NJSC «K.Zhubanov Aktobe Regional University»

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Modular guide
on educational program
6B05401-Mathematics

Aktobe

Module 1 - Language

Module	FL 1101 Foreign language
Semester(s) when the module is taught	1
Responsible teacher	Turmaganbetova G.N.
Language of instruction	English
Connection with the curriculum	GED
Forms of training	Practical clases SIWT, SIW.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (45 hours of practical classes) Independent study, including exam preparation: 25 hours of SIWT, 80 hours of SIW
ECTS	10
Mandatory and recommended prerequisites for studying the module	To successfully complete the course "English Language," students need knowledge of the following aspects of the language: phonetics – basic rules of reading and pronunciation of letters, the alphabet, and combinations in speech flow; spelling – writing letters and combinations corresponding to certain sounds; vocabulary – the most frequently used words, word-forming models; grammar – basic grammatical
Module objectives / expected learning outcomes	The goal is to develop students' intercultural and communicative competence in foreign language education at a minimum sufficient level. 1. Memorize and reproduce key words, phrases, and expressions on familiar topics; identify basic grammar rules and structures at the elementary level; acquire a basic vocabulary and common phrasal verbs. 2. Understand simple and familiar texts at a basic level; extract main ideas and information from texts on familiar topics; comprehend basic directions and instructions in English. 3. Use basic words, phrases, and grammatical structures to communicate on familiar topics; construct simple sentences and short texts in English; apply acquired language skills in everyday situations such as greetings, introductions, asking questions, and expressing simple wishes. 4. Identify main ideas and details in simple English texts; recognize basic grammar structures and vocabulary in sentences; analyze and correct mistakes and inconsistencies in their own speech. 5. Assess their level of English proficiency and identify strengths and weaknesses; evaluate the logic of text structure; maintain conversations on studied material; give recommendations in everyday situations; use language tools in speech and independently correct mistakes.
Content	In the course of foreign language teaching, various types and forms of work are used to prepare students for the subsequent use of the English language for professional purposes, as well as as a means of cognitive and communicative activities.
Form of examination	Oral exam
Training and Examination requirements	Regular attendance and active participation in class activities are required. Completion of homework assignments, including vocabulary, grammar, writing, listening, and reading tasks, is expected. Students should participate in dialogues, role-plays, and oral mini-presentations on everyday topics. Progress must be demonstrated in all four language skills: listening, speaking, reading, and writing.

List of literature	1. Davies P.A., Falla T. – *SOLUTIONS Elementary Student's Book*. Third Edition / Oxford University Press, 2018 – 164 pages. https://rmebrk.kz/search/?search=SOLUTIONS+Pre+-Intermediate 2. Romanovskaya, N.V. Professional English Language: Textbook / Chernyaeva E.V., Zelenkova S.K. – Moscow: MSTU GA, 2014. 3. Oxford Qazaq Dictionary: for the study of the discipline / Kazakh-English and English-Kazakh dictionary. Project supervisor: R. Kenzhekhanuly. – Almaty: National Translation Bureau, 2023. 65 copies. 4. Chazal, E. *Oxford EAP. A Course in English for Academic Purposes. Intermediate/B1+: Teacher's Handbook* / E. Chazal, L. Rogers. – China: Oxford University Press, 2013. 30 copies. 5. *Professionally Oriented Foreign Language (English): Textbook* / Compiled by A.Kh. Amerkhanova, M.K. Karimbergenova, B.M. Yesengeldin; Pavlodar State University named after S. Toraygyrov. – Pavlodar: Toraighyrov University, 2019. – 68 pages. ISBN 978-601-238-936-4. https://rmebrk.kz/ 6. Batinova, A.S. Practical English Course: For all specialties and fields of study / A.S. Batinova, G.N. Turzhanova. – Aktobe: Publishing House of K. Zhubanov Aktobe State University, 2008. 7. Nakesheva S.T. Methodological Guidelines for Practical Classes in the Discipline "English Language" for Full-time Students of Years 1-2. Edition: Aktobe, 2014. http://neb.arsu.kz/view?rid=5239&fid=5222 8. Baizhanova, A.A. Collection of Tests and Tasks for the Study of English Language / A.A. Baizhanova, A.S. Musralina. – Aktobe: IC ARGPU named after K. Zhubanov, 2015. 9. Berstenova A.B. Handbook of English Grammar with Practice Exercises. Edition: Aktobe, 2014. http://neb.arsu.kz/view?rid=5236&fid=5220 10. Berstenova A.B. Collection of Exercises for the English Grammar Dictionary. Edition: Aktobe, 2015. http://neb.arsu.kz/view?rid=5237&fid=5221 11. Shevyakova, V.E. Modern English: Word Order, Information Structure, Intonation / V.E. Shevyakova. – Moscow: Nauka, 1980. 12. Sabitova, Leylya Seitzharovna The Aspectual System of Russian Verbs and Methods of Its Transformation into Kazakh and English Languages: Abstract of Dissertation for the Degree of Doctor of Philosophy (PhD) (10.00.00). / Eurasian National University named after L.N. Gumilev. – Astana, 2010. – 28 pages. 13. Masalimova A.S. Handbook of English Grammar with Practice Exercises edited by A.S. Masalimova / Publishing Center of ARGPU named after K. Zhubanov, 2014. 77 pages. http://neb.arsu.kz/view?rid=5236&fid=5220

Module	FL 1101 Foreign language
Semester(s) when the module is taught	2
Responsible teacher	Turmaganbetova G.N.
Language of instruction	English
Connection with the curriculum	GED
Forms of training	Practical classes, SIWT/SIW
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (practice classes), independent study, including exam preparation, in hours: 25 hours SIWT, 80 hours SIW
ECTS	10
Mandatory and recommended prerequisites for studying the module	This module requires the knowledge, skills and abilities acquired during the study of English at the level A1 'minimal-sufficient' (pre-threshold level of foreign language proficiency according to the Common European Framework of Reference for Languages).
Module objectives / expected learning outcomes	**Module objectives:** The aim is to develop students' intercultural communicative competence through foreign language education at an adequate level (A2 Common European Framework of Reference for Languages).
	Learning Outcomes: 1. Identify the topic of a text or dialogue and recognize grammatical structures; ask and answer simple questions related to the material covered. 2. Summarize the main idea of a read or heard text, reorder parts of the text or dialogue logically, sustain conversations and discussions on familiar topics in concrete situations, and simulate everyday life scenarios. 3. Analyze grammatical structures and compare their use in context, break texts into logical segments, identify main ideas, transform and paraphrase sentences, and interpret text content in simple language. 4. Compose dialogues (simulations), summarize studied material, and describe everyday life situations. 5. Evaluate the coherence of text construction, express opinions on texts or dialogues, engage in conversations on studied material, and provide recommendations for everyday life situations.
Content	English language teaching in higher education is an independent and complete course. It is designed to provide students with training in the discipline 'Foreign Language' as one of the compulsory disciplines of the general education cycle. This discipline includes the study of topics of socio-domestic and socio-cultural spheres of communication and is aimed at the formation of intercultural-communicative competence at the level of basic standardization. You will learn and understand the most common English words and phrases: the most basic information about a person and his/her family, shopping, work, location. This is the level at which the learner will be able to speak intelligibly on the simplest topics. Vocabulary: about 1500-2500 words. Foreign Language at A2 level aims to develop the basic language skills and abilities needed to communicate in simple and everyday situations. Students learn to understand and use frequently occurring expressions and phrases, as well as to read and write simple texts.
Form of examination	Oral exam
Training and Examination requirements	Mandatory attendance at practical classes, active participation in the discussion of issues, preliminary preparation for practical classes, qualitative and timely fulfilment of assignments, participation in all forms of assessment. The final assessment takes place in the format of an oral examination (tickets). The examination is conducted in accordance with the academic integrity policy of the university and the rules of examinations. Examination questions are compiled according to Bloom's taxonomy.

List of literature	**Educational literature:** 1. Davies, P. A., & Falla, T. *SOLUTIONS Elementary Student's Book*, 3rd Edition. Oxford University Press, 2018. 164 pages. https://rmebrk.kz/search/?search=SOLUTIONS+Pre+-Intermediate 2. Romanovskaya, N. V. *Professional English Language: A Textbook* / E. V. Chernyaeva, S. K. Zelenkova. Moscow: MSTU GA, 2014. 3. *Oxford Qazaq Dictionary: For Studying the Discipline* / Kazakh-English and English-Kazakh Dictionary. Project Manager: R. Kenzhehanuly. Almaty: National Translation Bureau, 2023. 65 copies. 4. Chazal, E., & Rogers, L. *Oxford EAP: A Course in English for Academic Purposes. Intermediate/B1+ Teacher's Handbook*. China: Oxford University Press, 2013. 30 copies. 5. Amerkhanova, A. Kh., Karimbergenova, M. K., & Yesengeldin, B. M. *Professionally Oriented Foreign Language (English): Textbook*. Pavlodar: S. Toraighyrov Pavlodar State University, 2019. 68 pages. ISBN 978-601-238-936-4. https://rmebrk.kz/ **Educational and methodical literature:** 1. Batinova, A.S. *Practical English Course: For All Specialties and Fields of Study* / A.S. Batinova, G.N. Turzhanova. Aktobe: Publishing House of K. Zhubanov Aktobe State University, 2008. 2. Nakesheva, S.T. *Methodological Guidelines for Practical Classes in the Discipline "English Language" for Full-time Students of Years 1-2*. Edition: Aktobe, 2014. http://neb.arsu.kz/view?rid=5239&fid=5222
	3. Baizhanova, A.A. *Collection of Tests and Tasks for Studying English Language* / A.A. Baizhanova, A.S. Musralina. Aktobe: Publishing Center of K. Zhubanov Aktobe State University, 2015. 4. Berstenova, A.B. *Handbook of English Grammar with Practice Exercises*. Edition: Aktobe, 2014. http://neb.arsu.kz/view?rid=5236&fid=5220 5. Berstenova, A.B. *Collection of Exercises for the English Grammar Dictionary*. Edition: Aktobe, 2015. http://neb.arsu.kz/view?rid=5237&fid=5221 **Scientific literature:** 1. Shevyakova, V.E. *Modern English Language: Word Order, Information Structure, Intonation* / V.E. Shevyakova. Moscow: Nauka, 1980. 2. Sabitova, Leilya Seitzharovna. *The Aspectual-Genus System of the Russian Verb and Methods of Its Transformation into Kazakh and English Languages: Abstract of Dissertation for the Degree of Doctor of Philosophy (PhD) (10.00.00)* / L.N. Gumilyov Eurasian National University. Astana, 2010. 28 pages. 3. Masalimova, A.S. *Handbook of English Grammar with Practice Exercises*, edited by A.S. Masalimova. Publishing Center of K. Zhubanov Aktobe Regional State University, 2014. 77 pages. http://neb.arsu.kz/view?rid=5236&fid=5220 **Electronic resources:** 1. Free printable worksheets. Available at: https://busyteacher.org/classroom_activities 2. Vocabulary activities. Available at: https://www.teachingenglish.org.uk 3. English grammar exercises. Available at: https://learningapps.org/index.php?category=3&subcategory 4. English dialogue simulator of varying difficulty levels. Available at: https://catchenglish.ru/dialogi/dialogi-srednej-slozhnosti/at-the-pub.html

Module	K(R)L 1102 Kazakh (Russian) language.
Semester(s) when the module is taught	1,2
Responsible teacher	Tuleusheva Salima Diasovna
Language of instruction	Kazakh/Russian
Connection with the curriculum	University component
Forms of training	Practical classes, SROP, SRO.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 h Contact hours: 45 hours of practical classes Independent study, including preparation for exams, in hours: 25 hours SROP, 80 hours SRO
ECTS	10
Mandatory and recommended prerequisites for studying the module	Participation in all types of classes requires prior preparation and active engagement. The development of this module relies on the knowledge, skills, and abilities acquired in the following courses: Russian Language and Practical Russian Language.
Module objectives / expected learning outcomes	**Module objectives:** To develop in students the knowledge and practical skills in modern Russian language in accordance with established philological traditions and contemporary scientific paradigms. **Learning Outcomes :** 1. Masters the main studied language in its literary form; possesses fundamental methods and techniques of various types of oral and written communication in Russian. 2. Is able to formulate arguments and solve professional tasks related to the study of the Russian language. 3. Describes the language situation in Kazakhstan, identifying issues of national linguistic and cultural identity, as well as ethnic and cultural influences from a global perspective. 4. Explains studied rules of spelling, orthoepy, and punctuation. 5. Is capable of effective communication in Russian, adhering to the norms of spelling and punctuation of the standard language.
Content	The discipline is aimed at developing the language skills of learners, enabling them to engage in cognitive and communicative activities in Russian, as well as in communication contexts aligned with the implementation of state programs on trilingualism and the modernization of national spirituality and consciousness. It focuses on building competencies based on national identity and cultural codes, fostering qualities of internationalism, tolerance, and respect for world cultures and languages, alongside advanced modern technologies that support the country's modernization and the future career advancement of specialists. The teaching process will employ various methods, including seminars and blended learning approaches such as flipped classrooms, face-to-face sessions, "change worker zones," and individual rotation models. Additionally, exercises, brainstorming sessions, training, debate-dialogues, and case studies will be used.
Form of examination	Format conducting exam - oral answer By tickets .
Training and Examination requirements	All obliged visit classes and come on time . All tasks practical classes , SR O /SR O P, boundary , intermediate control should hand over on time . Out of time. sent tasks Not will be be accepted . On classes , in time surrender current , milestone and final control prohibited usage mobile phone (for exception cases works By to the instruction teacher).

List of literature	**Educational Literature in Print Format:** 1. Zhanalina, L.K., Musataeva, M.Sh. *Practical Russian Language: Textbook*. – Almaty: PrintS, 2005. – 529 p. 2. Rosenthal, D.E. *Russian Language [Text]: Collection of Rules and Exercises* / D.E. Rosenthal. – Moscow: Eksmo, 2018. – 464 p. 3. Chekina, E.B., Sansyzbaeva, S.K., Abaeva, Zh.S. *Professionally Oriented Russian Language: Educational Manual*. – Almaty: Kazakh Universities, 2017. – 272 p. 4. Ippolitova, N.A., Knyazeva, O.Yu., Savova, M.R. *Russian Language and Speech Culture in Questions and Answers: Educational Manual*. – Moscow: Prospect, 2016. – 344 p. 5. Balykhina, T.M. *Basics of Theory, Tests, and Practice Testing (Russian as a Foreign Language): Study Manual*. – Moscow: MGUA, 2003. – 242 p. **Educational and Methodological Literature in Print Format:** 6. Aikenova, R., Elgina, S.I. *Russian Language for Foreign Students: Educational and Methodological Complex*. – Almaty: Evero, 2015. – 256 p. 7. Grekov, V.F., Chizhov, V.V. *Benefit for Classes by Russian Language in Senior Classes*. – Moscow: Onyx; Peace and Education, 2008. – 512 p. 8. Khavaidarova, M.M. *Russian Language [Text]: Educational Manual*. – Almaty: Aknur, 2018. – 186 p. 9. Bespayeva, K.A., Tazhinina, A.B. *Russian Language for Students of Educational Programs [Text]: Educational Manual*. – [Place of publication not identified]: Med, 2020. – 102 p. 10. Baitenova, R.M. *Practical Stylistics of Russian Language [for Students of Non-Linguistic Specialties]: Collection of Exercises*. – Karaganda: Medet Group, 2020. – 121 p. **Electronic Publications:** 11. Igenbay, T.E., Zhandykeeva, G.E., Egizbaeva, Z.S. *Practical Russian Language: Educational Manual*. – Almaty: Kyzdar Universities Publishing, 2016. – 121 p. Republican Interuniversity Electronic Library: https://rmebrk.kz 12. Karavanova, N.B. *Matryoshka: Elementary Practical Russian Language Course*. – Moscow: Russian Language, 2015. – 336 p. Republican Interuniversity Electronic Library: https://rmebrk.kz 13. Isakova, A.G., Rumyantseva, E.V. *Intensive Practical Russian Language: Educational Manual*. – Almaty: Kyzdar Universities Publishing, 2015. – 260 p. Republican Interuniversity Electronic Library: https://rmebrk.kz 14. Sarsenova, Sh.A., Shuzheeva, Zh.L., Imanbekova, Zh.B. *Russian Language*. – Almaty: 2017. Aktobe Regional University named after K. Zhubanov: http://neb.arsu 15. Kovyneva, I.A., Rubtsova, E.V., Chirkova, V.M. *Russian Language: Educational and Methodological Manual for Russian as a Foreign Language for 2nd–3rd Year International Faculty Students*. – 2016. Aktobe Regional University named after K. Zhubanov: http://neb.arsu **Scientific Literature in Print Format:** 16. Kurmanova, B.Zh., Khalimullina, N.R., Islamgalieva, V.Zh. *New Approaches to Teaching Philological Disciplines* / Monograph. – Aktobe: LLP Liter A, 2021. – 226 p. **Scientific Literature in Electronic Editions:** 17. Ungarbaeva, G. *Training in Russian as a Non-Native/Foreign Language for Special Purposes: Theory and Practice* / Collective Monograph. – 2018. Aktobe Regional University named after K. Zhubanov: http://neb.arsu 18. Idrisova, E. *Current Problems of Modern Philology*. – 2019. Aktobe Regional University named after K. Zhubanov: http://neb.arsu 19. *Innovative Technologies in Trilingual Education: Works of Scientific School of Professor M.R. Kondubaeva* / Monograph. – Almaty, 2015. – 218 p. Kazakhstan National Electronic Library: http://kazneb.kz

Module 2 – General education

Module	ICT 1105 Information and communication technologies (in English)
Semester(s) when the module is taught	1
Responsible teacher	Shangytbayeva Gulmira Asaugalikyzy
Language of instruction	English
Connection with the curriculum	General education discipline
Forms of training	Lectures, practical and laboratory classes, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures, 15 hours of practical exercises, 15 hours of laboratory classes) Self-study, including exam preparation: 25 hours of CPR, 80 hours of CPR.
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module this module, you need the knowledge, skills and abilities acquired during the studyof science subjects in secondary school.
Module objectives / expected learning outcomes	The aim of the course is to train highly qualified specialists who can apply modern information technologies in the professional field, develop the ability to critically evaluate and analyze processes, methods of searching, storing and processing information, methods of collecting and transmitting information through digital technologies. 1. Knows and understands the basic methods and means of processing, storing, transmitting and accumulating information, the basic concepts of automated information processing, the goals and principles of using system and application software, the main components and principles of functioning of information and telecommunications networks. 2. Uses information resources, mobile, cloud services, Internet resources and automated workflow to search and store information, apply methods and tools to protect information. 3. Can manage and analyze data in various fields using digital technologies based on information security tools, e-learning methods, and basic software methods. 4. Can create algorithms and flowcharts, develop programs and perform testing and configuration of hardware and software, create and complete devices, evaluate the reliability of software and hardware. 5. Uses automated systems in office work and specialized programs to solve the problems of the relevant industry, masters the ability to understand the purpose and essence of information in the development of modern society, basic information security, including preserving state interest and value; masters the skills of applying modern technology and information technologies in the field of professional activity, develops various forms of e-learning for expansion of professional knowledge. 6. Develops programs for individual work with a computer, learns the necessary conditions for using information synthesis methods, analyzes the necessary information via the Internet, abstract journals, and electronic libraries. 7. Is able to assess the significance of the course material, the stages of analysis of the results obtained during the practice, and the consistency of conclusions. 8. Knows how to work individually and in a team, combine personal interest with a common goal; ability to analyze and sort information obtained from any options. 9. Is able to assess the formation of project activities in the specialty using modern ICT. 10. Can evaluate the stages of analysis of the results obtained in the course of practice and the correspondence of conclusions; evaluate the formation of project activities in the specialty using modern ICT.

