes, assessment methodology and methods of teaching and learning
6. organization of teaching and learning environments.

Students will have the skill to</td></tr>
</table>

	1.demonstrate hard and soft skills in a major discipline and pedagogy 2.apply the principles of learning and teaching processes 3.apply methods and approaches in teaching 4.apply various IT technologies 5.apply approaches of motivation (engagement) of BA students to study **In terms of Competences, students will be able to** • work with students as tutors; • evaluate student behaviour and their response to teaching and content • employ modern educational technologies • apply teaching and learning methods • assess student knowledge and skills • define their own teaching philosophy
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, projector and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Main literature:** 1. Оқыту теориясы. Д. Х Шунк. Тараулар 1, 3,4,5,6,7, 8,9,10,11 және 12. Баспа: Pearson, 2019 2. Рефлективті оқыту негіздері. Э.Поллард. Бөлімдер 2, 3, и 4. Баспа: Bloomsbury Academic, 2019 **Additional resources:** For the reading list and Resources, please find the attached links. These are the open sources by Massachusetts Institute of Technology (MIT), the US. MITOOPENCOURSEWARE https://ocw.mit.edu/courses/chemistry/5-95j-teaching-college-level-science-and-engineering-fall-2015/instructor-insights/

3d term

Module name:	**Information Security**
Code	
Trimester	2
Person responsible	Begimbayeva Englik, PhD

<table>
<tr><td>for the module</td><td></td></tr>
<tr><td>Lecturer(s)</td><td>Begimbayeva Englik, PhD</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Master Program: Applied Data Analysis</td></tr>
<tr><td>Type of teaching</td><td>Lectures serve to introduce new concepts and provide theoretical and methodological foundations.
Practice sessions (seminars) are active sessions to develop student's confidence through new examples and discussions on the problems.
Instructor-supervised independent study (ISIS) deals with review and exploration in greater depth of the course material.
Student's independent study (SIS): Self-study time including the time required to prepare for and complete all course assessments.</td></tr>
<tr><td>Workload of course components and credits per trimester</td><td>
<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>50</td><td>50</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>Course assessment and forms of examination</td><td>
<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="2">1st attestation</td><td>Mid-term project</td><td>100</td><td>Submission of the written project</td><td>5th week</td></tr>
<tr><td>1st attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td rowspan="4">2nd attestation</td><td>End-term project</td><td>60</td><td>Submission of the written project</td><td>8th - 9th week</td></tr>
<tr><td>End-term Quiz</td><td>40</td><td>Written</td><td>10th week</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>2nd attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>100</td><td>Written</td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
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</td></tr>
</table>

Requirements according to the examination regulations	**Course and university policies include:** **Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).** Late submissions are not accepted. **No cheating, duplication, falsification of data, plagiarism, and crib** **Contacting the Lecturer**: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.
Recommended prerequisites	
Module objectives/intended learning outcomes	By the end of this course students will attain the following learning outcomes. **The student will show a working knowledge in:** • fundamental concepts of information security and its importance; • the role of data and analytics in information security; • deep understanding of data-driven decision making principles and strategies. **Students will have the skill to:** • apply data-driven decision making strategies; • apply data analytics in information security. **In terms of competences, students will be able to:** • evaluate different information security technologies and their applications in different domains, including cybersecurity, network security, and cloud security; • analyze the components of information security, including threat modeling, risk assessment, and vulnerability management; • develop critical thinking and problem-solving skills, using data and analytics to inform decision-making in a rapidly changing and uncertain environment.
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	1. Michael E. Whitman and Herbert J. Mattord, "Principles of Information Security", Cengage Learning, 2018. 2. Bruce Schneier, "Applied Cryptography: Protocols, Algorithms, and Source Code in C", John Wiley & Sons, 1995. 3. Eric Conrad, Joshua Feldman, and Seth Misenar, "CISSP Study Guide", Syngress, 2020.

	4. Ross J. Anderson, "Security Engineering: A Guide to Building Dependable Distributed Systems", Wiley, 2008. 5. D. J. Henry and S. R. Simon, "Cybersecurity and Cyberwar: What Everyone Needs to Know", Oxford University Press, 2014.

Module name:	**Software development Case study**
Code	
Trimester	3
Person responsible for the module	Soltan G.
Lecturer(s)	Soltan G.
Language	Russian
Relation to curriculum	Masters programme: Computer science and Engineering. Compulsory course
Type of teaching	**Lectures** serve to introduce new concepts and provide theoretical and methodological foundations. **Practice sessions (seminars)** are active sessions to develop student's confidence through new examples and discussions on the problems. **Instructor-supervised independent study (ISIS)** deals with review and exploration in greater depth of the course material. **Student's independent study (SIS):** 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		ISIS	SIS	Total hours
	Lectures	Practice sessions			
4	20	20	10	70	120

Course assessment and forms of examination

Period	Assessment type	Number of points	Exam Form	Schedule (Week #)
1st attestation	Problem Sets	30	Reports	2rd week
	Problem Sets	30	Reports	4rd week
	Mid-term Exam	40	test	5th week
	1st attestation total	**100**		
2nd attestation	Problem Sets	30	Reports	7rd week
	Problem Sets	30	Reports	9th week
	End-term Exam	40	test	10th week
	2nd attestation total	**100**		