Content	Information and communication technologies are one of the fundamental branches of scientific knowledge that form a system-information approach to analyzing the world around us about the ways and means of studying, receiving, transmitting, storing and using information from information technologies. The course "Information and Communication Technologies" is aimed at studying the updated content of the general education discipline, developing the ability to critically understand the role and significance of modern information and communication technologies in the era of digital globalization, forming new "digital" thinking, acquiring knowledge and skills using modern information and communication technologies in various activities.
Form of examination	Computer-based test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical classes, high-quality and timely completion of SRO tasks, participation in all forms of assessment.
List of literature	1. Alshanov A.K., Abildinova G.M., Ramazanova D.A. *Information Communication Technologies: Educational–Methodical Manual*. Almaty: CyberSmith, 2017. – 176 p. 2. Urmashev B.A. *Information and Communication Technology: Textbook*. Almaty, 2016. – 410 p. ISBN 978–601–7940–02–7 (Textbook in English, approved by the Ministry of Education and Science of the Republic of Kazakhstan) 3. Bidaybekov Y.Y. *Mathematical Modeling and Numerical Methods: Textbook*. Almaty, 2016. – 416 p. 4. Jomartova Sh.A. *IT Infrastructure: Textbook*. Almaty, 2016. – 308 p. 5. Kisselyova E.A. *Theoretical Foundations of Computer Science: Textbook*. Almaty, 2016. – 265 p. 6. Tokhmetov A.T., Tanchenko L.A. *Course of Lectures on Informatics: Textbook*. Almaty: TechnoErudit, 2018. – 440 p. 7. Balapanov E.K. *Zhana Informatsialyq Tekhnologiyalar: Informatikadan 30 Sabak: Oqulyq* [New Information Technologies: 30 Lessons in Informatics: Textbook]. 6th ed., revised and supplemented. Almaty: CyberSmith Publ., 2017. 8. Balapanov E.K. *Novye Informatsionnye Tekhnologii: 30 Uroki po Informatike* [New Information Technologies: 30 Lessons in Informatics]. 6th ed., supplemented. Almaty: CyberSmith, 2017. – 340 p. 9. Aman K.P., Ilyasova T.Zh. *Informatika: Praktikalıq Sabaptarğa Ädistemelik Nūsqaūlıq* [Informatics: Methodological Guide for Practical Lessons]. 10. Mukhambetzhanova S.T. *Informatika* [Computer Science]: Textbook for 6th Grade. Almaty: Atamura, 2018. – 192 p.

Module	SPKM 1104 Socio-political knowledge module
Semester(s) when the module is taught	1,2
Responsible teacher	Sarsembin U.K.
Language of instruction	Kazakh
Connection with the curriculum	University component (UC) in the cycle of basic disciplines (BD).
Forms of training	Lectures, practical and laboratory classes, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Academic workload (including contact hours, IWS) Total workload: 120 hours Contact hours: 40 hours (15 hours of lectures, 25 hours of practical classes) Independent study, including exam preparation, in hours: 20 hours of IWST (Independent Work with the Teacher), 60 hours of IWS (Independent Work of Students)
ECTS	8
Mandatory and recommended prerequisites for studying the module	To study the module "Social and Political Disciplines", the student should have knowledge of history, society and culture, law, and a background in social and humanities disciplines.
Module objectives / expected learning outcomes	To support the development of students as future professionals and citizens of the state. This involves explaining the nature of society, the patterns of its development, internal structure, and the functioning of social institutions. The module also aims to form a professional qualification characterized by a high level of political culture, capable of deeply analyzing domestic and global policies and contributing to their development.
Content	The concept of society, the social structure of society, and the patterns of societal development. The role of sociology and political science in studying the socio-economic and political development of modern society. Key concepts in sociology and political science, sociological research, types and functions of social institutions, the role of the family as a social institution, the state, political consciousness, political culture, political ideology, the role of the political elite in the spiritual and political life of the state, the activities of political parties, and more.
Form of examination	Computer-based test
Training and Examination requirements	Full mastery of the course topics, study of the relevant literature throughout the course, understanding the specifics and relevance of each topic, deep knowledge of the social structure of society and the functioning of political institutions, as well as the methods and approaches of social and humanitarian sciences.

List of literature	1. Brinkerhoff, D., Weitz, D., Ortega, S. *Foundations of Sociology: Textbook*. – Almaty: National Translation Bureau, 2018. – pp. 215–221. 2. Ritzer, G., Stepnitsky, D. *Sociological Theory: Textbook*. – Almaty: National Translation Bureau, 2018. – 856 p. 3. Gabdullina, K. *Sociology: Textbook*. – Almaty: Nur-Press, 2019. – 210 p. – ISBN 978-9965-830-86-0 : 3000.00. 4. *Socio-logical and Analytical Research on Language Policy Issues in the Republic of Kazakhstan: Social Study*. – Ed. Committee for Language Development, Ministry of Culture and Sports of the Republic of Kazakhstan. – Astana: TOO Sana, 2018. – 145 p. 5. Nazarbayev, N. *Course Toward the Future: Spiritual Modernization*. – Astana: REGIS-ST Polygraph, 2017. – 55 p. 6. Sarsenbekov, N.Zh. *Political Science (in Table Format): Study Guide*. – Almaty: SSK, 2017. – 84 p. 7. Sydykov, U. *Political Science*. – Almaty, 2012. – pp. 53–62. 8. Rakhymbayeva, A. *Political Science (Lecture Notes)*. – Astana, 2012. – pp. 67–81, 137–141. 9. Absattarov, R. *Foundations of Political Science*, Vol. 1: Study Guide. – Almaty: Karasai, 2018. – 472 p. 10. Absattarov, R. *Foundations of Political Science*, Vol. 2: Study Guide. – Almaty: Karasai, 2018. – 460 p.

Module	MHK 1105 Modern History of Kazakhstan
Semester(s) when the module is taught	2
Responsible teacher	Abdullaev Nurtaza
Language of instruction	Russian, Kazakh
Connection with the curriculum	General education discipline, main component
Forms of training	Lectures, practical classes, independent work, independent work.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 h Contact hours: 45 h (30 h lectures, 15 h practical classes) Independent study, including preparation for exams: 25 hours independent study, 80 hours independent study
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge, skills and abilities acquired during the study of school courses are required : " History of Kazakhstan", "World History", "Man. Society. Law".
Module objectives / expected learning outcomes	The purpose of studying this discipline is to provide objective knowledge about the main stages in the development of the history of Kazakhstan from ancient times to the present. Learning outcomes: Demonstrate knowledge and understanding of world history and the history of Kazakhstan; master a system of theoretical knowledge on fundamental issues in historical science; and recognize the place and role of Kazakhstan in world history and cultural processes. 1. Demonstrate knowledge of the history of Kazakhstan from ancient times to the present, integrating general, specific, and individual aspects, as well as specific facts to form a comprehensive picture of world development. 2. Analyze historical phenomena of Kazakhstan's past and present from the perspective of historicism and a dialectical understanding of the complexity and contradictions inherent in historical processes. 3. Develop the ability to critically and comprehensively analyze information from diverse historical and contemporary sources, and independently and creatively interpret social development issues both past and present. 4. Cultivate a respectful attitude toward national and world history and culture, along with a commitment to preserving and enhancing the material and spiritual heritage of humanity. 5. Assesses the significance of the uniqueness of the development of modern Kazakhstan. Critically comprehends historical processes, and is able to show ways to solve current social problems.
Content	The program for the discipline " History of Kazakhstan" consists of 5 thematic blocks: Ancient people and the formation of nomadic civilization, Turkic civilization and the Great Steppe, Kazakhstan in the new era (XVIII - early twentieth centuries), Kazakhstan in the Soviet period, Independent Kazakhstan. The discipline "History of Kazakhstan" is a mandatory discipline for all educational programs. Methods and technologies of teaching used in the process of teaching the discipline: interactive and digital technologies; project-based teaching methods; problem-based learning technology; "Jigsaw", "insert", "problem lecture", "working with historical documents", "fishbone", and others.
Form of examination	Computer test
Training and Examination requirements	Mandatory attendance of classroom lessons, active participation in discussions of issues, preliminary preparation for lectures and practical classes, high-quality and timely completion of SRO assignments, participation in all forms of assessment. Students who have mastered the course material and scored at least 50% of the total rating based on the results of the 1st and 2nd midterm assessments are admitted to the state exam.

List of literature	1. Abusseitova M.Kh. Kazakhstan and Central Asia in the 15th-17th centuries: history, politics, diplomacy. – Almaty: Daik-Press, 1998. – 592 p. 2. Abylkhozhin Zh.B. Post-Stalin period in the history of Soviet Kazakhstan: a series of doomed reforms and failed declarations (1953 - 1991). - Almaty, KBTU, 2019. - 465 p. 3. Abylkhozhin Zh.B. Country in the heart of Eurasia: Stories on the history of Kazakhstan. – Almaty: Kazakh University, 1998. – 280 p. 4. Abdurakhmanov N.A. Modern history of Kazakhstan: a textbook. - Karaganda: IP "AKNUR", 2017-346 p. AKNURPRESS 5. Abdullaev, N.A. History of independent Kazakhstan (1900-2018) textbook / - Astana: Turan, 2019. - 315 p. 6. Abdullaev, N. A. Modern history of Kazakhstan (1900-2017): textbook - Aktobe: [b. i.], 2017. - 428 p. – 7. Berdenova R.K. History of Kazakhstan: Textbook. - Almaty: TOO "Medet Group", 2019. - 296 p. AKNURPRESS 8. History of Kazakhstan. Documents and materials (1917-2012) [Text]: reader. - Almaty: Shanyrak Media LLP, 2017. - 320 p.
	9. Nazarbayev N.A. Era of Independence. Astana, 2017. 508 p. 10. Khafizova K.Sh. Steppe rulers and their diplomacy in the 18th-19th centuries. - Nur-Sultan: KISI under the President of the Republic of Kazakhstan, 2019. - 480 p. 11. Grivennaya L.A. New history of Kazakhstan (Collection of tests) : Study guide for specialty 050114 "History". - Petropavlovsk: IPO SKSU named after M. Kozybaev, 2012. - 100 p. http://rmebrk.kz/ 12. Pishulina K. A. Essays on the history of the Kazakh Khanate. Collection of articles. - Almaty: Institute of History and Ethnology named after Ch.Ch. Valikhanova, 2016. - 350 p. ISBN 978-601-7342-14-2 https://djvu.online/file/Q5IG53yDUwRAo 13. History of independent Kazakhstan [Text]: [monograph] / [Abzhanov Kh. M. et al.]; Ministry of Education and Science Rep. Kazakhstan, Institute of History and Ethnology named after. Ch. Ch. Valikhanova. — Almaty: Kazakh encyclopedias, 2011. — 399 p. : portrait, table : 25 cm; ISBN https://rusneb.ru/catalog/000199_000009_005379944/ 14. Erofeeva I.V. Symbols of Kazakh statehood (late Middle Ages and modern times). – Almaty: Daik-Press, 2001. – 256 p. 15. Erofeeva I.V. Khan Abulkhair: commander, ruler, politician. – Almaty: Daik-Press, 2007. – 456 p. 16. Ismagulov O., Ismagulova A. Origin of the Kazakh people. According to physical anthropology. – Almaty, 2017. – 196 p. 17. Kumekov B.E. The State of the Kimaks in the 9th-11th centuries. – Alma-Ata, Nauka, 1972. – 695 p. 18. Klyashtorny S. G., Sultanov T. I. States and peoples of the Eurasian steppes. Antiquity and the Middle Ages. St. Petersburg: Petersburg Oriental Studies, 2004. – 368 b 19. Koigeldiev M.K. Stalinism and repressions in Kazakhstan in the 1920s – 1940s. – Almaty, 2009. – 448 p. 20. Masanov N.E. Nomadic civilization of the Kazakhs: the foundations of life of a nomadic society. – Almaty: Gorizont, 1995. – 320 p. 21. Sultanov T.I. Raised on a white felt mat. Khans of the Kazakh steppes. Astana: Astana Damu, 2006. – 256 p.

Module	PE 1106 Physical education
Semester(s) when the module is taught	1-2-3-4
Responsible teacher	Mukhtarov Seitkerey Malikovich, Erzhanov Gabit Kuangalievich
Language of instruction	Kazakh/Russian
Connection with the curriculum	Basic discipline of OOD
Forms of training	Practical classes.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 240 h Contact hours: 45 h (60 h practical classes)
ECTS	
Mandatory and recommended prerequisites for studying the module	Remember and master vital physical skills such as walking, running, skiing, swimming, and others. Acquire physical culture methods for developing specific physical qualities. Develop the ability to independently conduct physical exercises. Understand the basics of physical culture and sports, including physical education, self-education, physical development, functional fitness, psychophysical fitness, and professional areas of physical education. Apply knowledge of the functioning of the human body and its individual systems under the influence of physical exercise and sports in various environmental conditions. Analyze scientific, biological, and practical foundations of physical culture and the principles of a healthy lifestyle. Synthesize practical skills and abilities to maintain and improve health, mental well-being, and psychophysical capabilities, as well as personality traits and self-determination in physical culture. Evaluate your own physical condition accurately. Possess skills for self-assessment of performance, fatigue, and recovery, and apply physical culture methods to correct and improve physical state.
Module objectives / expected learning outcomes	The aim of the academic discipline "Physical Education" at the university is to develop students' social and personal competencies, ensuring the targeted use of appropriate means of physical education and sports to maintain and strengthen health and prepare for professional activities.
Content	The discipline "Physical Education" is included in the section of the curriculum for the preparation of students of all forms of education, areas of training specialties and is a mandatory section of the humanitarian component of education and is aimed at developing the physical culture of the student's personality, preparing for social and professional activities, maintaining and strengthening health, which contributes to expansion and in-depth study of knowledge and skills in physiology, pedagogy and psychology, which allows to increase the level of professional competence of the future specialist. The teaching methods used: the method of circuit training, repeated method, *frontal method,* competitive *method.*
Form of examination	Practical
Training and Examination requirements	Mandatory attendance of classes, active participation in physical education lessons, preliminary preparation for practical classes, high-quality and timely completion of homework, participation in all forms of assessment.

List of literature	1. Aizakov A. D. Monitoring Physical Health and Healthy Lifestyle of Children, Adolescents, and Young People at the Regional Level: Tutorial. – [Place of publication unknown], 2012. – 120 p. 2. Evseev Yu. I. Physical Education: Textbook. – 6th ed. – [Place of publication unknown]: Phoenix, 2010. – 444 p.: ill. – (Higher Education). 3. Barchukova G. V., Mizin A. N. Table Tennis at the University: Teaching Aid for Students of Non-Physical Education Universities. – Moscow: SportAkademPress, 2002. – 132 p. 4. Melnikov V. S. Physical Education in the University: Textbook. – Orenburg: OSU, 2002. – 114 p. [https://rmebrk.kz/] 5. Grishina Yu. I. Physical Education of a Student: Study Guide. – Rostov-on-Don: Phoenix, 2019. – 283 p. – (Higher Education). – ISBN 978-5-222-31286-5. [https://rmebrk.kz/] 6. Evseev Yu. I. Dene Shynyktyru [Physical Conditioning]: Textbook. – 6th ed. – [Place unknown]: Phoenix, 2010. – 444 p.: ill. – (Higher Education). 7. Barchukova G. V., Mizin A. N. Jogars About the Ornynds of Tennis: Teaching Aid for Non-Physical Education Students. – Moscow: SportAkademPress, 2002. – 132 p. 8. Kulanova K. K., Marchibaeva U. S., Akhmetov A. K. Theory and Methodology of National Sports in Schools: Teaching Aid. – Almaty: New Book, 2021. 9. Uanbaev E. K. Teaching Methodology of Physical Education and Sport: Teaching Aid. – 4th ed., revised. – Oskemen: S. Amanzholov East Kazakhstan State University "Berel" Publishing House, 2014. – 360 p. [https://rmebrk.kz/] 10. Uanbaev E. K., Uanbaeva F. Zh. Theory of Physical Culture and Sport: Teaching Aid. – Oskemen: East Kazakhstan State University Press, 2006. – 267 p. – ISBN 9965-687-86-2.

Module	NS 1201 National spirituality
Semester(s) when the module is taught	1
Responsible teacher	Begimbaeva Zh.S.
Language of instruction	Russian
Connection with the curriculum	Curriculum Schedule (KII)
Forms of training	Lectures, practical classes (seminars), independent work, independent work
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 90 hours Time: 30 hours (15 hours of lectures, 15 hours of practical classes) Personal training, including exam preparation, in hours: 15 hours of independent self-study, 45 hours of independent self-study
ECTS	5
Mandatory and recommended prerequisites for studying the module	problems of ethnicity, the place of the Kazakh people in history and the modern world, the concept of national spirituality, national identity, national values, national self-awareness
Module objectives / expected learning outcomes	The course is aimed at the formation of a modern personality in a spiritual and moral sense, at education in the spirit of respect for national and universal values, folk traditions, and the heritage of the Kazakh people.
Content	The course explores the system of spiritual values, Kazakh national existence, the ethnocultural foundations of spirituality, national consciousness, traditions, customs, tolerance, rituals, art, literature, national education, traditional culture, aimed at shaping a broad worldview, benevolence, and goodwill towards others, as well as striving for good values. The study of this discipline forms a spiritually and morally developed personality, raised in the spirit of respect for global and universal values, folk traditions, and spiritual heritage.
Form of examination	computer testing
Training and Examination requirements	Mandatory attendance of classroom lessons, active participation in discussions of issues, preliminary preparation for lectures and practical classes, high-quality and timely completion of independent work assignments, participation in all forms of assessment.
List of literature	1.K.-Zh. Tokayev. "Abai and Kazakhstan in the 21st Century" // Kazakhstanskaya Pravda, January 9, 2020. 2. Nysanbayev A.N. "The Development of Farabi Studies in Kazakhstan: Results, Problems, and Prospects" // Voprosy Filosofii. No. 5, 2011. Pp. 119-129. 3. Ardakani R.D. "Farabi - The Founder of Islamic Philosophy." Translated from Persian by A. Absalikov. - Moscow: "Sadra" LLC, 2014. - 132 pages. 4. Khoja Akhmet Yassawi // Kazakhstan. National Encyclopedia. Vol. V. - Almaty: Kazakh Encyclopedia, 2006. 5. Balasaguni, Yusuf Khass Hajib // Kazakhstan. National Encyclopedia. - Almaty: Kazakh Encyclopedia, 2004. - Vol. I. 6. Kunanbayev A. "The Book of Words" (Qara söz). Translated from Kazakh by R. Seysenbaev, Semipalatinsk, 2001. 7. "Twenty Poems of Abai" (all known translations, compiled and translated by M. Adibayev), Almaty, 2005. 8. Abai Kunanbayev. Selected Works (series "Wisdom of the Ages"), Moscow, Russian Raritet, 2006. 9. Artykbaev Zh.O. "Ethnology and Ethnography: Textbook" / Zh.O. Artykbaev. - Astana: Foliant, 2001. - 304 pages. 10. Kadirkulova A.N. "Ethnology of the Kazakh People: Educational and Methodical Complex. 5B050114-History Specialty" / A.N. Kadirkulova. - Aktobe: K. Zhubanov Aktobe Regional State University, 2014. - 55 pages.

Module 3 – Fundamentals of Mathematics

Module	**BA 1202 Bases of Algebra**
Semester(s) when the module is taught	1
Responsible teacher	Imanchiev A.E.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Profile discipline, university component
Forms of training	Lectures, practical classes, independent work, independent work.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 120 h Contact hours: 20 h (20 h lectures, 30 h practical classes) Independent study, including preparation for exams, in hours: 20 hours independent study, 60 hours independent study
ECTS	4
Mandatory and recommended prerequisites for studying the module	To master this module, you need knowledge, skills and abilities acquired in the following courses : algebra and basic analysis
Module objectives / expected learning outcomes	The main objective of the course *Bases of Algebra* is to develop students' fundamental mathematical knowledge and skills needed for further study in algebra, number theory, discrete mathematics, logic, and related mathematical disciplines. The course introduces key algebraic concepts and methods, including matrices, determinants, systems of linear equations, complex numbers, polynomials, algebraic structures, groups, rings, fields, vector spaces, and linear operators.
	Learning outcomes: 1. Apply basic operations with matrices and determinants, including finding minors, cofactors, and the inverse matrix. 2. Solve systems of linear algebraic equations using various methods such as Cramer's rule, matrix method, and Gauss elimination. 3. Work with complex numbers and polynomials, perform algebraic operations, and use their properties. 4. Understand fundamental algebraic structures such as groups, rings, fields, and ordered fields, and explain their properties. 5. Determine the order of group elements, analyze cyclic groups, cosets, normal subgroups, quotient groups, and homomorphisms. 6. Understand and work with vector spaces, including bases, dimension, scalar products, and orthogonalization. 7. Analyze linear operators, their kernels and images, matrix representations in different bases, eigenvalues, eigenvectors, and diagonalization conditions. 8. Apply theoretical knowledge to solve standard and advanced problems across the main sections of algebra.
Content	The course covers the basic elements of linear algebra, including the definition and types of matrices, matrix operations, inverse matrices, the definition and properties of determinants, and the use of minors, cofactors, and Laplace expansion to compute higher-order determinants and find inverse matrices. It also focuses on methods for solving systems of linear algebraic equations, introducing fundamental concepts of SLAE, the rank of a matrix, the Kronecker–Capelli theorem, and solution techniques such as Cramer's rule and the matrix method. Further topics include the Gauss elimination method and the study of linear homogeneous systems, their general form, solution properties, fundamental solution sets, and their relation to the coefficient matrix and determinants. The course introduces key algebraic structures such as sets, binary operations, groups and their properties, rings, ordered fields, symmetric groups, cosets, and Cayley's theorem, as well as the order of a group element, cyclic groups, normal subgroups, quotient groups, and homomorphism kernels. It examines vector spaces, their properties, n-dimensional spaces, bases and dimensions, scalar products, orthogonalization, and finite-dimensional vector spaces. Additionally, the course covers linear operators, their kernels and images, matrix representations in

	different bases, eigenvalues and eigenvectors, spectral properties, and diagonalization. The field of complex numbers is also included, along with Euclidean and unitary spaces, operations on complex numbers, and their trigonometric form.
Form of examination	Traditional
Training and Examination requirements	Mandatory attendance of classes. Students are expected to actively participate in discussions during lectures and practical sessions, as well as to prepare for lectures and practical classes in advance. Students must complete SRO (independent work) assignments accurately and on time, and participate in all types of assessment, including tests, assignments, and other forms of performance evaluation.
List of literature	**Core reading** 1. Algebra and Theory numbers: Textbook . 2004, Balyukevich E.L., Romannikov A.N.http://rmebrk.k z/book/62202 2.Pismennyi D.T. Lecture notes on higher mathematics. Part 1. - 11th ed. - M.: Iris-press, 2011. RMEB. http://rmebrk.kz/book/1159098 3. Algebra And Number theory: a tutorial. 2014, A.A. Mukhambetova 4.Minorsky V.P. Collection of problems in higher mathematics. Moscow: Nauka. 2010. 5.Lungu K.N., Makarov E.V. Higher Mathematics. Guide to solving problems. Part 1. - M., FIZMATLIT, 2005. http://neb.arsu.kz/ru/view?rid=3752&fid=3707 6.Melnikova I.N., Soboleva T.S., Fastovets N.O. Methodical recommendations for practical classes in higher mathematics. Part 1. Elements of linear algebra (For the faculty of Automation and Computer Engineering) - M .: Gubkin Russian State University of Oil and Gas, 2013. - 66 p. https://kvm.gubkin.ru/LinAlgeba.pdf **Supplementory reading** 7.Ilyin V. A. , Kurkina A. V. Higher Mathematics. - M.: Prospect, 2014. 8.Danko P.E., Popov A.G., Kozhevnikova T.Ya., Danko S.P. Higher Mathematics in Exercises and Problems: Tutorial. - 7th ed., corrected. - M.: AST; Peace and Education, 2014. http://neb.arsu.kz/ru/view?rid=6540&fid=6526 RMEB. http://rmebrk.kz/book/1159050 9.Zhunisbekova D. A. Mathematics : methodical instructions. - Almaty: CyberSmith, 2021 . 10.Kritskov L.V. Higher Mathematics in Questions and Answers: Study Guide. - Moscow: Prospect, 2014. RMEB. http://rmebrk.kz/book/1176593 11.Gusak A.A. Higher Mathematics. V.1., 2. Minsk: Tetra Systems, 2001.

Module	BG 1203 Bases of Geometry
Semester(s) when the module is taught	2
Responsible teacher	Kaidasov Zh.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Basic discipline, university component
Forms of training	Lectures, practical classes, independent work, independent work.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 90 h Contact hours: 45 h (15 h lectures, 15 h practical classes) Independent study, including preparation for exams, in hours: 45 hours independent study, 15 hours independent study
ECTS	3
Mandatory and recommended prerequisites for studying the module	To master this module, you need knowledge, skills and abilities acquired while studying the following courses: Introduction to Mathematics, Analytical Geometry.
Module objectives / expected learning outcomes	Studying the discipline " Bases of Geometry" sets the following goal: to equip the future specialist with specific knowledge on such sections of geometry as foundations of geometry, construction problems, and projective geometry, which will provide an understanding of intersubject connections. Also such sections as: basic concepts of geometry; intersecting and parallel lines; perpendicular lines; properties of parallel lines; geometric shapes and bodies; coordinates; vectors, actions on vectors. Learning Outcomes: 1. Understand analytic geometry on a plane and in space, vector algebra, properties and classification of second-order curves and surfaces, and geometric interpretations of vectors. 2. Solve problems involving lines, planes, curves, and surfaces; perform vector operations; reduce equations to canonical forms; construct and analyze geometric objects. 3. Explain and interpret geometric and vector concepts, apply knowledge in mathematics and related fields, and systematically organize and generalize geometric information.
Content	The course covers analytic geometry and vector algebra on a plane, including coordinate systems, points, lines, distances, polar coordinates, vector operations, scalar products, collinearity, and linear dependence. It examines straight lines on a plane, their equations, relative positions, angles, distances, and families of lines. Second-order curves such as circles, ellipses, hyperbolas, and parabolas are studied, including their equations, properties, canonical forms, and classifications. In space, students learn about vectors, scalar, vector, and mixed products, planes, their equations, relative positions, and distances. The course also covers lines in space, angles with planes, second-order surfaces including spheres, ellipsoids, hyperboloids, cones, cylinders, paraboloids, canonical forms, cross-sections, and applications, with a general review and systematization of the material.
Form of examination	Oral
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in discussions of issues, preliminary preparation for lectures and practical classes, high-quality and timely completion of SRO assignments, participation in all forms of assessment.
List of literature	1.Alexandrov A.D., Netsvetaev N.Yu. Geometry. – M.: Nauka, 1990. 2.Atanasian L.S., Bazylev V.T. Geometry. Part. II. - M.: Enlightenment, 1987. 3. Аналитикалык ге ометрия жэне сызыктык алгебра элементтер! : oku kuraly / Zh. Kaidasov, E. K. Kagazbaeva, N. Askarova. Aktobe : K. Zhubanov at. AMU RBB, 2002. -78 Beth 4.Atanasian L.S., Gurevich G. B. Geometry Part 2. – M.: Education, 1985.

	5.Efimov N.V. Higher geometry. - M.: Science, 1993. 6. Metodicheskie napravleniya: samopodno y rabote studentov [Methodological guidelines for students ' work]. on the disc. "Algebra and geometry" for students. 1st year special 050703 - information systems of full-time education / A. A. Kulzhumieva. Aktobe: RIO ASU named after K.Zhubanov,

Module	MA(1) 1204 Mathematical Analysis I
Semester(s) when the module is taught	2
Responsible teacher	Otarov K.T.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Basic discipline, Component by choice
Forms of training	Lectures, practical classes, guided self-study (GSS), self-study (SS).
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical classes) Self-study, including exam preparation, in hours: 25 hours of guided self-study (GSS), 80 hours of self-study (SS)
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge, skills, and abilities acquired in the following courses are required: School course of algebra, geometry, algebra, and the basics of analysis.
Module objectives / expected learning outcomes	The aim of the trainingis to provide a comprehensive introduction to the basic concepts of the theory of functions, which are the main object of research Learning outcomes: A. Understands the role of mathematical analysis within the broader system of mathematical knowledge; masters fundamental concepts and methods of mathematical analysis; possesses a culture of thinking and is capable of generalization, analysis, information processing, goal setting, and selecting methods to achieve those goals; is familiar with key facts, ideas, and mathematical methods; able to apply knowledge and techniques from other disciplines within mathematical analysis; understands how to use mathematical analysis in various scientific fields; and knows the main stages of the development of mathematics. B. Able to prepare and edit texts of professional and socially significant content; proficient in mathematical language; capable of proving theorems; and skilled in creating mathematical models to solve problems across different domains. C. Able to logically construct coherent oral and written communication; capable of creating and analyzing mathematical objects using analytical methods; and skilled in public speaking, discussions, and debates. D. Ready to collaborate effectively with colleagues and work in teams. E. Able to competently apply knowledge and teaching skills; understands the social importance of the teaching profession; is motivated to engage in professional activities; and takes responsibility for the outcomes of their work.
Content	This course is devoted to the study of the fundamental principles of mathematical analysis and serves as the foundation for further studies in higher mathematics. It introduces sets and number systems, the properties of real numbers, and numerical sets. Functions of a single variable are studied in detail, including their properties, methods of representation, and graphical interpretation. Special attention is given to the theory of limits: limits of numerical sequences and functions, properties of limits, and practical problems involving their calculation using various techniques. An important part of the course is the concept of continuity and the analysis of continuous functions. A significant section of the course focuses on differential calculus of functions of one variable. Topics include the derivative and its geometric and physical interpretation, differentiation rules, and the application of derivatives to function analysis, graphing, monotonicity, convexity, extrema, and optimization

	problems. In this way, students acquire essential analytical skills that form the basis for advanced study in mathematical analysis and related disciplines.
Form of examination	Traditional
Training and Examination requirements	Information about sets and logical symbolism. Number sets. The set of real numbers. Bounded number sets. Function. Theory of limits. Limit of a function. Limit of a numerical sequence. Continuity of a function. Differential calculus of a function of one variable. Integral calculus of a function of one variable.
List of literature	**Core reading** 1. Otarov, K.T. *Mathematical Analysis.* – Almaty: Economics, 2012. - 536 p. 2. Temirgaliyev, N. *Mathematical Analysis.* – Part 1. Almaty: Mektep, 1987. 3. Akhmetova, S.S. *Mathematical Analysis* : 2008. RMEB 4. Fichtenholz, G.M. *Course of Differential and Integral Calculus.* Vol. 1: Educational Aid. – 4th Edition. – Moscow: Science, Chief Editorial Office of Physics and Mathematics Literature, 2012. - 656 p. 5. Ibrashev, K.I., Yerkegulov, Sh.T. *Mathematical Analysis Course*. Vol. 1. Almaty: KazMeyOkupedBAS, 1963. 6. Karasheva, G. *Mathematical Analysis:* 2017. RMEB 7. Ibraimkulov, A.M., Smatova, G.D. *Mathematical Analysis-I* : 2010. RMEB 8. Aktaeva, U.Zh. *Mathematical Analysis* 2011. RMEB 9. Makhimova, S.Zh. *Mathematical Analysis* 2011. RMEB 10. Zhanabayev, Zh. *Mathematical Analysis.* 2008. RMEB **Supplementory reading** 11. Pilidi, V.S. *Mathematical Analysis: Textbook* - Rostov-on-Don: Phoenix, 2009. - 239 p. 12. Askarova, M.A. *Elementary Mathematics. Algebra: Educational Tool.* – Karasai, 2013. 13. Musin, A.T. *Mathematics I (Lectures. Test Collection): Educational Tool* / A.T. Musin. – Almaty: LLC RPBK Daur, 2012. - 312 p. 14. Nadyrbekova, A.Sh. *Mathematical Analysis.* – Taraz, TarMPI, 2012. - 260 p. 15. Tokybetov, Zh.A. *Mathematical Analysis,* 2009. 16. Il'inin, V.A., Sadovnichiy, V.A., Sendov, B.L. *Mathematical Analysis.* – Part 1. Moscow University Press, 2004. 17. Zorich, V.A. *Mathematical Analysis.* – Part 1. Moscow: MCNMO, 2002. 18. Bavrin, I.I., Matrosov, V.L. *General Course of Higher Mathematics.* Moscow: Prosveshchenie, 1995. 19. Il'in, V.A., Poznyak, E.G. *Fundamentals of Mathematical Analysis.* Moscow: Nauka, 1971. **Electronic Resources:** 1. Republican Interuniversity Electronic Library (RMEB) – http://rmebrk.kz/ 2. Electronic Database of the "Epigraph" Publishing House – https://elib.kz/ 3. Electronic Library of ARU – http://neb.arsu.kz/ru 4. Internet Library – https://math.ru/lib/ 5. Internet Library of the Moscow Center for Continuous Mathematical Education (Vitaliy Arnold) – http://ilib.mccme.ru/ 6. Electronic Portal of Multimedia Textbooks of MU "Epigraph" – https://mbook.kz/ru/index/ 7. Republican Scientific and Technical Library (RNTB) – http://aktobe.rntb.kz/ 8. Electronic Educational-Scientific Physics and Mathematics Library of EqWorld – http://eqworld.ipmnet.ru/ru/library/mathematics.htm