<table>
<tr><td></td><td>
<table>
<tr><td>Final Exam</td><td>100</td><td>Project</td><td>During final exam session</td></tr>
<tr><td colspan="4">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
</table>
</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>By the end of this course students will attain the following learning outcomes.
The student will show a working knowledge in:
methods of case study, comprehensive analysis of situations from the field of professional activity,
approaches to planning and risk analysis at the stage of software development;
the composition of the analytical stage of the project based on the results of the analysis of the product and the main stages of the analysis;
formulas and software compliance checks;
the role of the analyst in the collection of protection, the concept of business processes and business rules.
Students will have the skill to:
present clearly and precisely one's own point of view orally or in written form;
apply theoretical knowledge to solve practical problems in software development;
develop the skills of constructive critical evaluation of the point of view of others;
to carry out the development of project documentation for a software solution
In terms of competences, students will be able to:
make decisions based on a group analysis of the situation;
identify user requirements for the developed software;
develop quality requirements for the software product,
set achievable requirements for functionality and quality;
specify (formulate) requirements;
select the notations that should be used when creating diagrams,</td></tr>
<tr><td>Content</td><td>This course explores case study as a method used in qualitative research in software development. Introduce students to case study methods and the ability to use results and factors to design or guide software development.</td></tr>
</table>

Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Basic Literature:** 1. D. Beatty, Vigers K.I. Software Requirements, Third Edition. 2016, PUBLISHED BY Microsoft Press 2. Gagarina L. G. Software development technology [Text]: textbook for universities, Moscow: FORUM: INFRA-M, 2012. **Supplementary literature:** 1. Golitsyna O. L. Software [Text]: textbook / O. L. Golitsyna, T. L. Partyka, I. I. Popov. - 3rd ed., revised. and additional - Moscow: FORUM, 2010. 2. Case-study method in the educational process from school to graduate, April 2016Interactive Science

Module name:	**Project Management**
Code	
Trimester	3
Person responsible for the module	Professor B.Amirgaliyev, PhD
Lecturer(s)	Professor B.Amirgaliyev, PhD
Language	English
Relation to curriculum	Masters program: Computer science and Engineering. Compulsory course
Type of teaching	**Lectures** serve to introduce new concepts and provide theoretical and methodological foundations. **Practice sessions (seminars)** are active sessions to develop student's confidence through new examples and discussions on the problems. **Instructor-supervised independent study (ISIS)** deals with review and exploration in greater depth of the course material. **Student's independent study (SIS):** 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		ISIS	SIS	Total hours
	Lectures	Practice sessions			
4	20	20	10	70	120

Course assessment and forms of examination

Period	Assessment type	Number of points	Exam Form	Schedule (Week #)
	Team Project 1	10	Written	Weekly

<table>
<tr><td></td><td>
<table>
<tr><td rowspan="3">1st attestation</td><td>Team Project 2</td><td>10</td><td>Written</td><td>3rd week</td></tr>
<tr><td>Individual Assignment 1</td><td>10</td><td>Written</td><td>5th week</td></tr>
<tr><td>1st attestation total</td><td>30</td><td></td><td></td></tr>
<tr><td rowspan="4">2nd attestation</td><td>Team Project 3</td><td>10</td><td>Written</td><td>Weekly</td></tr>
<tr><td>Team Project 4</td><td>10</td><td>Written</td><td>8th week</td></tr>
<tr><td>Individual Assignment 2</td><td>10</td><td>Written</td><td>10th week</td></tr>
<tr><td>2nd attestation total</td><td>30</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>60</td><td>Written</td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 1st Att + 2nd Att + Final = 100.</td></tr>
</table>
</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>Product Management</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>By the end of this course students will attain the following learning outcomes.
The student will show a working knowledge in:
project planning techniques;
project execution and control processes;
stakeholder management principles;
project documentation and reporting.
Students will have the skill to
develop leadership and team management skills;
use skills in project risk management, project communication,
project quality management.
In terms of competences, students will be able to:
analyze the effectiveness of problem solving and decision-making strategies;
assess adaptability and change management;
conduct ethically and professionally based on principles management skills.</td></tr>
<tr><td>Content</td><td>A Project management course typically covers a wide range of topics that are essential to managing projects successfully. Topics include: Introduction to Project management, project planning, execution and monitoring, working with stakeholders, software and tools to successfully deliver project, software development processes.</td></tr>
</table>

Media employed	Multimedia classrooms equipped with computer, projection, and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Basic Literature:** 1. A Systems Approach to Planning, Scheduling, and Controlling, 12th ed. Harold Kerzner, ISBN-10: 9781119165354, ISBN-13: 978-1119165354, 2017 2. Project Management Case Studies 5th Edition, Harold Kerzner, ISBN-10: 1119385970, ISBN-13: 978-1119385974, 2017 3. A Guide to the Project Management Body of Knowledge (PMBOK® Guide)–Sixth Edition, Project Management Institute, ISBN-10: 9781628251845, ISBN-13: 978-1628251845, 2017 4. Agile Practice Guide 1st Edition, Project Management Institute, Inc., ISBN: 978-1-62825-199-9, 2017 **Supplementary literature:** Verzuh, E (2011). *The fast forward MBA in project management* (4th ed.) New York: J. Wiley.