Module 4.1 – Public Law

Module	AH 2107 Academic honesty
Semester(s) when the module is taught	3
Responsible teacher	Kagazbaeva A K
Language of instruction	Kazakh/Russian
Connection with the curriculum	General education discipline
Forms of training	Lectures, practical classes, independent work, independent work.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 h Contact hours: 45 h (15 h lectures, 30 h practical classes) Self-study , including preparation for exams, in hours: 25 hours independent study, 80 hours independent study
ECTS	
Mandatory and recommended prerequisites for studying the module	*To master this module, knowledge, skills and abilities acquired during the study of the following courses are required: Philosophy , Pedagogical Practice*
Module objectives / expected learning outcomes	The purpose of the discipline is to cultivate a culture of academic integrity in students, ensuring mastery of the norms and rules of honest educational and scientific conduct. It aims to develop critical thinking skills, responsible decision-making, and adherence to ethical standards within the educational environment. Upon completion of the course, the student will: Know the fundamental principles of academic honesty, including honesty, responsibility, respect, fairness, and trust; understand the various forms of academic dishonesty such as plagiarism, cheating, falsification, and fabrication; be familiar with the university's academic integrity policy and the consequences of violations. Be able to apply the norms of academic honesty in educational and research activities; correctly format citations, references, and bibliographies; and independently complete academic and research assignments while avoiding dishonest practices. Possess skills to identify and prevent academic misconduct; demonstrate ethical writing abilities in essays, term papers, and research papers; and employ effective academic planning strategies to reduce the risk of misconduct.
Content	The concept of academic honesty and its importance. Why academic honesty is important in the educational and scientific environment. Basic principles: honesty, trust, fairness, respect, responsibility. Plagiarism: what it is and how to avoid it. Self-plagiarism and dual use of works. Falsification and fabrication of data. Cheating and assistance in completing assignments. Using third-party services (including AI) without permission. Citations and bibliography. Working with scientific and educational materials. The difference between paraphrasing and plagiarism. Academic code of honor. Consequences of violations: disciplinary measures, cancellation of results, expulsion. The procedure for considering cases of violations. Effective time management. Independent completion of assignments. Ethics in scientific research. Analysis of situations (case studies) on the topic of violations. Completing exercises to recognize plagiarism. Writing an essay or paper with correct citations.
Form of examination	*Essay*
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in discussions of issues, preliminary preparation for lectures and practical classes, high-quality and timely completion of independent work assignments, participation in all forms of assessment.

List of literature	1. Code of Academic Integrity of Students of the Republic of Kazakhstan. — Astana: League of Academic Integrity, 2019. 2. Methodological recommendations for ensuring academic integrity in universities of the Republic of Kazakhstan. — Ministry of Science and Higher Education of the Republic of Kazakhstan, 2022. 3. Academic honesty: a teaching aid / edited by A.B. Aimagambetov . - Almaty: Bilim , 2021. 4. Asanova D.B. Academic culture and academic honesty of students. - Almaty: Kazakh Universities , 2020. 5. Serikbaeva A.K. Formation of academic honesty in students: theory and practice. - Nur-Sultan: L.N. Gumilyov ENU, 2021. 6. Smagulova R.R. Problems of academic plagiarism in universities of Kazakhstan. // Bulletin of KazNU . Series: Pedagogical Sciences. - 2020. No. 2. 7. Kusainov A.K. Ethics and academic honesty in the digital educational environment. // Education and Science of Kazakhstan, 2022. No. 1. 8. Aidosova A. et al. Academic Integrity in Higher Education in Kazakhstan: Challenges and Perspectives. // Central Asian Journal of Education, 2021. 9. Documents of the League of Academic Integrity of Kazakhstan (Adaldyq League): codes, anti-plagiarism, regulations. — adaldyq.kz 10. Anti-corruption strategy of the Republic of Kazakhstan for 2022–2026. — Approved by the Decree of the President of the Republic of Kazakhstan.

Module	Phil 2107 Philosophy
Semester(s) when the module is taught	2
Responsible teacher	Senior teacher Yeshniyazova Ainur Chapaevna
Language of instruction	Kazakh
Connection with the curriculum	Profile discipline, university component
Forms of training	Lectures, practical classes, independent work, independent work.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 h Contact hours: 45 h (15 h lectures, 30 h practical classes) Independent study, including preparation for exams, in hours: 25 hours independent study, 80 hours independent study
ECTS	5
Mandatory and recommended prerequisites for studying the module	To successfully master a philosophy course, no special training is required, but it is useful to have some basic knowledge and skills. Skills in reading and understanding texts, critical thinking, the ability to analyze arguments, identify logical errors and formulate your own point of view, literacy and the ability to express thoughts, an interest in the questions of "why" and "what for". Philosophy begins with wonder and the desire to understand the underlying causes of phenomena, the meaning of life, justice, truth, etc.
Module objectives / expected learning outcomes	The goal of the philosophy course is to develop in students the ability to think critically, analyze in depth and understand fundamental questions of existence, knowledge, morality, consciousness and society. The philosophy course is aimed at: ✔ Developing skills of argumentation and logical thinking – the ability to construct, analyze and evaluate arguments. ✔Developing the ability to think independently – understanding different points of view and forming one's own position. ✔ Introduction to key philosophical traditions and concepts such as being, epistemology, ethics, philosophy of mind, etc. ✔Understanding the historical context of the development of philosophical thought - from antiquity to modern philosophy.
Content	The material in the basic philosophy course is presented as a concise series of lectures, which nevertheless covers a wide range of key philosophical topics outlined in the state educational standard. The textbook focuses on questions commonly asked in exams to assess students' understanding and depth of knowledge. Philosophical issues are examined in close connection with humanism, legal consciousness, and other forms of spiritual and value-based comprehension of reality. This course aims to help students, through engagement with philosophical content, develop their own philosophical stance and independently navigate complex life issues.
Form of examination	Computer test
Training and Examination requirements	Educational requirements (during the semester): attendance of classes, Regular participation in lectures and seminars is mandatory, activity in seminars, study of philosophical texts, mandatory reading of primary sources, preparation for discussion of key ideas in seminars, writing written works, essays, reports or analytical notes on course topics, participation in all forms of assessment.

List of literature	1. Khasanov M.Sh. "Philosophy" (sign language translation) is a textbook recommended by the Kazakh National University named after al-Farabi, corresponds to the standard program of the Ministry of Education and Science of the Republic of Kazakhstan. 2. Abisheva A.K. "Philosophy" - a textbook for students, master's students and PhD students of higher educational institutions, edited by Z.K. Shaukenova. 3. Nurysheva G.Zh. "Philosophy" is a textbook published in Almaty in 2013. 4. Petrova V.F., Khasanov M.Sh. “Philosophy” is a textbook published in Almaty in 2014. 5. Barlybaeva G.G. “Evolution of ethical ideas in Kazakh philosophy” is a study published in Almaty in 2011. 6. Segizbaev O.A. “Kazakh philosophy of the son of Tarikh” - a book translated by Nurysheva G.Zh. and M. Sabit, published in 2017. 7. Begalinova K.K., Alzhanova U.K. “Philosophy” (Part 1 and 2) is a textbook published in Almaty in 2014. 8. Masalimova A.R., Altayev Zh.A., Kasabek A.K. “Kazakh Philosophy” is a textbook published in Almaty in 2018. 9. Hess R. "25 Key Books on Philosophy" is a book published in 1999. 10. Johnston D. "A Brief History of Philosophy" - 2010 edition. 11. 14. Johnston D. “A Brief History of Philosophy: From Socrates to Derrida.” –A&C Black, 12. 2006. – 211 p. (Johnston, D. “A Brief History of Philosophy: From Socrates to Darrida.”- 13. A&C Black, 2006. - 211 pi.) 14. 15. Kenny A. “New History of Western Philosophy.” Volume 1-4. –Oxford University Press, 15. 2006 - 2010. (Kenny A. "New History of Western Philosophy". Volume 1-4 - Oxford 16. University Press, 2006-2010) 17. 16. Humphreys P. “The Oxford Handbook of Philosophy of Science.” – Oxford University 18. Press, 2016. (Humphreys P. "The Oxford Handbook of Philosophy of Science". – Oxford 19. University Press, 2016) 20. 17. Estlund D. “The Oxford Handbook of Political Philosophy.” –Oxford University Press, 21. 2017. (Estland Di. “The Oxford Handbook of Palitical Philosophy.” - Oxford University 22. press, 2016) 23. 18. Cappelen H., Gendler T., Hawthorne J. The Oxford Handbook of Philosophical 24. Methodology. – Oxford University Press, 2016. (Kappelen

Module 4.2. – Socio-economic

Module	BBE 2108 Basics of business and entrepreneurship
Semester(s) when the module is taught	2
Responsible teacher	Duissenbayeva B.B.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Elective component
Forms of training	Lectures, practical classes, IWST (Independent Work with the Teacher), IWS (Independent Work of Students).
Academic load (incl. contact hours and SIW - Students' Independent Work	Academic workload (including contact hours, IWS) Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical classes) Independent study, including exam preparation, in hours: 25 hours of IWST (Independent Work with the Teacher), 80 hours of IWS (Independent Work of Students)
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge, skills, and competencies gained from studying the following course are required: *Basics of Entrepreneurship*.
Module objectives / expected learning outcomes	Study of the conceptual foundations of business, development of entrepreneurial thinking, and basic skills in developing one's own business. Learning outcomes: 1. Understand the essence of economic phenomena and processes, and know and comprehend the theory of entrepreneurship. 2. Apply in practice the peculiarities of various legal forms of business organization. 3. Formulate different aspects of ensuring the functioning of a business. 4. Evaluate the achieved results of the economic activity of an enterprise. 5. Master methods of analyzing the impact of various factors on business development.
Content	The course provides practical training in business thinking psychology, skills in choosing a business idea, learning business models and planning core entrepreneurial activities, skills in working with the target audience in marketing and entrepreneurship, sales strategies, and management of entrepreneurial resources. It also covers methods of designing financial models and attracting investments, as well as the basics of tax and legal literacy and the responsibilities of entrepreneurs. The program is practice-oriented, allowing students to work independently on their own startups while studying the course. Additionally, the program utilizes the case method, demonstrating the ability to apply acquired knowledge through examples from active Kazakhstani and international companies.
Form of examination	Computer test
Training and Examination requirements	1. Everyone must attend classes and arrive on time. 2. If you cannot attend due to a valid reason, you must inform in advance. 3. Assignments must be submitted on time. 4. Be able to argue your point of view, strive for professional growth, and possess skills in working with literature. 5. Late assignments will not be accepted.

List of literature	**Core reading:** 1. Kuratko, Donald F. *Entrepreneurship: Theory, Process, Practice*. – Almaty: Public Foundation "National Translation Bureau". – 2019. – 514 p. 2. Shalbolova U.Zh., Baizholova R.A., Egemberdieva S.M., Ryspekova M.O., Rakhmetulina Zh.B. *Basics of Entrepreneurship: A Textbook* / Edited by Shalbolova U.Zh. – Almaty, Evero, 2018. – 236 p. Link 3. *Methodological Guide: Student Workbook "Basics of Entrepreneurship"* / E.S. Duysenhanov, N.E. Zhuldyzbaev, A.S. Uspaeva, A.S. Utepkalieva, S. Atageldinova, G.E. Kerimbek – NPP "Atameken" – Nur-Sultan: Public Organization "Young Disabled People of the City of Astana", 2019. – 206 p. 4. Isabekov B.N. *Innovation and Entrepreneurship: A Textbook* / B.N. Isabekov, L.K. Mukhambetova. – Almaty: "Evero" Publishing House, 2016. – 592 p. Link 5. *Business Organization, Vol. II: Study Guide* / A.M. Balkybaeva, N.V. Kishko, R.A. Karabasov, et al. – Almaty: Bastau, 2020. – 392 p. 6. *Entrepreneurship: Creating a Business – Basics* / Chris Nguyen – KIMEP University Publications, 2015. Link **supplementary reading:** 1. Mamytova S.N. *History of Entrepreneurship in Kazakhstan in the Second Half of the 19th – Early 20th Century*. – Almaty, EVERO, 2018. – 324 p. Link 2. Duysenhanov E.S., Shcheglov S.A., Khanin D., Seitenova A.A. *Basics of Entrepreneurship and Business*. Electronic Textbook. – Almaty: "Kokzhiek-Horizon", 2019. Link 3. Lipovka, A.V. *Social Entrepreneurship as a Key to Increasing Social Responsibility in the Republic of Kazakhstan*. // *Social Entrepreneurship in Kazakhstan: Materials of the International Scientific-Practical Conference "Development of Social Entrepreneurship in Kazakhstan"*, Almaty, February 27, 2015. – Almaty, 2015. – pp. 74–77. Link 4. Osterwalder, A., Pigneur, I. *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. Link **Electronic resources:** 1. https://demeufund.kz/ - KMF-Demeu 2. http://e.gov.kz - Official website of the Electronic Government of Kazakhstan 3. https://afk.kz/ - Association of Financiers of Kazakhstan (AFK) 4. https://amanatpartiasy.kz/?lang=ru - "Amanat" Party 5. https://epigraph.kz/ - Epigraph electronic textbook database 6. http://rmebrk.kz/resources - Republican Inter-University Electronic Library 7. http://kazneb.kz – Kazakh National Electronic Libra

Module	Phil 2107 Philosophy
Semester(s) when the module is taught	2
Responsible teacher	Senior teacher Yeshniyazova Ainur Chapaevna
Language of instruction	Kazakh
Connection with the curriculum	Profile discipline, university component
Forms of training	Lectures, practical classes, independent work, independent work.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 h Contact hours: 45 h (15 h lectures, 30 h practical classes) Independent study, including preparation for exams, in hours: 25 hours independent study, 80 hours independent study
ECTS	5
Mandatory and recommended prerequisites for studying the module	To successfully master a philosophy course, no special training is required, but it is useful to have some basic knowledge and skills. Skills in reading and understanding texts, critical thinking, the ability to analyze arguments, identify logical errors and formulate your own point of view, literacy and the ability to express thoughts, an interest in the questions of "why" and "what for". Philosophy begins with wonder and the desire to understand the underlying causes of phenomena, the meaning of life, justice, truth, etc.
Module objectives / expected learning outcomes	The goal of the philosophy course is to develop in students the ability to think critically, analyze in depth and understand fundamental questions of existence, knowledge, morality, consciousness and society. The philosophy course is aimed at: ✔ Developing skills of argumentation and logical thinking – the ability to construct, analyze and evaluate arguments. ✔Developing the ability to think independently – understanding different points of view and forming one's own position. ✔ Introduction to key philosophical traditions and concepts such as being, epistemology, ethics, philosophy of mind, etc. Understanding the historical context of the development of philosophical thought - from antiquity to modern philosophy.
Content	The material in the basic philosophy course is presented as a concise series of lectures, which nevertheless covers a wide range of key philosophical topics outlined in the state educational standard. The textbook focuses on questions commonly asked in exams to assess students' understanding and depth of knowledge. Philosophical issues are examined in close connection with humanism, legal consciousness, and other forms of spiritual and value-based comprehension of reality. This course aims to help students, through engagement with philosophical content, develop their own philosophical stance and independently navigate complex life issues.
Form of examination	Computer-based test
Training and Examination requirements	Regular participation in lectures and seminars is mandatory, activity in seminars, study of philosophical texts, mandatory reading of primary sources, preparation for discussion of key ideas in seminars, writing written works, essays, reports or analytical notes on course topics, participation in all forms of assessment.

List of literature	1. Khasanov M.Sh. "Philosophy" (sign language translation) is a textbook recommended by the Kazakh National University named after al-Farabi, corresponds to the standard program of the Ministry of Education and Science of the Republic of Kazakhstan. 2. Abisheva A.K. "Philosophy" - a textbook for students, master's students and PhD students of higher educational institutions, edited by Z.K. Shaukenova. 3.Nurysheva G.Zh. "Philosophy" is a textbook published in Almaty in 2013. 4. Petrova V.F., Khasanov M.Sh. “Philosophy” is a textbook published in Almaty in 2014. 5. Barlybaeva G.G. “Evolution of ethical ideas in Kazakh philosophy” is a study published in Almaty in 2011. 6. Segizbaev O.A. “Kazakh philosophy of the son of Tarikh” - a book translated by Nurysheva G.Zh. and M. Sabit, published in 2017. 7. Begalinova K.K., Alzhanova U.K. “Philosophy” (Part 1 and 2) is a textbook published in Almaty in 2014. 8. Masalimova A.R., Altayev Zh.A., Kasabek A.K. “Kazakh Philosophy” is a textbook published in Almaty in 2018. 9. Hess R. "25 Key Books on Philosophy" is a book published in 1999. 10.Johnston D. "A Brief History of Philosophy" - 2010 edition. 11.. Johnston D. “A Brief History of Philosophy: From Socrates to Derrida.” –A&C Black,2006. – 211 p. (Johnston, D. “A Brief History of Philosophy: From Socrates to Darrida.”-A&C Black, 2006. - 211 pi.)

Module 5.1 – Additional chapters of mathematical analysis

Module	MA(II) 2205 Mathematical Analysis II
Semester(s) when the module is taught	3
Responsible teacher	Otarov K.T.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Basic discipline, Elective component
Forms of training	Lectures, practical classes, guided self-study (GSS), self-study (SS).
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 120 hours Contact hours: 40 hours (20 hours of lectures, 20 hours of practical classes) Self-study, including exam preparation, in hours: 20 hours of guided self-study (GSS), 60 hours of self-study (SS)
ECTS	4
Mandatory and recommended prerequisites for studying the module	Elementary Mathematics, Mathematical Analysis-1
Module objectives / expected learning outcomes	**Learning Outcomes:** **A.** Knows the place of mathematical analysis in the system of mathematical knowledge; masters the basic principles and methods of mathematical analysis; possesses a culture of thinking, is capable of generalization, analysis, information perception, setting goals, and choosing ways to achieve them; masters the key facts, ideas, and methods of mathematics; is able to apply knowledge and methods from other disciplines in mathematical analysis; knows how to use mathematical analysis knowledge in other scientific areas; understands the key stages of the development of mathematics. **B.** Capable of preparing and editing texts of professional and socially significant content; proficient in mathematical language; able to prove theorems; capable of creating mathematical models to solve problems from various fields. **C.** Able to logically construct oral and written speech; capable of creating and investigating mathematical objects using analytical methods; able to use public speaking skills, engage in discussions and debates. **D.** Ready to collaborate with colleagues and work in a team. **E.** Knows how to effectively apply knowledge and teaching skills, realizes the social importance of the future profession, is motivated to perform professional activities; is responsible for the results of professional work.
Content	The course is designed to deepen students' knowledge of advanced concepts in mathematical analysis, with a particular focus on integral calculus, series theory, and the study of multivariable functions. It begins with an in-depth treatment of indefinite, definite, and improper integrals, emphasizing both theoretical foundations and practical methods of evaluation. Considerable attention is devoted to numerical, functional, and power series, including convergence criteria and applications to solving mathematical and applied problems.The course further develops students' understanding of differential calculus of functions of several variables. Topics include partial derivatives, the total differential, the gradient, tangent planes, and conditions for local and global extrema. Building upon this, the study of multiple integrals (double and triple integrals) is introduced, highlighting their geometric and physical interpretations and their evaluation in different coordinate systems.
Form of examination	Blank test

Training and Examination requirements	Mandatory attendance of classes, active participation in discussions, preliminary preparation for lectures and practical sessions, high-quality and timely completion of independent work assignments, and participation in all types of assessments.
List of literature	**Core reading:** 1. Otarov, K.T. *Mathematical Analysis.* – Almaty: Ekonomika, 2012. – 536 pages. 2. Ibrashev, K.I., Erkeghulov, Sh.T. *Courses on Mathematical Analysis.* – Vol. 2. Almaty: 1970. 3. Temirgaliyev, N. *Mathematical Analysis.* – Part 2. Almaty: Ana Tili, 1991. 4. Fichtenholz, G.M. *Course of Differential and Integral Calculus.* Vol. 1, 2, 3: Textbook. – 4th Edition. – Moscow: Nauka. Editorial Board of Physical and Mathematical Literature, 2012. – 656 pages. 5. Tokybetov, Zh.Ä. *Mathematical Analysis*, 2009. 6. Karasheva, G. *Mathematical Analysis.* – 2017. RMEB. 7. Ibrayimkulov, Ä.M., Smatova, G.D. *Mathematical Analysis.* – 2010. RMEB. 8. Aqtaeva, Ü.J. *Mathematical Analysis.* – 2011. RMEB. 9. Makhimova, S.J. *Mathematical Analysis.* – 2011. RMEB. 10. Tilepiev, M.Sh., Urazmaganbetova, E.Ü. *Collection of Problems in Mathematical Analysis: Teaching Aid. Part 2, 3.* – Aktau: Sh. Esenov KMU, 2011. **Supplementary reading:** 11. Pilidi, V.S. *Mathematical Analysis: Textbook* – Rostov-on-Don: Feniks, 2009. – 239 pages. 12. Guryanova, K.N., et al. *Mathematical Analysis: Teaching Aid.* / K.N. Guryanova, U.A. Alexeeva, V.V. Boyarshinov. – Yekaterinburg: Ural University Press, 2014. 13. Musin, A.T. *Mathematics (Lectures, Test Collection): Teaching Aid.* / A.T. Musin. – Almaty: RPBC Daur, 2012. – 312 pages. 14. Nadybekova, A.Sh. *Mathematical Analysis.* – Taraz, TarMPI, 2012. – 260 pages. 15. Zorich, V.A. *Mathematical Analysis.* – Vol. 2. Moscow: MTSNMO, 2002. 16. Bavrin, I.I., Matrosov, V.L. *General Course in Higher Mathematics.* – Moscow: Prosveshchenie, 1995. 17. Ilyin, V.A., Poznyak, E.G. *Fundamentals of Mathematical Analysis.* – Moscow: Nauka, 1971. **Electronic Resources:** 1. Republic Interuniversity Electronic Library (RMEB) – http://rmebrk.kz/ 2. Electronic Database of the Publishing House “Epigraph” – https://elib.kz/ 3. Electronic Library of ARU – http://neb.arsu.kz/ru 4. Internet Library – https://math.ru/lib/ 5. Internet Library of the Moscow Center for Continuous Mathematical Education (Vitaly Arnold) – http://ilib.mccme.ru/ 6. Multimedia Textbook Portal of the MU “Epigraph” – https://mbook.kz/ru/index/ 7. Republican Scientific and Technical Library (RNTB) – http://aktobe.rntb.kz/ 8. Electronic Educational and Scientific Physics and Mathematics Library of the EqWorld website – http://eqworld.ipmnet.ru/ru/library/mathematics.htm

Module	PSPHM 2206 Practicum on Solving of Problems of Higher Mathematics (in English)
Semester(s) when the module is taught	3
Responsible teacher	Kemaladinova U.U.
Language of instruction	Kazakh / Russian
Connection with the curriculum	Core Discipline, Elective Component
Forms of training	Practical Sessions, Instructor-Guided Independent Work (IGIW), Self-Directed Learning (SDL)
Academic load (incl. contact hours and SIW - Students' Independent Work	Total Academic Workload: 150 hours Contact Hours: 45 hours (Practical Sessions: 45 hours) Independent Study (including exam preparation): IGIW - 25 hours, SDL - 80 hours
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge of the school course of algebra and basic analysis is required.
Module objectives / expected learning outcomes	The purpose of studying this discipline is to systematize students' knowledge of the school mathematics curriculum; to highlight the role and specificity of mathematical language and fundamental concepts; to develop practical problem-solving skills, mathematical culture, and intuition; to foster a general culture of logical thinking; and to establish a solid foundation of mathematical knowledge aligned with their professional path.
Content	The course is aimed at developing students' skills in solving problems in the main areas of higher mathematics while using the English language. It covers arithmetic operations on numbers, as well as transformations of rational, irrational, trigonometric, exponential, and logarithmic expressions. Students study methods for solving equations and inequalities of various types, as well as systems of equations. Special attention is given to working with word problems and translating them into mathematical form. The course also includes elements of mathematical analysis such as limits, derivatives, and integrals of elementary functions.
Form of examination	Blank test
Training and Examination requirements	Requirements for training and examinations Mandatory attendance of classroom lessons, active participation in discussions of issues, preliminary preparation for practical classes, high-quality and timely completion of independent work assignments.
List of literature	1. V. V. Konev «The elements of mathematics», workbook, part 2, published by Tomsk Polytechnic University, 2009. 2. V. V. Konev «The elements of mathematics», textbook, published by Tomsk Polytechnic University, 2009. 3. V. V. Konev «Higher mathematics», textbook, part 2, published by Tomsk Polytechnic University, 2009. 4. V. V. Konev «The elements of mathematics», workbook, published by Tomsk Polytechnic University, 2009. 5. W. W. Lchen, X. T. Duong "Elementary mathematics", Kyiv, 2012, electronic version. 6. V. V. Konev «Mathematics, preparatory course algebra», workbook, published by Tomsk Polytechnic University, 2012. University, 2009. 7. V. N. Litvinenko, A. G. Mordkovich "Workshop on Elementary Mathematics. Algebra. Trigonometry." Moscow: Education, 1991. 8. V. A. Gusev, V. N. Litvinenko, A. G. Mordkovich "Workshop on Elementary Mathematics. Geometry." Moscow: Education, 1992. 9. V. V. Zaitsev et al. Elementary Mathematics Moscow 1974

Module	MA(III) 2207 Mathematical Analysis III
Semester(s) when the module is taught	4
Responsible teacher	Otarov K.T.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Basic discipline, Component by choice
Forms of training	Lectures, practical classes, guided self-study (GSS), self-study (SS).
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 180 hours Contact hours: 60 hours (30 hours of lectures, 30 hours of practical classes) Self-study, including exam preparation, in hours: 30 hours of guided self-study (GSS), 90 hours of self-study (SS)
ECTS	6
Mandatory and recommended prerequisites for studying the module	Mathematical Analysis 1, Mathematical Analysis 2
Module objectives / expected learning outcomes	**Learning Outcomes :** **A.** Knows the place of mathematical analysis in the system of mathematical knowledge; possesses the fundamental concepts and methods of mathematical analysis; possesses a culture of thinking, capable of generalizing, analyzing, perceiving information, setting goals, and choosing ways to achieve them; knows the basic facts, ideas, and methods of mathematics; is able to apply the knowledge and methods of other disciplines in mathematical analysis; can use the knowledge of mathematical analysis in other scientific fields; knows the main stages of the development of mathematics. **B.** Is capable of preparing and editing texts of professional and socially significant content; possesses mathematical language; is capable of proving theorems; is capable of creating mathematical models to solve problems from various fields. **C.** Is capable of logically constructing both oral and written speech; is capable of creating and investigating mathematical objects using analytical methods; is capable of using public speaking, debating, and polemic skills. **D.** Is ready for collaboration with colleagues and for working in a team. **E.** Is able to competently apply teaching knowledge and skills, understands the social significance of their future profession, is motivated to perform professional activities, and is capable of taking responsibility for the results of their professional activities.
Content	This course is the final stage of the mathematical analysis cycle and focuses on advanced and applied areas of analysis. It covers elements of functional analysis, the theory of functions of a complex variable, Fourier series, and their application in the expansion of functions. Fourier integrals and their use in solving problems of mathematical physics are also studied. Special emphasis is placed on differential equations, their types and solution methods, as well as integral transforms (including the Laplace and Fourier transforms), which are widely used in theoretical and applied mathematics, physics, and engineering. The course also includes an in-depth study of higher-order multiple integrals, surface integrals, and the further development of vector analysis methods. By the end of the course, students will have acquired a comprehensive understanding of advanced methods of mathematical analysis and the skills to apply them in research and professional practice.
Form of examination	Blank test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical exercises, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.

List of literature	**Core Reading:** 1. Otarov H. T., Azhimbayev D. T. *Functions of Several Variables*. – Aktobe, 2022. – 190 p. 2. Nadyrbekova A. Sh. *Mathematical Analysis*. – Taraz: TarSPI, 2012. – 260 p. 3. Temirgaliyev N. *Mathematical Analysis. Part 3*. – Almaty: Education, 1997. 4. Fikhtengolts G. M. *Course in Differential and Integral Calculus*. Vol. 1, 2, 3. – 4th ed. – Moscow: Nauka, Chief Editorial Office for Physical and Mathematical Literature, 2012. – 656 p. 5. Tokybetov Zh. A. *Mathematical Analysis*, 2009. 6. Karasheva G. *Mathematical Analysis*. – RSE, 2017. 7. Aktaeva U. Zh. *Mathematical Analysis*. – RSE, 2011. 8. Makhmedzhanov N. *Collection of Problems in Higher Mathematics*. – Almaty, 2008. – 690 p. 9. Tlepiev M. Sh., Urazmagambetova E. U. *Collection of Problems in Mathematical Analysis: A Manual*. Part 2, Part 3. – Aktau: Caspian State University of Technology and Engineering named after Sh. Yessenov, 2011. **Supplementary Reading:** 10. Pilidi V. S. *Mathematical Analysis: Textbook*. – Rostov-on-Don: Phoenix, 2009. – 239 p. 11. Guryanova K. N., Alekseeva U. A., Boyarshinov V. V. *Mathematical Analysis: A Textbook*. – Yekaterinburg: Ural University Publishing House, 2014. 12. Musin A. T. *Mathematics (Lectures, Exercises): Study Guide*. – Almaty: ZHSHS RPBK "Dauir", 2012. – 312 p. 13. Bavrin I. I., Matrosov V. L. *General Course of Higher Mathematics*. – Moscow: Prosveshchenie, 1995. 14. Ilyin V. A., Poznyak E. G. *Fundamentals of Mathematical Analysis*. – Moscow: Nauka, 1971. **Electronic Resources:** 1. Republican Interuniversity Electronic Library (RMEB) – http://rmebrk.kz/ 2. Electronic database of the publishing house "Epigraf" – https://elib.kz/ 3. AGC Electronic Library – http://neb.arsu.kz/ru 4. Online Library – https://math.ru/lib/ 5. Internet Library of the Moscow Center for Continuing Mathematical Education (Vitaly Arnold) – http://ilib.mccme.ru 6. Electronic portal of multimedia textbooks by "Epigraf" – https://mbook.kz/ru/index/ 7. Republican Scientific and Technical Library (RNTB) – http://aktobe.rntb.kz/ 8. EqWorld Electronic Educational Physical and Mathematical Library – http://eqworld.ipmnet.ru/ru/library/mathematics.htm

Module	DE 2208 Differential Equations
Semester(s) when the module is taught	4
Responsible teacher	Mynbayeva ST, PhD, senior lecturer
Language of instruction	English language
Connection with the curriculum	Compulsory/elective/specialization module
Forms of training	lectures, practical work , independent work , independent work
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 180 Contact hours lectures, practical classes , SRSP: 30/30/30 Independent work, including preparation for exams, in hours: 90
ECTS	*4*
Mandatory and recommended prerequisites for studying the module	Mathematical analysis
Module objectives / expected learning outcomes	Teach students mathematical culture, teach them to understand the basics of Applied and practical problems, and teach them to establish interdisciplinary connections using simple differential equations. 1. Knowledge of the problem solving of The Theory of Elementary differentials and its application. 2. Application of basic classical methods for solving a given problem, familiarization with practical methods for describing physical processes. 3. Knowledge of practical methods of solving limits and initial problems of differential equations, the ability to summarize the given problem. 4. Formation of a general view of differential equations, the ability to perceive, process, accumulate information, and interact with them. 5. Ability to work with various methods of solving these problems.
Content	The course is devoted to the study of the main methods for solving differential equations and systems of equations. It covers first-order and higher-order differential equations, their basic types, and solution techniques. Special emphasis is placed on linear and nonlinear equations, the use of integrating factors, and methods of order reduction. The course also examines systems of differential equations, their classification, and approaches to finding solutions. In addition, first-order partial differential equations and their applications in practical problems are considered.
Form of examination	oral
Training and Examination requirements	The final evaluation will take place in the format of an exam. The exam will be held in accordance with the university's academic integrity policy and examination regulations. The subject examination form is accepted in the orally form. According to the credit amount of the subject, a pool of tasks is created, the tasks are created with a special template. Questions are formulated according to Bloom's taxonomy. There are 3 questions in the examination ticket. The maximum score for the ticket is 100 points. If plagiarism or copying is detected , the exam results will be automatically canceled and the subject will be retaken in the summer semester. Final control questions (exam) https://univer.arsu.kz/