Module name:	**Advanced Frontend**
Code	
Trimester	3
Person responsible for the module	PhD. Aditi Sharma
Lecturer(s)	PhD. Aditi Sharma
Language	English
Relation to curriculum	Masters programme: Computer science and Engineering. Compulsory course
Type of teaching	**Lectures** serve to introduce new concepts and provide theoretical and methodological foundations. **Practice sessions (seminars)** are active sessions to develop student's confidence through new examples and discussions on the problems. **Instructor-supervised independent study** (ISIS) deals with review and exploration in greater depth of the course material. **Student's independent study (SIS):** Self-study time including the time required to prepare for and complete all course assessments.
Workload of course components and	

ECTS credits	Contact hours			ISIS	SIS	Total hours
	Lectures	Practice sessions	classroom activities			

<table>
<tr><td>credits per trimester</td><td>
<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>5</td><td>20</td><td>30</td><td></td><td>10</td><td>90</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>Course assessment and forms of examination</td><td>
<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">1st attestation</td><td>Assignment 1
Assignment 2</td><td>30
30</td><td></td><td>2nd week
4th week</td></tr>
<tr><td>Mid-term Exam</td><td>40</td><td>Report</td><td>5th week</td></tr>
<tr><td>1st attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td rowspan="3">2nd attestation</td><td>Assignment 3
Assignment 4</td><td>30
30</td><td></td><td>7th week
9th week</td></tr>
<tr><td>End-term Exam</td><td>40</td><td>Report</td><td>10th week</td></tr>
<tr><td>2nd attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>100</td><td>Project</td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
</table>
</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>

HTML, CSS, and JavaScript
DOM manipulation and event handling
Understanding of web development concepts such as browser rendering, web requests, and web APIs.
Familiarity with JavaScript frameworks such as React or Angular
Understanding of web development tools such as text editors, developer tools and version control systems like Git
Familiarity with web development concepts such as responsive design, accessibility, and cross-browser compatibility.
Basic understanding of web development concepts such as webpack, npm, etc
Basic understanding of JavaScript concepts such as variables, functions, classes, and objects.
Basic understanding of web development concepts such as server-side rendering and SPA.

</td></tr>
</table>

Module objectives/intended learning outcomes	By the end of this course students will attain the following learning outcomes. **The student will show a working knowledge in:** • understanding of the technologies and techniques used in modern front-end web development, such as HTML, CSS, JavaScript, and React or Angular frameworks; • understanding of the principles of user experience (UX) design; • tools and technologies such as webpack, npm, and Git; • concepts such as SPA and server-side rendering; • latest trends and advancements in front-end web development; • Understand the basics of web security, web optimization and performance. **Students will have the skill to:** • build complex, interactive web applications using modern front-end technologies such as HTML, CSS, JavaScript, React or Angular framework; • build complex, interactive web applications; • apply principles of user experience (UX) design to create responsive and accessible web pages. **In terms of Competences, students will be able to:** • Develop web applications using modern front-end technologies and frameworks; • Optimize web applications for performance and browser compatibility; • implement the best practices in web development, such as performance optimization, browser compatibility, and cross-browser compatibility
Content	Front-end development involves the building and maintenance of the user-facing side of a website or application. The main technologies used in front-end development include HTML, CSS, and JavaScript. • Advanced HTML and CSS: This could include topics such as CSS preprocessors (e.g. SASS, LESS), CSS Grid and Flexbox, and responsive design. • JavaScript: This could include topics such as JavaScript basics, ES6/ES2015, asynchronous JavaScript (e.g. promises, async/await), and JavaScript frameworks/libraries such as React, Angular, or Vue.js. • Accessibility: This could include topics such as WCAG 2.0 guidelines, ARIA attributes, and semantic HTML. • Performance optimization: This could include topics such as reducing page load times, minimizing requests, and code splitting. • Cross-browser compatibility: This could include topics such as browser quirks, feature detection, and fallbacks. • Testing and debugging: This could include topics such as unit testing, end-to-end testing, and debugging techniques.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.

Reading list	**Basic Literature:** 1. Lecture notes (available on moodle.astanait.edu.kz) 2. "JavaScript: The Good Parts" by Douglas Crockford - This book provides a comprehensive look at the core elements of JavaScript and how they can be used to build efficient, high-quality web applications. 3. "React: Up & Running" by Stoyan Stefanov and Alex Banks - This book provides a detailed introduction to React, including the basics of components, JSX, and the Virtual DOM. 4. "CSS: The Definitive Guide" by Eric A. Meyer - This book provides a comprehensive introduction to CSS, including layout, styling, and advanced layout techniques such as flexbox and grid. 5. "Web Design for Developers" by Brian P. Hogan - This book provides an introduction to web design concepts and best practices, with a focus on how to apply them to web development projects. 6. "Web Design with HTML, CSS, JavaScript and jQuery Set" by Jon Duckett - This book provides a comprehensive introduction to web development using HTML, CSS, JavaScript, and jQuery. 7. "High Performance Browser Networking" by Ilya Grigorik - This book provides an in-depth look at the networking protocols and APIs that are used to create high-performance web applications. 8. "Don't Make Me Think" by Steve Krug - This book provides an introduction to the principles of user experience design, including how to create intuitive, user-friendly web pages and applications. 9. "Progressive Web Applications" by Maximiliano Firtman - This book provides an introduction to Progressive Web Apps, including how to create web applications that can be installed on a user's device and work offline. **Supplementary literature:** 1. Google Developers - Google Developers provides a wealth of information on web development technologies, including HTML, CSS, and JavaScript, as well as tutorials and guides on specific topics such as Progressive Web Apps and performance optimization.

Module name:	**Advanced QA**
Code	
Trimester	3
Person responsible for the module	Yedilkhan Didar, PhD
Lecturer(s)	Yedilkhan Didar, PhD
Language	English

<table>
<tr><td>Relation to curriculum</td><td>Masters programme: Computer science and Engineering.
Compulsory course</td></tr>
<tr><td>Type of teaching</td><td>Lectures serve to introduce new concepts and provide theoretical and methodological foundations.
Practice sessions (seminars) are active sessions to develop student’s confidence through new examples and discussions on the problems.
Instructor-supervised independent study (ISIS) deals with review and exploration in greater depth of the course material.
Student’s independent study (SIS): Self-study time including the time required to prepare for and complete all course assessments.</td></tr>
<tr><td>Workload of course components and credits per trimester</td><td>
<table>
<tr><td rowspan="2">ECTS credits</td><td colspan="3">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><td>classroom activities</td></tr>
<tr><td>4</td><td>20</td><td>20</td><td></td><td>10</td><td>70</td><td>120</td></tr>
</table>
</td></tr>
<tr><td>Course assessment and forms of examination</td><td>
<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">1st attestation</td><td>Assignment 1
Assignment 2</td><td>30
30</td><td></td><td>Weekly</td></tr>
<tr><td>Mid-term Exam</td><td>40</td><td>Report</td><td>5th week</td></tr>
<tr><td>1st attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td rowspan="3">2nd attestation</td><td>Assignment 3
Assignment 4</td><td>30
30</td><td></td><td>Weekly</td></tr>
<tr><td>End-term Exam</td><td>40</td><td>Report</td><td>10th week</td></tr>
<tr><td>2nd attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>100</td><td>MCQ</td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final = 100.</td></tr>
</table>

</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
</table>

Recommended prerequisites	• Programming knowledge: Students should have a basic understanding of programming concepts and experience with at least one programming language. • Understanding of software development life cycle: Students should have a basic understanding of the software development life cycle and how quality assurance activities fit in it. • Understanding of software testing: Students should have a basic understanding of software testing concepts, such as testing methodologies, testing levels, and testing types. • Understanding of quality assurance: Students should have a basic understanding of quality assurance concepts, such as quality management and quality control. • Understanding of software engineering: Students should have a basic understanding of software engineering concepts, such as requirements engineering and software design. • Understanding of data structures and algorithms: Students should have a basic understanding of data structures and algorithms, which will help them to understand the software they are testing. • Understanding of computer systems: Students should have a basic understanding of how computer systems work, including operating systems, databases, and networks. • Basic understanding of statistics: Students should have a basic understanding of statistics, which will help them to understand and analyze the data obtained from testing. • Experience with software development: It is recommended that students have experience working with software development teams and have some experience with software development. • Communication Skills: Strong communication skills are important for a QA professional, as it will help them to effectively communicate with developers, customers, and management.
Module objectives/intended learning outcomes	By the end of this course students will attain the following learning outcomes. **The student will show a working knowledge in:** • Software testing methodologies: Students will have a working knowledge of various testing methodologies, such as unit testing, integration testing, system testing, and acceptance testing. • Testing tools and techniques: Students will have a working knowledge of various testing tools and techniques, such as test management tools, automated testing frameworks, test execution tools, and performance testing tools. • Quality assurance processes: Students will have a working knowledge of various quality assurance processes, such as requirements management, configuration management, change management, and incident management. • Standards and regulations: Students will have a working knowledge of various standards and regulations related to software quality and testing, such as ISO 9126, ISO 15504, and IEEE 829. • Advanced QA practices and methodologies: Students will have a working knowledge of various advanced QA practices and methodologies, such as test-driven development, test automation, and performance testing.