List of literature	1. Trench WF Elementary Differential Equations. – Department of Mathematics Trinity University San Antonio, Texas, USA, 2013, – 663 p. 2. Nagy G. Ordinary Differential Equations. – Mathematics Department Michigan State University, 2020. – 419 p. 3. Jiri Lebl . Notes on Diffy Qs: Differential Equations for Engineers. eBook , 2020. – 466 p. 4. Adkins WA, Davidson MG Ordinary Differential Equations. – Springer New Heidelberg Dordrecht London, 2012. – 815 p. 5. Graig A. Tracy. Lectures on Differential Equations. – Department of Mathematics University of California, 2017. – 165 p. 6. Chasnov JR Differential Equations. – The Hong Kong University of Science and Technology, 2020. – 128 p. 7. Kupferman R. Ordinary Differential Equations. – Institute of Mathematics The Hebrew University, 2012. – 118 p. 8. Ipatova V.M., Pyrkova O.A., Sedov V.N. Differential Equations : Solution Methods . – M.: MIPT, 2012. – 140 p. 9. Feofanova V.A. Differential equations. Lectures, examples and problems. – Nizhny Tagil: NTI (branch) UrFU 2015. – 128 p. 10. Muratova T.V. Differential equations: Textbook and practical training for secondary vocational education. Moscow: Publishing House Yurait, 2016. – 435 p. 11. Kolekeev K.D., Nazarova K.Zh. Differential tendeuler . – Almaty: Housing Society RPBK “ Dauir ”, 2012. – 216 b. 12. Mohan C. Joshi. Ordinary Differential Equations: Modern Perspective. Department of Mathematics at IIT Bombay, Hardcover, 2006. – 276 p. 13. Kapadia D. Differential Equation Solving with Dsolve . – Wolfram Research. Inc., 2008. – 118 p. 14. Clay C. Ross. Differential Equations: an introduction with Mathematica. 2nd Ed · – Department of Mathematics at the University of the South, 2004. – 444 p. 15. Coddington E. A., Carlson R. Linear Ordinary Differential Equations. – Society for Industrial and Applied Mathematics, 1997. – 354 p

Module 5.2 – Selected Chapters of Mathematical Analysis

Module	MA(II) 2205 Mathematical Analysis II
Semester(s) when the module is taught	3
Responsible teacher	Otarov K.T.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Basic discipline, Component by choice
Forms of training	Lectures, practical classes, guided self-study (GSS), self-study (SS).
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 120 hours Contact hours: 40 hours (20 hours of lectures, 20 hours of practical classes) Self-study, including exam preparation, in hours: 20 hours of guided self-study (GSS), 60 hours of self-study (SS)
ECTS	4
Mandatory and recommended prerequisites for studying the module	Elementary Mathematics, Mathematical Analysis-1
Module objectives / expected learning outcomes	**Learning outcomes:** **A.** Knows the place of mathematical analysis in the system of mathematical knowledge; masters the basic principles and methods of mathematical analysis; possesses a culture of thinking and is capable of generalization, analysis, information perception, goal setting, and selecting appropriate methods to achieve those goals; masters key facts, ideas, and methods of mathematics; is able to apply knowledge and methods from other disciplines in mathematical analysis; knows how to use mathematical analysis knowledge in other scientific fields; understands the key stages in the development of mathematics. **B.** Is capable of preparing and editing texts of professional and socially significant content; is proficient in mathematical language; is able to prove theorems; is capable of creating mathematical models to solve problems from various fields. **C.** Is able to logically construct oral and written communication; is capable of creating and investigating mathematical objects using analytical methods; is able to use public speaking skills and engage in discussions and debates. **D.** Is prepared to collaborate with colleagues and work effectively in a team. **E.** Knows how to effectively apply knowledge and teaching skills, understands the social importance of the future profession, is motivated to engage in professional activities, and takes responsibility for the results of their professional work.
Content	The course is designed to deepen students' knowledge of advanced concepts in mathematical analysis, with a particular focus on integral calculus, series theory, and the study of multivariable functions. It begins with an in-depth treatment of indefinite, definite, and improper integrals, emphasizing both theoretical foundations and practical methods of evaluation. Considerable attention is devoted to numerical, functional, and power series, including convergence criteria and applications to solving mathematical and applied problems.The course further develops students' understanding of differential calculus of functions of several variables. Topics include partial derivatives, the total differential, the gradient, tangent planes, and conditions for local and global extrema. Building upon this, the study of multiple integrals (double and triple integrals) is introduced, highlighting their geometric and physical interpretations and their evaluation in different coordinate systems.
Form of examination	Blank test
Training and Examination requirements	Mandatory attendance at online and in-person classes, active participation in discussions, preliminary preparation for lectures and practical sessions, high-quality and timely completion of independent work assignments,

	participation in all types of assessments.
List of literature	**Core reading:** 1. Otarov, K.T. *Mathematical Analysis.* – Almaty: Ekonomika, 2012. – 536 pages. 2. Ibrashev, K.I., Erkeghulov, Sh.T. *Courses on Mathematical Analysis.* – Vol. 2. Almaty: 1970. 3. Temirgaliyev, N. *Mathematical Analysis.* – Part 2. Almaty: Ana Tili, 1991. 4. Fichtenholz, G.M. *Course of Differential and Integral Calculus.* Vol. 1, 2, 3: Textbook. – 4th Edition. – Moscow: Nauka. Editorial Board of Physical and Mathematical Literature, 2012. – 656 pages. 5. Tokybetov, Zh.Ä. *Mathematical Analysis*, 2009. 6. Karasheva, G. *Mathematical Analysis.* – 2017. RMEB. 7. Ibrayimkulov, Ä.M., Smatova, G.D. *Mathematical Analysis.* – 2010. RMEB. 8. Aqtaeva, Ü.J. *Mathematical Analysis.* – 2011. RMEB. 9. Makhimova, S.J. *Mathematical Analysis.* – 2011. RMEB. 10. Tilepiev, M.Sh., Urazmaganbetova, E.Ü. *Collection of Problems in Mathematical Analysis: Teaching Aid. Part 2, 3.* – Aktau: Sh. Esenov KMU, 2011. **Supplementary reading:** 11. Pilidi, V.S. *Mathematical Analysis: Textbook* – Rostov-on-Don: Feniks, 2009. – 239 pages. 12. Guryanova, K.N., et al. *Mathematical Analysis: Teaching Aid.* / K.N. Guryanova, U.A. Alexeeva, V.V. Boyarshinov. – Yekaterinburg: Ural University Press, 2014. 13. Musin, A.T. *Mathematics (Lectures, Test Collection): Teaching Aid.* / A.T. Musin. – Almaty: RPBC Daur, 2012. – 312 pages.

Module	PSPEM 2206 Practicum on Solving of Problems of Elementary Mathematics (in English)
Semester(s) when the module is taught	3
Responsible teacher	Kemaladinova U.U.
Language of instruction	Kazakh / Russian
Connection with the curriculum	Core Discipline, Elective Component
Forms of training	Practical Sessions, Instructor-Guided Independent Work (IGIW), Self-Directed Learning (SDL)
Academic load (incl. contact hours and SIW - Students' Independent Work	Total Academic Workload: 150 hours Contact Hours: 45 hours (Practical Sessions: 45 hours) Independent Study (including exam preparation): IGIW - 25 hours, SDL - 80 hours
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge of the school course of algebra and basic analysis is required.
Module objectives / expected learning outcomes	The purpose of studying the discipline is to systematize the knowledge of the school mathematics course; to reveal the role and specificity of mathematical language and basic concepts of mathematics; to develop practical skills in solving problems, to develop mathematical culture and intuition, to cultivate a general culture of thinking, to form basic mathematical knowledge in students in accordance with the profession.
Content	The course is aimed at developing students' practical skills in solving problems in elementary mathematics while using the English language. It covers arithmetic operations on numbers, transformations of rational and irrational expressions, as well as trigonometric, exponential, and logarithmic functions Methods for solving equations and inequalities of various types are studied. Special attention is given to developing students' ability to use mathematical terminology and to present solutions in English. The practicum combines problem-solving, discussion of methods, and independent student work.
Form of examination	Blank test
Training and Examination requirements	Requirements for training and examinations Mandatory attendance of classroom lessons, active participation in discussions of issues, preliminary preparation for practical classes, high-quality and timely completion of independent work assignments.
List of literature	1. V. V. Konev «The elements of mathematics», workbook, part 2, published by Tomsk Polytechnic University, 2009. 2. V. V. Konev «The elements of mathematics», textbook, published by Tomsk Polytechnic University, 2009. 3. V. V. Konev «Higher mathematics», textbook, part 2, published by Tomsk Polytechnic University, 2009. 4. V. V. Konev «The elements of mathematics», workbook, published by Tomsk Polytechnic University, 2009. 5. W. W. Lchen, X. T. Duong "Elementary mathematics", Kyiv, 2012, electronic version. 6. V. V. Konev «Mathematics, preparatory course algebra», workbook, published by Tomsk Polytechnic University, 2012. University, 2009. 7. V. N. Litvinenko, A. G. Mordkovich "Workshop on Elementary Mathematics. Algebra. Trigonometry." Moscow: Education, 1991. 8. V. A. Gusev, V. N. Litvinenko, A. G. Mordkovich "Workshop on Elementary Mathematics. Geometry." Moscow: Education, 1992. 9. V. V. Zaitsev et al. Elementary Mathematics Moscow 1974

Module	DICFSV 2206 Differential and integral calculus of function of several variables
Semester(s) when the module is taught	4
Responsible teacher	Utesov A. B
Language of instruction	Kazakh
Connection with the curriculum	Professional discipline, IE
Forms of training	Lectures, Practical Sessions, Instructor-Guided Independent Work (IGIW), Self-Directed Learning (SDL)
Academic load (incl. contact hours and SIW - Students' Independent Work	Total Academic Workload: 150 hours Contact Hours: 60 hours (Lectures: 30 hours, Practical Sessions: 30 hours) Independent Study (including exam preparation): IGIW - 30 hours, SDL - 90 hours
ECTS	6
Mandatory and recommended prerequisites for studying the module	Elementary mathematics, Mathematical analysis 1
Module objectives / expected learning outcomes	To develop professional and methodological competencies in future mathematics teachers through in-depth training in analytical geometry. Learning Outcomes: A. Acquire, comprehend, and apply key principles, rules, and formulas in analytical geometry. B. Identify and interpret structured outcomes independently and understand the essential value of fundamental knowledge. C. Master content at a professional level and critically evaluate its applications. D. Select and apply appropriate methods for solving problems, and understand the importance of geometrical problem-solving. E. Engage in lifelong learning independently, communicate acquired knowledge effectively, express ideas using mathematical language, and evaluate the significance of analytical geometry in academic and professional contexts.
Content	The course is aimed at developing students' knowledge and skills in working with functions of two or more variables. It covers the concepts of partial derivatives, the total differential, and the gradient, as well as the conditions for local and global extrema. Special attention is given to practical methods for analyzing multivariable functions and their applications. A significant part of the course is devoted to integral calculus: double and triple integrals, their geometric and physical interpretations, and methods of evaluation in rectangular, polar, cylindrical, and spherical coordinate systems. The course concludes with applied problems demonstrating how differential and integral calculus of multivariable functions is used in physics, engineering, and economics.
Form of examination	Blank test
Training and Examination requirements	Regular attendance in classes is mandatory. Students are expected to engage actively in the discussion of course topics, demonstrate preparedness for lectures and practical sessions, and complete all Independent Study (IS) assignments with high quality and within set deadlines. Participation in all forms of assessment, including formative and summative evaluations, is required.

List of literature	1. Zhautikov O.A. Course in Mathematical Analysis. Textbook. Association of Higher Education Institutions of the Republic of Kazakhstan. – Almaty: “Ekonomik” Publishing, 2014. 2. Ibrashev Kh.I., Erkegulov Sh.T. Course in Mathematical Analysis. Vol. I. Textbook. Association of Higher Education Institutions of the Republic of Kazakhstan. – Almaty: “Ekonomik” Publishing, 2014. 3. Temirgaliev N. Mathematical Analysis. Vol. II. Study Guide. – Almaty: Ana tili, 1991. 4. Aidos E.Zh. Higher Mathematics, Vols. 1 and 2. Almaty, 2008. 5. Kasymov K.A., Kasymov E.A. Course of Higher Mathematics (Mathematical Analysis). Vols. 1-2, Almaty, KazNU, 2002. 6. Makhmedzhanov N. Collection of Higher Mathematics Problems. Almaty, 2005. 7. Sakhanov N., Zhanbyrbayev B. Higher Mathematics. Almaty, Kaynar, 1993.

Module	DE 2208 Differential Equations
Semester(s) when the module is taught	5
Responsible teacher	Mynbayeva ST, PhD, senior lecturer
Language of instruction	English language
Connection with the curriculum	Compulsory/elective/specialization module
Forms of training	lectures, practical work , independent work , independent work
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 180 Contact hours lectures, practical classes , SRSP: 30/30/30 Independent work, including preparation for exams, in hours: 90
ECTS	*6*
Mandatory and recommended prerequisites for studying the module	Mathematical analysis
Module objectives / expected learning outcomes	**Objective of the Course:** Teach students mathematical culture, develop their understanding of the basics of applied and practical problems, and train them to establish interdisciplinary connections through the study of simple differential equations. **Learning Outcomes:** 1. Knowledge of solving problems in the theory of elementary differential equations and understanding their application. 2. Application of classical methods for solving given problems, and familiarization with practical approaches to describing physical processes. 3. Understanding practical methods for solving boundary value and initial value problems in differential equations, and the ability to summarize and interpret the given problems. 4. Development of a broad perspective on differential equations; ability to perceive, process, and accumulate information, and to interact with mathematical content effectively. 5. Competence in using various methods to solve differential equation problems. **Course Topics:** ● Differential equations of the first and higher orders ● Systems of differential equations ● Differential equations involving partial derivatives of the first order

Content	**Objective of the Course:** Teach students mathematical culture, develop their understanding of the basics of applied and practical problems, and train them to establish interdisciplinary connections through the study of simple differential equations. **Learning Outcomes:** 1. Knowledge of solving problems in the theory of elementary differential equations and understanding their application. 2. Application of classical methods for solving given problems, and familiarization with practical approaches to describing physical processes. 3. Understanding practical methods for solving boundary value and initial value problems in differential equations, and the ability to summarize and interpret the given problems. 4. Development of a broad perspective on differential equations; ability to perceive, process, and accumulate information, and to interact with mathematical content effectively. 5. Competence in using various methods to solve differential equation problems. **Course Topics:** ● Differential equations of the first and higher orders ● Systems of differential equations ● Differential equations involving partial derivatives of the first order
Form of examination	oral
Training and Examination requirements	The final evaluation will take place in the format of an exam. The exam will be held in accordance with the university's academic integrity policy and examination regulations. The subject examination form is accepted in the orally form. According to the credit amount of the subject, a pool of tasks is created, the tasks are created with a special template. Questions are formulated according to Bloom's taxonomy. There are 3 questions in the examination ticket. The maximum score for the ticket is 100 points. If plagiarism or copying is detected , the exam results will be automatically canceled and the subject will be retaken in the summer semester. Final control questions (exam) https://univer.arsu.kz/

List of literature	1. Trench, W.F. *Elementary Differential Equations.* Department of Mathematics, Trinity University, San Antonio, Texas, USA, 2013. – 663 p. 2. Nagy, G. *Ordinary Differential Equations.* Mathematics Department, Michigan State University, 2020. – 419 p. 3. Lebl, Jiri. *Notes on Diffy Qs: Differential Equations for Engineers.* eBook, 2020. – 466 p. 4. Adkins, W.A., Davidson, M.G. *Ordinary Differential Equations.* Springer, New Heidelberg Dordrecht London, 2012. – 815 p. 5. Tracy, Graig A. *Lectures on Differential Equations.* Department of Mathematics, University of California, 2017. – 165 p. 6. Chasnov, J.R. *Differential Equations.* The Hong Kong University of Science and Technology, 2020. – 128 p. 7. Kupferman, R. *Ordinary Differential Equations.* Institute of Mathematics, The Hebrew University, 2012. – 118 p. 8. Ipatova, V.M., Pyrkova, O.A., Sedov, V.N. *Differential Equations: Solution Methods.* Moscow: MIPT, 2012. – 140 p. 9. Feofanova, V.A. *Differential Equations. Lectures, Examples and Problems.* Nizhny Tagil: NTI (branch) UrFU, 2015. – 128 p. 10. Muratova, T.V. *Differential Equations: Textbook and Practical Training for Secondary Vocational Education.* Moscow: Publishing House Yurait, 2016. – 435 p. 11. Kolekeev, K.D., Nazarova, K.Zh. *Differential Tendeuler.* Almaty: Housing Society RPBK “Dauir”, 2012. – 216 p. 12. Joshi, Mohan C. *Ordinary Differential Equations: Modern Perspective.* Department of Mathematics at IIT Bombay, Hardcover, 2006. – 276 p. 13. Kapadia, D. *Differential Equation Solving with Dsolve.* Wolfram Research, Inc., 2008. – 118 p. 14. Ross, Clay C. *Differential Equations: An Introduction with Mathematica.* 2nd Ed. Department of Mathematics at the University of the South, 2004. – 444 p. 15. Coddington, E.A., Carlson, R. *Linear Ordinary Differential Equations.* Society for Industrial and Applied Mathematics, 1997. – 354 p.