	• Risk-based testing: Students will have a working knowledge of risk-based testing concepts, methodologies, and practices, and how to identify and prioritize risks and test accordingly. • Exploratory testing: Students will have a working knowledge of exploratory testing concepts, methodologies, and practices, and how to use it to identify defects and improve the overall quality of the software. • Security testing: Students will have a working knowledge of security testing concepts, methodologies, and practices, and how to use them to identify and mitigate security vulnerabilities in software systems. • Software development life cycle: Students will have a working knowledge of the software development life cycle and how quality assurance activities fit in it. • Software testing and quality assurance industry standards: Students will have a working knowledge of industry standards, such as ISO 9126, ISO 15504, and IEEE 829, and their application in the software testing and quality assurance field. **Students will have the skill to** • Design and implement effective test cases: Students will have the ability to design and implement test cases that effectively validate the functionality, performance, and reliability of software systems. • Use test management tools: Students will have the ability to use test management tools to plan, execute, and report on software testing activities. • Automate testing: Students will have the ability to use automated testing frameworks to create, execute, and maintain automated test scripts. • Conduct performance testing: Students will have the ability to use performance testing tools to measure the performance and scalability of software systems. • Conduct security testing: Students will have the ability to use the appropriate tools and techniques to test the security of software systems. • Analyze and interpret test results: Students will have the ability to analyze and interpret test results to identify defects and determine the overall quality of software systems. • Continuously monitor and improve the software process : Students will have the ability to continuously monitor and improve the software process by using various quality management methodologies and practices. • Communicate with stakeholders: Students will have the ability to effectively communicate with stakeholders, such as developers, customers, and management, to ensure that testing activities align with project goals and requirements. • Communicate with technical and non-technical audiences: Students will have the ability to effectively communicate with both technical and non-technical audiences, such as developers, customers, and management, to ensure that testing activities align with project goals and requirements. • Utilize best practices to test software: Students will have the ability to understand and use best practices to test software and apply them in different scenarios. **In terms of Competences, students will be able to** • Understand and apply various software testing methodologies: Students will be able to understand and apply various testing methodologies, such as unit testing, integration testing, system testing, and acceptance testing.

	• Use testing tools and techniques: Students will be able to use various testing tools and techniques, such as test management tools, automated testing frameworks, test execution tools, and performance testing tools. • Implement quality assurance processes: Students will be able to implement various quality assurance processes, such as requirements management, configuration management, change management, and incident management. • Understand and comply with standards and regulations: Students will be able to understand and comply with various standards and regulations related to software quality and testing, such as ISO 9126, ISO 15504, and IEEE 829. • Apply advanced QA practices in real-world scenarios: Students will be able to apply advanced QA practices in real-world scenarios and understand the impact of their actions on the project and the product. • Understand and apply various software testing methodologies. • Understand and apply various testing tools and techniques. • Understand and implement various quality assurance processes. • Understand and comply with various standards and regulations related to software quality and testing • Improve the quality and reliability of systems.
Content	• Software testing methodologies: The course may cover various testing methodologies, such as unit testing, integration testing, system testing, and acceptance testing. It may also cover the principles and best practices of test-driven development and agile testing. • Testing tools and techniques: The course may cover various testing tools and techniques, such as test management tools, automated testing frameworks, test execution tools, and performance testing tools. It may also cover the principles and best practices of test automation and continuous integration. • Quality assurance processes: The course may cover various quality assurance processes, such as requirements management, configuration management, change management, and incident management. It may also cover the principles and best practices of quality management and quality control. • Standards and regulations: The course may cover various standards and regulations related to software quality and testing, such as ISO 9126, ISO 15504, and IEEE 829. It may also cover the principles and best practices of compliance and certification. • Case studies and real-world examples: The course may include case studies and real-world examples of advanced QA in action. These may include examples of how advanced QA practices have been implemented in various industries and how they have helped to improve the quality and reliability of systems.
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Basic Literature:** 1. Lecture notes (available on moodle.astanait.edu.kz) 2. "Advanced Software Testing" by Rex Black 3. "Quality Assurance for IT Systems" by Mike Watson 4. "Advanced Software Testing: Vol. 2" by Rex Black 5. "Quality Assurance for the Information Systems Development Life Cycle" by David Herron

	6. "Effective Software Testing: 50 Specific Ways to Improve Your Testing" by Elfriede Dustin **Supplementary literature:** 1. https://www.udemy.com/course/quality-assurance-process-improvement-course/ 2. "Software Testing" by University of Alberta: This course covers the fundamental concepts and techniques of software testing, including testing methodologies, testing tools, and testing standards. 3. "Software Testing and Verification" by University of Maryland: This course covers the fundamental concepts and techniques of software testing, verification, and validation. It covers different testing methodologies, testing levels, and testing types. 4. "Software Testing and Continuous Integration" by The Hong Kong University of Science and Technology: This course covers the fundamental concepts of software testing and continuous integration, including testing methodologies, testing tools, and testing standards. 5. "Advanced Software Testing" by the University of Minnesota: This course covers advanced topics in software testing, including test-driven development, test automation, and performance testing. 6. "Software Testing and Quality Assurance" by the University of Illinois at Urbana-Champaign: This course covers the fundamentals of software testing and quality assurance, including testing methodologies, testing tools, and testing standards.