Module 6.1 – Additional chapters of algebra and geometry

Module	AChG 2209 Additional Chapters of Geometry
Semester(s) when the module is taught	3
Responsible teacher	(l) Kaidasov Zh.K. (pr) - Tutkusheva Zh.S.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Profile discipline, university component
Forms of training	Lectures, practical classes, independent work, independent work.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 h Contact hours: 45 h (15 h lectures, 30 h practical classes) Independent study, including preparation for exams, in hours: 25 hours independent study, 80 hours independent study
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge, skills, and abilities acquired in the following courses are required. The module aims at the formation of a fairly broad view of analytical geometry in students, the study of the main method of analytical geometry—the coordinate method—as well as the vector method, the method of geometric transformations, and the projective method. It also includes the disclosure of the possibilities of generalizing these methods in constructing multidimensional geometries. Additionally, the module focuses on the development of mathematical culture and thinking of students, as well as their proof skills.
Module objectives / expected learning outcomes	The aim of the course is to give students an in-depth understanding of advanced geometric concepts and theorems and to develop their ability to apply analytical and theoretical methods in solving geometry problems. **Learning outcomes** A. As a result of mastering the discipline, the student should know the basic concepts and theorems of the discipline "Additional Chapters of Geometry ", be able to use theoretical material when solving practical problems, and be proficient in analytical methods for solving geometry problems. B. Is capable of preparing and editing texts of professional and socially significant content; is fluent in mathematical language; is able to prove theorems; is able to create mathematical models for solving problems from various fields. C. Is able to solve problems in the studied sections D. Is capable of preparing and editing texts of professional and socially significant content; is fluent in mathematical language; is able to prove theorems; is able to create mathematical models for solving problems from various fields. E. Is able to logically correctly construct oral and written speech.
	History of the problem of the fifth postulate of Euclid. Axiomatic construction of Euclidean geometry. Arithmetic model of the Euclidean plane and consistency of the axiomatics of Euclidean geometry. Absolute geometry. Geometry of Lobachevsky. Poincare model of the Lobachevsky plane and consistency of the axiomatics of Lobachevsky geometry. Construction with a compass and ruler on a plane, methods of construction. Elements of projective geometry.
Form of examination	Blank test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in discussions of issues, preliminary preparation for lectures and practical classes, high-quality and timely completion of SRO assignments, participation in all forms of assessment.

List of literature	1. Pogorelov A.V. , Geometry. – M.: Education , 19 83 . 2. Atanasian L.S., Bazylev V.T. Geometry. Part. II. - M.: Enlightenment, 1987. 3. Trainin Ya.L. Foundations of Geometry - M.: Uchpedgiz, 1961. 4. Atanasian L.S., Gurevich G. B. Geometry Part 2. – M.: Education, 1985. 5. Efimov N.V. Higher geometry. - M.: Science, 1993. 6. Kaidasov Zh. Lobachevsky zhazyktygyndagy keibir beineler - Almaty: Gylym, 2002. 7. Electronic library https://www.biblio-online.ru .

Module	ANTh 2210 Algebra and Number Theory
Semester(s) when the module is taught	3
Responsible teacher	Omarova B.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Basic discipline, university component
Forms of training	Lectures, practical classes, guided self-study (GSS), self-study (SS).
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical classes) Self-study, including exam preparation, in hours: 25 hours of guided self-study (GSS), 80 hours of self-study (SS)
ECTS	5
Mandatory and recommended prerequisites for studying the module	Mastering this module requires the knowledge, skills, and abilities acquired through the study of the following courses: Fundamentals of Algebra and Mathematical Analysis 1.
Module objectives / expected learning outcomes	The aim of the course is to provide foundational knowledge in number theory and polynomial theory, including divisibility, the Euclidean algorithm, prime numbers, modular comparisons, properties and factorization of polynomials, as well as the study of algebraic and transcendental numbers. **Learning outcome**: A. Identify and describe fundamental algebraic structures, key concepts of polynomials, the Euclidean algorithm, irreducible polynomials, rational fractions, and their decomposition into partial fractions. B. Apply concepts such as the greatest common divisor (GCD), least common multiple (LCM), the Euclidean algorithm, irreducible polynomials, the fundamental theorem of algebra, and methods of decomposing rational fractions. Solve systems of linear equations. C. Analyze mathematical problems based on studied topics and select appropriate methods for their solution. D. Construct and justify mathematical arguments in a logically coherent and clear form, both orally and in writing. E. Evaluate personal learning needs and organize independent study of new areas in fundamental sciences.
Content	The course is aimed at preparing students in the field of number theory and algebra, covering the following key topics: divisibility and the Euclidean algorithm, greatest common divisor (GCD) and least common multiple (LCM), prime numbers, modular comparisons and their applications, as well as the fundamental concepts of polynomial theory. Students will study irreducible polynomials, their factorization, Vieta's formulas, and solve problems related to polynomials of the third and fourth degrees, including rational and integer roots. The course will also address polynomials with multiple variables, symmetric polynomials, and their results. The course concludes with the study of algebraic and transcendental numbers and their properties.
Form of examination	Traditional
Training and Examination requirements	Mandatory attendance at both online and in-person classes is required. Students must actively participate in discussions during lectures and practical sessions, as well as prepare in advance for lectures and practical sessions. Students are expected to complete self-study assignments (SRO) qualitatively and on time and participate in all forms of assessment, including tests, assignments, and other forms of performance evaluation.

List of literature	1. Bukhshtab A. A. Number Theory. – 4th ed., reprint. – St. Petersburg: Lan Publishing, 2015. – 384 p. 2. Smolin Yu. N. Algebra and Number Theory. 4th ed., reprint. – Moscow: FLINTA, Nauka, 2012. – 464 p. 3. Avdoshin S. M., Nabebin A. A. Discrete Mathematics. Modular Algebra, Cryptography, Coding. – Moscow: DMK Press, 2017. – 352 p. 4. Deza E. I., Kotova L. V. Collection of Problems in Number Theory. – Moscow: Librocom Publishing House, 2012. – 224 p. 5. Sitnikov V. M. Number Theory. – Chelyabinsk: Chelyabinsk State Pedagogical University Publishing, 2014. – 116 p. 6. Veretennikov B. M., Mikhaleva M. M. Algebra and Number Theory. Vol. 1. – Yekaterinburg: Ural University Publishing, 2014. – 52 p. 7. Cheremisina M. I. Selected Topics in Algebra and Number Theory. – Orenburg: Orenburg State Pedagogical University Publishing, 2016. – 28 p. 8. Guschina O. A., Neeshpapa T. A. Congruences in the Ring of Integers. – Yuzhno-Sakhalinsk: Sakhalin State University Publishing, 2012. – 96 p. 9. Vorobyev N. N., Vorobyev S. N., Naumik M. I. Algebra: Polynomial Theory and Elements of Field Theory. – Vitebsk: P. M. Masherov VSU, 2018. – 87 p. 10. Luzgarev A. Algebra and Number Theory. Lecture Notes, 2016 [Electronic resource: http://mahalex.net/151-153/algebra.pdf]. 11. Ermolaeva N. N., Kozychenko V. A., Kurbatva G. I. Practical Classes on Algebra. Elements of Set Theory, Number Theory, Combinatorics. Algebraic Structures. – St. Petersburg: Lan Publishing, 2014. – 112 p. 12. Myrzabekov S. A., Omarova B. Zh., Mukash M. A. Practicum on Solving Problems in Number Theory. – Aktobe, 2014. – 100 p. 13. Myrzabekov S. A., Omarova B. Zh., Mukash M. A. Practicum on Solving Number Theory Problems. – Aktobe, 2014. – 100 p.

Module	FM 2211 Financial Mathematics (dual education)
Semester(s) when the module is taught	4
Responsible teacher	Akhmetova Ayymgul Utegulovna, Associate Professor of the Department of Mathematics
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Basic discipline, elective component
Forms of training	Lectures, practical exercises, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation, in hours: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge, skills and abilities acquired during the study of the following courses are required: MA(I) 1204 Mathematical Analysis I, MO(II) 2205 Mathematical Analysis II.
Module objectives / expected learning outcomes	**Module objectives** To equip future specialists with both theoretical knowledge and practical skills in applying financial computation methods. These methods include the analysis of payment flows, evaluation of investment payments and projects, as well as calculating interest rates and profitability in financial and credit transactions under modern economic conditions. **Learning Outcomes (RO 4, 5, 7, 8)** **A.** Solve problems in key branches of mathematics, including actuarial mathematics and statistics. **B.** Develop research skills in the use of information and communication technologies, software, and computer networks; ability to create databases and utilize Internet resources. **C.** Recognize applied aspects in solving scientific problems; competently present, interpret, and analyze results; adjust mathematical models when necessary. **D.** Master mathematical and algorithmic modeling methods for analyzing management tasks in scientific, technical, economic, business, and humanitarian domains. **By the end of the course, students should:** **Know:** ● Methodology and practical approaches for financial and economic calculations. **Be able to:** ● Use financial and economic calculations to solve practical problems, including those lacking reliable statistical data. ● Calculate simple and compound interest, perform discounting, and account for interest rates. ● Conduct quantitative analysis of financial transactions. ● Build quantitative estimation models and calculate parameters for equivalent contract term changes. ● Develop debt repayment plans and calculate summary characteristics of payment flows for various financial rents. ● Analyze investment projects effectively. **Develop skills to:** ● Work effectively in teams, express viewpoints clearly, propose innovative solutions, and pursue professional and personal growth. ● Work independently with foundational methods to find solutions, seek compromises, and reconcile their opinions with those of team members.
Content	The theory of interest. Simple percentages. Discounting and accounting. Compound interest. Continuous percentages. Accrual of interest in the context of inflation. Payment flows. Financial rents. Currency conversion. Repayment of debt in installments. Outline of a financial transaction. Actuarial method. The merchant's rule. Securities. Bonds. Stocks.
Form of examination	Blank test

Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical exercises, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.
List of literature	1. Berkimbay R.E. Financial Mathematics. – 2012. RMEb. 2. Seilkhanova D.K. Actuarial and Financial Mathematics. – 2019. Epigraph. 3. Imanbayeva A.B. Mathematics in Economics. – 2018. Epigraph. 4. Malykhin V. Financial Mathematics. – 2018. Epigraph. 5. Abdiev B.A. Practicum on Financial Mathematics. – 2013. RMEb. 6. Kuraqbai Zh.S. Mathematical Models in Economics. – 2018. 7. Dosbolova A.Zh. Financial Mathematics. – 2010. RMEb. 8. Akhmetov K.A. Financial Mathematics in MS Excel. – 2010. RMEb. 9. Akhmetov G.B. Actuarial Calculations. Textbook. Almaty: Otan, 2014. – 102 p. 10. Chetyrkin E.M. Financial Mathematics. – 2008. RMEb. 11. Krass M.S., Chuprynov B.P. Mathematics for Economists. Saint Petersburg: Piter, 2009. – 464 p. 12. Kirlitsa V.P. Financial Mathematics: A Guide to Problem Solving: Textbook. Minsk: Tetrasystems, 2005. http://neb.arsu.kz/ru/view?rid=217&fid=215

Module 6.2 – Mathematical models in economics

Module	ME 2209 Mathematics in Economics
Semester(s) when the module is taught	3
Responsible teacher	Izgarina G.K., Senior lecturer
Language of instruction	Kazakh
Connection with the curriculum	Basic discipline, elective component
Forms of training	Lectures, practical exercises, IWOSWT, SIW
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation, in hours: 25 hours IWOSWT, 80 hours SIW
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Fundamentals of Algebra, Mathematical Analysis-1
Module objectives / expected learning outcomes	The objectives of the Mathematics in Economics course are to study the basic concepts of higher mathematics and their applications in economics, such as the application of linear algebra elements in economics, the application of mathematical analysis and differential equations in economics, and the application of functions of several variables in economics. A. Students should demonstrate an understanding of the application of mathematical models in economics. B. Students should be able to apply mathematical models in economics. methods for solving real economic problems. C. Students should be able to analyze complex economic data using mathematical and statistical methods, identify patterns, and draw conclusions. D. Students should develop mathematical models to solve complex economic problems, taking into account various parameters and uncertainties. E. Students should evaluate the effectiveness of various mathematical models and methods in terms of their applicability to specific economic situations.
Content	Linear algebra with elements of analytical geometry. Systems of linear equations. Elements of matrix analysis. Equation of the line. Function. Application of functions in economics. Limits and continuity. The derivative. The use of derivatives in economics. Applications of the derivative in economic theory. The differential of the function. The indefinite integral. A definite integral. The use of the concept of a definite integral in economics. Differential equations. The use of differential equations in economic dynamics. Rows. Functions of several variables in economic theory.
Form of examination	Blank test
Training and Examination requirements	Compulsory attendance of in-person classes, preliminary preparation for lectures and practical exercises, high-quality and timely completion of assignments, participation in all forms of assessment. The final assessment takes place in the format of an exam. The exam is conducted in accordance with the university's academic integrity policy and the exam rules.

List of literature	1. Vasenkova E.K., Volkova E.S., Shandra I.G. Mathematics for Economists. Differential and Difference Equations. Course of Lectures. Moscow: Financial Academy, 2003. – 116 p. 2. Krass M.S., Chuprynov B.P. Mathematics for Economists. Saint Petersburg: Piter, 2009. – 464 p. 3. Lungu K.N., Makarov E.V. Higher Mathematics. Guide to Problem Solving. Moscow: FIZMATLIT, 2005. – 216 p. 4. Danko P.E., Popov A.G., Kozhevnikova T.Ya., Danko S.P. Higher Mathematics in Exercises and Problems: Textbook for Universities. Moscow: AST: Mir i Obrazovanie, 2014. – 816 p. 5. Grigoriev S.G. Mathematics: Textbook for Students of Secondary Vocational Education Institutions. Moscow: Publishing Center “Academy,” 2015. – 416 p. 6. Belousova V.I., Ermakova G.M., Mikhaleva M.M., Shapar Yu.V., Shestakova I.A. Higher Mathematics. Yekaterinburg: Ural University Press, 2016. – 296 p.

Module	MME 2210 Modeling of a market economy
Semester(s) when the module is taught	3
Responsible teacher	Akhmetova Ayymgul Utegulovna, Associate Professor of the Department of Mathematics
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Basic discipline, elective component
Forms of training	Lectures, practical exercises, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation, in hours: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, it is necessary to have the knowledge, skills, and competencies acquired through the study of the following courses: MA(I) 1204 Mathematical Analysis I, MA(II) 2205 Mathematical Analysis II.
Module objectives / expected learning outcomes	**Module objectives** The purpose of studying **Economic and Mathematical Modeling** is to familiarize students with fundamental topics such as the basic concepts of economic and mathematical modeling, linear programming problems, methods for solving linear programming problems, the Simplex method, transport models, and the balance model. **Learning outcomes** **A.** Be able to recognize the applied aspects of scientific problems, competently present and interpret results, analyze outcomes, and adjust the underlying mathematical model as needed. **B.** Master mathematical and algorithmic modeling methods to analyze management tasks in scientific, technical, economic, business, and humanitarian fields. C. Demonstrate skills for independently acquiring new knowledge and competencies in law, management, and business. **Knowledge and Skills** ● **Know:** The basic concepts, definitions, and main theorem formulations; foundational mathematical tools used to study economic processes. ● **Be able to:** Solve problems related to the studied topics. ● **Master:** Skills in mathematical modeling of economic processes. ● **Use:** Mathematical apparatus to describe economic phenomena, correctly interpret research results, and develop practical recommendations for application.
Content	Data collection; hypothesis testing of the law of magnitude distribution; statistical evaluation of parameters; reliability domain; torque theory; correlation analysis; confidence interval of a dependent variable; time series analysis; components of a time series; trend determination; seasonal and cyclical fluctuations; time series processing; stationary time series; stationarity testing; cointegration; time series forecasts; adaptive and multiplicative forecasting methods; exponential processing; autoregressive model; moving medium method; mathematical model; linear planning accounting; objective function; system of constraints; production planning; accounting for the creation of an effective diet; accounting for the effective use of resources; simplex schedule; primary baseline plan; effective plan; method of gradual improvement of the primary baseline plan; artificial basis; M-method; subsystem and its formulation; auxiliary simplex method; calculation of transport links.
Form of examination	Blank test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical exercises, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.