Module name:	**Applied Software Development Project**
Code	
Trimester	3
Person responsible for the module	Aditi Sharma, PhD
Lecturer(s)	Aditi Sharma, PhD
Language	English
Relation to curriculum	Masters programme: Computer science and Engineering. Compulsory course
Type of teaching	**Lectures** serve to introduce new concepts and provide theoretical and methodological foundations. **Practice sessions (seminars)** are active sessions to develop student's confidence through new examples and discussions on the problems. **Instructor-supervised independent study (ISIS)** deals with review and exploration in greater depth of the course material. **Student's independent study (SIS):** Self-study time including the time required to prepare for and complete all course assessments**.**
Workload of	

	Contact hours	ISIS	SIS	Total hours

<table>
<tr><td>course components and credits per trimester</td><td>
<table>
<tr><td>ECTS credits</td><td>Lectures</td><td>Practice sessions</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>20</td><td>20</td><td>10</td><td>70</td><td>120</td></tr>
</table>
</td></tr>
<tr><td>Course assessment and forms of examination</td><td>
<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>1st attestation</td><td>Topic (plan)</td><td>20</td><td>Submission of written reports</td><td>Weekly</td></tr>
<tr><td></td><td>Project proposal</td><td>20</td><td></td><td>3rd week</td></tr>
<tr><td></td><td>Weekly progress (week 1- 4)</td><td>20</td><td></td><td>4th week</td></tr>
<tr><td></td><td>Progress report</td><td>40</td><td></td><td>5th week</td></tr>
<tr><td></td><td>1st attestation total</td><td>100</td><td></td><td></td></tr>
<tr><td>2nd attestation</td><td>Weekly progress (week 6- 9)</td><td>30</td><td>Submission of written reports</td><td>Weekly</td></tr>
<tr><td></td><td>Progress report</td><td>50</td><td></td><td>8th week</td></tr>
<tr><td></td><td>Final presentation</td><td>20</td><td></td><td>9th week</td></tr>
<tr><td></td><td>2nd attestation total</td><td>100</td><td></td><td>10th week</td></tr>
<tr><td colspan="2">Final paper</td><td>100</td><td></td><td>During final exam session</td></tr>
<tr><td colspan="5">Cumulative total for the course = 0,3 * 1st Att + 0,3 * 2nd Att + 0,4*Final</td></tr>
</table>
</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>By the end of this course students will attain the following learning outcomes.
The student will show a working knowledge in:</td></tr>
</table>

	- Software Development Lifecycle: understanding of the software development lifecycle, including requirements gathering, design, implementation, testing, deployment, and maintenance - Programming Languages and Technologies: working knowledge of programming languages, frameworks, and technologies relevant to the project they have worked on - Software Design and Architecture: ability to design and architect software solutions that are modular, scalable, and maintainable **Students will have the skill to** - design, implement, debug created system that address the selected problem - choose appropriate theories and techniques to address the problem. - develop software project - describe the essential characteristics, and identify, using examples, the connections between the characteristics of a good software system In terms of Competences, students will be able to **Students will be able to:** - address a theoretical, practical, real-world challenge. - select, collect and use required information - design a solution to a significant open-ended problem. - design, implement, debug, and test created system that address the selected problem. - take appropriate decisions based on collected and analyzed information. - prepare project report after performing due plagiarism check using appropriate tools.
Content	This course covers the basic characteristics of a 'good software system', and considers how such software systems may be developed. Topics include: introduction to the course and policies; phases of software development methodologies
Media employed	Multimedia classrooms equipped with computer, projection and audio system; Whiteboard; Microsoft Teams; LMS Moodle.
Reading list	**Basic Literature:** 1. Applied Software Project Management 1st Edition, 2005 2. Wright, Christopher. Ely : ITGP. 2017., Fundamentals of Assurance for Lean Projects

Module name:	**Research practice**
Code	
Trimester	4
Person responsible for the module	Professor or industry expert, Lab instructor, supervisor, exc.
Lecturer(s)	Professor or industry expert, Lab instructor, supervisor, exc.
Language	English

<table>
<tr><td>Relation to curriculum</td><td>Research practice</td></tr>
<tr><td>Type of teaching</td><td>

Workshops and seminars: Workshops and seminars can provide students with practical skills training and information on industry-specific topics.
Performance of Industrial 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.

</td></tr>
<tr><td>Workload of course components and credits per trimester</td><td>
<table>
<tr><td rowspan="2">ECTS credits</td><td colspan="3">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><td>classroom activities</td></tr>
<tr><td>16</td><td></td><td></td><td></td><td>330</td><td>90</td><td>420</td></tr>
</table>
</td></tr>
<tr><td>Course assessment and forms of examination</td><td>Final Report and Industrial Practice Assessment: The final grade for Industrial Practice is given by the mentor at the Faculty in cooperation with the mentor at the company or institution on the basis of the submitted final report and the proposed final grade from the mentor at the company or institution.</td></tr>
<tr><td>Recommended prerequisites</td><td>

Basic knowledge of research methodology and statistical analysis
Familiarity with academic writing and referencing conventions
Ability to critically evaluate and synthesize research literature
Proficiency in using technology for data collection and analysis
Background in the field of study relevant to the scientific field

</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>By the end of this course students will attain the following learning outcomes. The student will show a working knowledge in:

Research design and methodology: The student will show a working knowledge of different research methods, including experimental design, observational studies, and surveys, and will be able to design and implement a research project.
Data collection and analysis: The student will show a working knowledge of data collection and analysis techniques, including the use of statistical methods and software, and will be able to analyze and interpret data to support research conclusions.
Ethics in research: The student will show a working knowledge of ethical considerations in research, including the responsible use of data, the protection of human subjects, and the appropriate treatment of animals in research.
Communication and presentation of research results: The student will show a working knowledge of effective communication techniques, including writing and presenting research results, and will be able to communicate research results effectively and persuasively.

</td></tr>
</table>

	• Peer-review and publication process: The student will show a working knowledge of the peer-review and publication process, including the importance of peer-review and the various formats for publishing research results. • Critical evaluation of research: The student will show a working knowledge of the critical evaluation of research results and will be able to apply the findings to practical problems. **Students will have the skill to** • Design and implement a research project: Students will have the skills to design and implement a research project, including problem definition, hypothesis formation, data collection and analysis, and interpretation of results. • Analyze and interpret data: Students will have the skills to analyze and interpret data, including the use of statistical methods and software, and will be able to draw valid conclusions from data analysis. • Communicate research results: Students will have the skills to communicate research results effectively, both verbally and in writing, and will be able to present research results in a clear and concise manner. • Engage in ethical research practices: Students will have the skills to engage in ethical research practices, including the responsible use of data, the protection of human subjects, and the appropriate treatment of animals in research. • Evaluate and critically assess research: Students will have the skills to evaluate and critically assess research results, including the ability to identify strengths and weaknesses in research design and methodology, and to apply the findings to practical problems. • Prepare for publication: Students will have the skills to prepare research results for publication, including the ability to write papers and abstracts for conference proceedings and journal articles, and to understand the importance of peer-review in the publication process. **In terms of Competences, students will be able to** • Apply research methods: Students will be able to apply appropriate research methods to solve real-world problems and to design and implement a research project. • Analyze and interpret data: Students will be able to analyze and interpret data to support research conclusions, including the use of statistical methods and software. • Communicate research results: Students will be able to communicate research results effectively and persuasively, both verbally and in writing, and to present research results in a clear and concise manner. • Engage in ethical research practices: Students will be able to engage in ethical research practices, including the responsible use of data, the protection of human subjects, and the appropriate treatment of animals in research. • Evaluate and critically assess research: Students will be able to evaluate and critically assess research results, including the ability to identify strengths and weaknesses in research design and methodology, and to apply the findings to practical problems. • Prepare for publication: Students will be able to prepare research results for publication, including the ability to write papers and abstracts for

	conference proceedings and journal articles, and to understand the importance of peer-review in the publication process. • Collaborate with others: Students will be able to work effectively as part of a team and to collaborate with others in conducting research and preparing research results for publication.
Content	• ***Introduction to Research:*** Overview of the research process, including problem definition, hypothesis formation, data collection and analysis, and interpretation of results. • ***Research Methods:*** Overview of different research methods, including experimental design, observational studies, and surveys, and the selection of appropriate methods for different research problems. • ***Data Collection and Analysis:*** Techniques for data collection, including survey design, sampling, and data coding. Techniques for data analysis, including descriptive statistics, inferential statistics, and multivariate analysis. • ***Ethics in Research:*** Overview of ethical considerations in research, including the responsible use of data, the protection of human subjects, and the appropriate treatment of animals in research. • ***Communication and Presentation of Research Results:*** Techniques for effective communication of research results, including writing and presenting research results, and the use of visual aids to enhance understanding. • ***Peer-review and Publication Process:*** Overview of the peer-review and publication process, including the importance of peer-review, the various formats for publishing research results, and the preparation of papers and abstracts for conference proceedings and journal articles. • ***Critical Evaluation of Research:*** Techniques for the critical evaluation of research results, including the identification of strengths and weaknesses in research design and methodology, and the application of research findings to practical problems. • ***Collaborative Research:*** Overview of working effectively as part of a team and collaborating with others in conducting research and preparing research results for publication.
Media employed	The media employed in this module may include: • Lectures • Class Discussions • Hands-on Projects • Case Studies • Online Resources • Classroom Software • Written Assignments Multimedia resources that may be used in a course on Research Practice include: • **Video Lectures:** High-quality video lectures, recorded by the instructor or sourced from online platforms such as YouTube or Coursera. • Interactive Visualizations: Interactive visualizations, including graphs, charts, and animations, to help students understand complex data and statistical concepts.

	• **Audio Recordings:** Audio recordings of lectures, discussions, and other class activities, allowing students to review and reinforce their understanding of course material. • **Online Quizzes and Surveys:** Online quizzes and surveys, to assess student understanding and engagement with course content. • **e-Books and PDFs:** Electronic versions of textbooks and other reading materials, including articles, case studies, and research papers, to support student learning. • **Virtual Classroom Tools:** Virtual classroom tools, such as video conferencing software, to facilitate group discussions and hands-on projects. • **Online Discussion Boards:** Online discussion boards, where students can engage with each other and the instructor, to encourage peer-to-peer learning and collaboration.
Reading list	1. R. Kumar "Research Methodology: A Step-by-Step Guide for Beginners", SAGE Publications, 2012 2. H. Cooper, L.V. Hedges, J.C. Valentine, "The handbook of research synthesis and meta-analysis", Russell Sage Foundation 2nd ed., 2009 3. Trochim, W. M. K. The research methods knowledge base, Atomic Dog. 3rd ed., 2006 4. Paul Oliver "Understanding the research process", SAGE Study Skills Series, 2010

Module name:	**Master's research work**
Code	
Trimester	2,3,4,5
Person responsible for the module	Supervisors of master's students
Lecturer(s)	Supervisors of master's students
Language	English
Relation to curriculum	The module is designed to build upon the foundational knowledge and skills acquired during the undergraduate studies and provide students with the opportunity to engage in independent research in their field of study.
Type of teaching	• **Seminars:** Small group discussions and presentations, where students have the opportunity to engage in in-depth discussions, ask questions, and share their own perspectives on the material. • **Independent Research Projects and Internships:** Students conduct independent research projects, including internships, to gain hands-on experience in their field of study. • **Written Assignments:** Students complete written assignments, such as research proposals and a master's thesis, to demonstrate their understanding of the research process and their ability to communicate their findings effectively.

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- **Supervision and Mentorship:** Students receive guidance and feedback from a supervisor or mentor, who helps them to develop their research proposal, conduct their research project, and complete their master's thesis.
- **Feedback and Evaluations:** Students receive regular feedback and evaluations from instructors and peers on their research proposals, internships, and final thesis, to help them to continuously improve their skills and knowledge.

</td></tr>
<tr><td>Workload of course components and credits per trimester</td><td>

<table>
<tr><th rowspan="2">ECTS credits</th><th colspan="3">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><th>classroom activities</th></tr>
<tr><td>24</td><td></td><td></td><td></td><td></td><td>720</td><td>720</td></tr>
</table>

</td></tr>
<tr><td>Course assessment and forms of examination</td><td>

<table>
<tr><th>Assessment type</th><th>Number of points</th><th>Exam Form</th><th>Schedule (Week #)</th></tr>
<tr><td>Final Grade</td><td>100</td><td>Final report</td><td>During the term</td></tr>
</table>

</td></tr>
<tr><td>Requirements according to the examination regulations</td><td>

Course and university policies include:
Attendance is mandatory. Missing 30% of lessons will result in F (Fail) grade (or summer school).
Late submissions are not accepted.
No cheating, duplication, falsification of data, plagiarism, and crib
Contacting the Lecturer: students are welcome to arrange one-to-one meetings with the teacher during office hours to discuss the class.

</td></tr>
<tr><td>Recommended prerequisites</td><td>

- Completion of relevant undergraduate coursework in the field of study
- Basic knowledge of research methodologies and techniques
- Strong analytical and critical thinking skills
- Effective written and verbal communication skills

</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>

By the end of this course students will attain the following learning outcomes.
The student will show a working knowledge in:

- Developing and implementing research projects
- Applying relevant research methodologies and techniques
- Analyzing and evaluating existing research
- Conducting independent research and drawing valid conclusions
- Presenting research findings effectively through a master's thesis
- Gaining practical experience through internships

Students will have the skill to

- Develop a well-structured research proposal
- Apply appropriate research methodologies and techniques
- Analyze and evaluate existing research
- Conduct independent research and draw valid conclusions
- Communicate research findings effectively through a master's thesis

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	• Gain practical experience through internships • Apply critical thinking and problem-solving skills in the research process • Write and present research findings in a clear and professional manner • Work independently and as part of a team • Adhere to ethical considerations in research • Continuously update and improve their knowledge and skills in their field of study. **In terms of Competences, students will be able to** • Design and implement research projects • Evaluate and synthesize existing research • Analyze and interpret research data • Communicate research findings in a clear and professional manner • Apply critical thinking and problem-solving skills in the research process • Work independently and as part of a team • Adhere to ethical considerations in research • Continuously update and improve their knowledge and skills in their field of study.
Content	• Overview of the research process, including identifying a research question, selecting appropriate research methodologies, and conducting a literature review • Development of research proposals and the ethics of research • Practical experience through internships in a relevant field of study • Analysis and interpretation of research data • Effective communication of research findings, including the preparation of a master's thesis • Critical evaluation of existing research and the application of research findings to real-world situations • Professional development and career opportunities in the field of study
Media employed	The media employed in this module may include: • Lectures and seminars • Group discussions and presentations • Independent research projects and internships • Written assignments, such as research proposals and a master's thesis • Online resources, such as academic journals and databases • Guest lectures and workshops • One-on-one meetings with a supervisor or mentor • Feedback and evaluations from instructors and peers. The use of multimedia resources and technology, such as virtual meetings and online databases, may also be incorporated to enhance the learning experience and provide students with access to a wide range of information and resources.
Reading list	• Creswell, J. W. (2014). Research design: qualitative, quantitative, and mixed methods approaches (4th ed.), SAGE Publications, Inc • Trochim, W. M. K. (2006). The research methods knowledge base (3rd ed.), Atomic Dog. • Robert K. Yin (2018). Case study research and applications: design and methods (6th ed.), SAGE Publications, Inc

	• Paul Oliver (2010). Understanding the research process, SAGE Study Skills Series