List of literature	1. Besbaev G.E., Meldebekova S.K. Variational Calculus and Optimization Methods: Educational-Methodical Manual. – Almaty: CyberSmith, 2021. – 140 p. 2. Dilman T.B., Dilmanova A.T. Optimization Methods. Textbook. Almaty: Evero, 2016. – 248 p. 3. Bayaly A.T. Modeling of Production and Economic Processes. Educational-Methodical Manual. Almaty: CyberSmith, 2019. – 224 p. 4. Kazagachev V.N. Mathematical Models. Textbook. Vol. 1. Almaty: CyberSmith, 2021. – 324 p. 5. Kazagachev V.N. Mathematical Models. Textbook. Vol. 2. Almaty: CyberSmith, 2021. – 284 p. 6. Garmash A.N., Orlova I.V., Fedoseev V.V. Economic-Mathematical Methods and Applied Models: Textbook for Bachelor's and Master's Degrees. Edited by V.V. Fedoseev. – 4th ed., revised and supplemented. – Moscow: Yurayt, 2022. – 328 p. Educational platform Yurayt [website]. – URL: https://urait.ru/bcode/507819. 7. Isin M.E. Mathematics Manual for Economists: Textbook. – Almaty: CyberSmith, 2021. – 116 p. 8. Mukhanbetkaliyeva A.K. Models and Management Methods. Almaty: Evero, 2011. – 160 p. 9. Gusmanova F.R. Fundamentals of Operations Research. Textbook. Almaty: Dair, 2011. – 472 p. 10. Krass M.S., Chuprynov B.P. Mathematics for Economists. Saint Petersburg: Piter, 2005. – 464 p. 11. Zamkov O.O., Tolstopyatenko A.V., Cheremnykh Yu.N. Mathematical Methods in Economics: Textbook / Under the general editorship of Doctor of Economics, Prof. A.V. Sidorovich; Lomonosov Moscow State University. – Moscow: Delo i Servis, 2011. – 368 p. 12. Kazeshev A.K., Nurpeisov S.A. Mathematics for Economists: Textbook / Editor-in-Chief Rakhmetova R.O. Almaty: Economia, 2011. – 528 p. 13. Kazeshev A., Nurpeisov S. Higher Mathematics for Economic Majors. Problem Book. Almaty: Evero, 2007. – 294 p. 14. Vlasov M.P., Shimko P.D. Modeling of Economic Processes. Rostov-on-Don: Feniks, 2005. – 409 p. http://simulation.su/uploads/files/default/2005-uch-posob-vlasov-shimko-1.pdf

Module	GThS 2211 General theory of statistics
Semester(s) when the module is taught	4
Responsible teacher	Izgarina Gulzhanat Kadirzhanovna
Language of instruction	Kazakh / Russian
Connection with the curriculum	Basic discipline, elective component
Forms of training	Lectures, practical classes, guided independent study, independent study.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours. Contact hours: 45 hours (15 hours of lectures, 20 hours of practical classes, 10 hours of laboratory classes) Independent study, including exam preparation: 25 hours of guided independent study, 80 hours of independent study
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master the discipline "General Theory of Statistics" within the module, it is necessary to have the knowledge, skills, and competencies acquired through the study of the following courses: Fundamentals of Algebra, Fundamentals of Geometry, Probability Theory.
Module objectives / expected learning outcomes	**Module objectives** To develop students' understanding and practical skills in the methodology of collecting, systematizing, and processing socio-economic information using statistical methods. **Learning Outcomes** **1. Knowledge of:** ● Basic concepts, categories, and terminology of statistics. ● Methods and techniques for studying statistical populations. ● Principles and organization of statistical observation. **2. Ability to:** ● Group and summarize statistical data effectively. ● Calculate absolute, relative, and average values. ● Construct and analyze statistical tables, diagrams, and charts. ● Calculate and apply various economic indices. ● Use sampling observation methods accurately. ● Calculate and interpret measures of variation. ● Compute and utilize time series indicators. ● Study and analyze interrelations between socio-economic phenomena and processes. ● Apply statistical knowledge and skills in economic and geographical research contexts. **3. Mastery of:** ● Organizing statistical observations and conducting comprehensive processing and analysis of statistical information.
Content	Concept of Statistics. Subject, objectives, and structure of statistics. Application of statistics in geography, economics, and other areas of life. Statistical indicator. Stages of statistical research. Methods of mass observation. Statistical data. Statistical observation as the initial stage of statistical research. Statistical form. Organizational plan. Time frame and critical moment of statistical observation. Accuracy and errors in statistical observation. Summarizing and grouping statistical data. Presentation of statistical data: distribution series, statistical charts and tables. Absolute, relative, and average values. Statistical study of variation. Sample observation. Statistical analysis of the dynamics of socio-economic phenomena.

Form of examination	Traditional
Training and Examination requirements	The mandatory attendance of classes, active participation in discussions, prior preparation for lectures and practical sessions, high-quality and timely completion of independent work assignments (SRO), and participation in all types of assessments.
List of literature	1. Eliseeva, I.I., Yuzbashyev, M.M. *General Theory of Statistics: Textbook*. 5th ed., revised and expanded. Moscow: Finance and Statistics, 2005. 480 p. 2. Efimova, M.R., Ganchenco, O.I., Petrova, E.V. *Practical Course on General Theory of Statistics: Teaching Manual*. Moscow: Finance and Statistics, 1999. 280 p. 3. *General Theory of Statistics. Practical Course: Teaching Manual*. Edited by L.I. Karpenko. Minsk: BGEU, 2007. 271 p. 4. Bashina, O.E., Spirin, A.A., Baburin, V.T., et al. *General Theory of Statistics: Statistical Methodology in the Study of Commercial Activity*. 5th ed., revised and expanded. Moscow: Finance and Statistics, 2005. 440 p. 5. Novikov, M.M., et al. *Statistics: Indicators and Methods of Analysis. Reference Manual*. Minsk: Modern School, 2005. 619 p. 6. *Theory of Statistics: Textbook*. Edited by R.A. Shmoilova. Moscow: Finance and Statistics, 2001. 558 p. 7. Byyul, A., Tsöfel, P. *SPSS: The Art of Information Processing*. St. Petersburg: DiaSoftUP, 2002. 608 p. 8. Glinksy, V.V. *Statistical Analysis: Teaching Manual*. 3rd ed., revised and expanded. Moscow: INFRA, 2002. 241 p. 9. Dyuk, V. *Data Processing on PC in Examples*. St. Petersburg: Piter, 1997. 240 p. 10. Loseva, O.V., Budanov, K.M. *Practical Course on General Theory of Statistics*. Penza: PGPU, 2009. 92 p. 11. Soshnikova, L.A., Tarlovskaya, V.A., Terlizhenko, I.N., et al. *General Theory of Statistics. Teaching and Practical Manual*. Minsk: BGEU, 2004. 136 p. 12. *Practical Course on Theory of Statistics. Teaching Manual*. 2nd ed., revised and expanded. Edited by R.A. Shmoilova. Moscow: Finance and Statistics, 2005. 404 p. 13. Teslyuk, I.E., Tarlovskaya, V.A., Terlizhenko, I.N., et al. *Statistics: Teaching Manual*. Minsk: Urazhay, 2000. 360 p. 14. *Statistical Dictionary*. Moscow: FinStatInform, 1996. 479 p.

Module 7.1 – Basics of programming

Module	DMML 2212 Discrete Mathematics and Mathematical Logic
Semester(s) when the module is taught	3
Responsible teacher	(lecture) - Nugaeva Z.T.. Doctor of PhD (practice) - Izgarina G.K., Senior lecturer
Language of instruction	Kazakh
Connection with the curriculum	Basic discipline, university component
Forms of training	Lectures, practical exercises, IWOSWT, SIW.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload:120 hours Contact hours: 40 hours (20 hours of lectures, 20 hours of practical exercises) Self-study, including exam preparation, in hours: 20 hours IWOSWT, 60 hours SIW.
ECTS	4
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Mathematical Analysis 1, Fundamentals of Algebra, Fundamentals of Geometry
Module objectives / expected learning outcomes	The purpose of the course is to familiarize students with the concepts of the main sections of the course, such as propositional algebra, discrete analysis, set theory, combinatorics. A. Students should know the basic definitions and concepts of the studied sections of discrete mathematics. B. They must be able to prove theorems, be able to solve problems, be able to build mathematical models for solving problems, and must be able to use mathematical logic to construct proofs, compile and analyze logical formulas and algorithms. C. Students should be able to analyze complex problems and identify their key elements by applying theorems and methods from discrete mathematics. D. Students should be able to combine various methods of discrete mathematics to solve complex problems. Students should be able to develop new algorithms and problem solving methods. E. Students should be able to evaluate the effectiveness and correctness of applied problem solving methods. Students should be able to critically evaluate different approaches to solving mathematical problems and choose the most effective and appropriate methods.
Content	Set theory. Relationships, correspondences, and functions. Statements and operations on them. Formulas of the algebra of propositions. Tautology. Equivalence of formulas. Normal forms for propositional Verbally(ticket)algebra formulas. Logical following. Applications of the algebra of propositions to logical and mathematical practice. Boolean functions. Elements of combinatorics. The binomial of Newton. Graph theory.
Form of examination	Oral exam (ticket)
Training and Examination requirements	Compulsory attendance of in-person classes, preliminary preparation for lectures and practical exercises, high-quality and timely completion of assignments, participation in all forms of assessment. The final assessment takes place in the format of an exam. The exam is conducted in accordance with the university's academic integrity policy and the exam rules.

List of literature	1. Baizhumanov A.A., Ibragimov O.A. Discrete Mathematics and Mathematical Logic, Almaty, 2021. 2. Bimendina A.U. Discrete Mathematics and Mathematical Logic, Almaty, 2019. 3. B.N. Drobutun. Guide to Solving Problems in Discrete Mathematics and Mathematical Logic: Textbook. Part 1, 2019. 4. Alyaev Yu.A., Tyurin S.F. Discrete Mathematics and Mathematical Logic: Textbook. Moscow: Finance and Statistics, 2006. – 368 p. 5. M.Zh. Talipova, B.S. Buranbaeva. Discrete Mathematics: A Short Collection of Lectures, 2016. 6. Mathematical Logic and Discrete Mathematics: Educational-Methodical Complex of the Discipline, 2013, Compiled by L.F. Pakhomova. 7. Buranbaeva B.S. Discrete Mathematics and Mathematical Logic, Study Guide, 2011.

Module	Prog 2213 – Programming
Semester(s) when the module is taught	4
Responsible teacher	Jakhina Ryskul Uteovna
Language of instruction	Kazakh
Connection with the curriculum	Basic discipline, university component
Forms of training	Lectures, practical and laboratory classes, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	General workload: 120 hours Contact hours: 45 hours (15 hours of lectures, 15 hours of practical and 10 hours of laboratory classes) Self-study , including preparation for exams: 20 h SRSP, 60 h SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	For development than the module necessary acquired knowledge , skills and abilities at studying next Kursov : Information and communication technologies .
Module objectives / expected learning outcomes	**Module objectives:** The course covers the main levels of problem-solving on a computer, including the concept of algorithms and methods for their representation, types of algorithms, principles of their processing and search, as well as their software implementation. It also addresses dynamic data structures, software development methods, programming styles, indicators of programming quality, and methods for testing and creating programs. The aim is to develop students' knowledge and skills in designing efficient algorithms for solving various problems, while encouraging mastery of both fundamental and modern algorithmic methods for information processing. **Learning outcomes:** A. Create diverse programs using fundamental computational algorithms and their properties, classifying algorithms into linear, branching, and cyclic types. B. Use tools for developing and implementing standard algorithms in C++, independently process arrays with various internal sorting methods, and develop software implementations of abstract data structures. C. Evaluate algorithmic methods and software solutions in systems and applied programming, assess the relevance of course material, and ensure consistency in conclusions. D) Know and understand programming paradigms, structural features of algorithms, algorithmic methods, modern software tools, and contemporary computing techniques for problem-solving. E) Be able to effectively apply this knowledge in practical programming tasks and software development.
Content	This course is aimed at preparing students for their future professional activities, specifically teaching mathematics in schools with various profiles. Mastery of this discipline also lays a foundation for successfully completing pedagogical practice. Programming is a discipline focused on the creation of computer programs. A modern specialist must understand the principles of computer operation and the capabilities of software to support it. The course "Programming" is designed to develop knowledge of the basic concepts of algorithmization and programming, including algorithms and data structures, methods of algorithm creation, algorithm analysis, programming techniques and technologies, as well as various algorithms for internal data sorting and search tasks. During the course, students study the properties of these algorithms, the situations in which they are most useful, and explore the connection between algorithm theory and computing systems, with a focus on evaluating algorithm efficiency.
Form of examination	Oral exam (tickets)

Training and Examination requirements	Mandatory participation in both online and in-person classes, active engagement in discussions, advance preparation for lectures and practical sessions, high-quality and timely completion of SIS assignments, and participation in all forms of assessment are required.
List of literature	1. Pavlovskaya, T.A. *C/C++. Programming in a High-Level Language: Textbook*. Almaty: Dauir Publishing House, 2013. – 504 p. 2. Pavlovskaya, T.A. *C/C++. Procedural and Object-Oriented Programming: Textbook for University Standard, 3rd Generation*. St. Petersburg: Peter, 2021. 3. Boribaev, B.B., Makhmetova, A.M. *Algorithms and Programming Languages: Textbook*. Almaty: LLP RPBK "Dauir". 328 p. Online 4. Zhoranova, N.Zh. *Fundamentals of High-Level Programming Languages: Textbook*. Almaty: CyberSmith, 2017. – 296 p. 5. Smailova, U.M. *Programming: Algorithm Creation Technologies: Educational Tool*. Almaty: Asyl kitap. 6. Shevchuk, E.V. *Collection of Tasks and Exercises on Data Structures and Programming: Teaching Manual*, 2014. 7. Koksegen, A.E., Seifullina, A.O. *Algorithms and Programming Languages: Textbook*. Almaty: LLP RPBK "Dauir". 191 p. (Ministry of Education and Science of the Republic of Kazakhstan) 8. Kemelbekova, Zh. *Programming Languages and Technologies: Textbook*. Almaty: TechSmith, 2019. – 284 p. 9. Lafore, R. *Object-Oriented Programming in C++*. St. Petersburg: Peter. 10. Stroustrup, Bjorn. *Programming: Principles and Practice Using C++, Vol. 1*. Ed. B. Buribayev, M. Abdrakhmanova. Almaty, 2013. 11. Stroustrup, Bjorn. *Programming: Principles and Practice Using C++, Vol. 2*. Ed. B. Buribayev, S. Adilgazhinova. Almaty, 2014. 12. Pavlovskaya, T.A. *C/C++. Programming in a High-Level Language for Masters and Bachelors: Textbook, Standard 3rd Generation*. St. Petersburg: Peter, 2021. 13. Shevchuk, E.V. *Programming in C++: Tutorial*, 2014. 14. Gumarov, Zh. *Fundamentals of Algorithms and Programming (Collection of Papers)*. 15. Boribaev, B.B. *Programming Technologies: Textbook*. Almaty: LLP RPBK "Dauir". 352 p. Online

Module 7.2 – Fundamentals of algorithms and data structures

Module	DMEML 2212 Discrete Mathematics with elements of mathematical logic
Semester(s) when the module is taught	3
Responsible teacher	(lecture) - Nugaeva Z.T.. Doctor of PhD (practice) - Izgarina G.K.. Senior lecturer
Language of instruction	Kazakh
Connection with the curriculum	Basic discipline, university component
Forms of training	Lectures, practical exercises, IWOSWT , SIW.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload:120 hours Contact hours: 40 hours (20 hours of lectures, 20 hours of practical exercises) Self-study, including exam preparation: 20 hours IWOSWT, 60 hours SIW.
ECTS	4
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Mathematical Analysis 1, Fundamentals of Algebra, Fundamentals of Geometry
Module objectives / expected learning outcomes	The purpose of the course is to familiarize students with the concepts of the main sections of the course, such as propositional algebra, discrete analysis, set theory, combinatorics. A. Students should know the basic definitions and concepts of the studied sections of discrete mathematics. B. They must be able to prove theorems, be able to solve problems, be able to build mathematical models for solving problems, and must be able to use mathematical logic to construct proofs, compile and analyze logical formulas and algorithms. C. Students should be able to analyze complex problems and identify their key elements by applying theorems and methods from discrete mathematics. D. Students should be able to combine various methods of discrete mathematics to solve complex problems. Students should be able to develop new algorithms and problem solving methods. E. Students should be able to evaluate the effectiveness and correctness of applied problem solving methods. Students should be able to critically evaluate different approaches to solving mathematical problems and choose the most effective and appropriate methods.
Content	Set theory. Relationships, correspondences, and functions. Statements and operations on them. Formulas of the algebra of propositions. Tautology. Equivalence of formulas. Normal forms for propositional algebra formulas. Logical following. Applications of the algebra of propositions to logical and mathematical practice. Boolean functions. Elements of combinatorics. The binomial of Newton. Graph theory.
Form of examination	Verbally (ticket)
Training and Examination requirements	Compulsory attendance of in-person classes, preliminary preparation for lectures and practical exercises, high-quality and timely completion of assignments, participation in all forms of assessment. The final assessment takes place in the format of an exam. The exam is conducted in accordance with the university's academic integrity policy and the exam rules.

List of literature	1. Bayzhumanov A.A., Ibragimov O.A. Discrete Mathematics and Mathematical Logic. Almaty, 2021. 2. Bimendina A.U. Discrete Mathematics and Mathematical Logic. Almaty, 2019. 3. B.N. Drobotun. Guide to Solving Problems in Discrete Mathematics and Mathematical Logic: Textbook. Part 1, 2019. 4. Alyaev Yu.A., Tyurin S.F. Discrete Mathematics and Mathematical Logic: Textbook. Moscow: Finance and Statistics, 2006. – 368 pages. 5. M.Zh. Talipova, B.S. Buranbaeva. Discrete Mathematics: A Collection of Short Lectures, 2016. 6. Mathematical Logic and Discrete Mathematics: Educational and Methodological Complex of the Discipline. 2013. Compiled by L.F. Pakhomova. 7. Buranbaeva B.S. Discrete Mathematics and Mathematical Logic: Textbook, 2011.

Module	ADS 2213 Algorithms and Data Structures
Semester(s) when the module is taught	4
Responsible teacher	Zhakhina Ryskul Uteuovna, Ph.D., Associate Professor of the Department of Informatics and Information Technology
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Basic discipline, elective component
Forms of training	Lectures, laboratory classes, practical exercises, SRSP, SRS
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures,10 hours of laboratory classes, 20 hours of practical classes) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge, skills and abilities acquired during the study of the following courses are required: Information and Communication Technologies, Mathematical Analysis I, II.
Module objectives / expected learning outcomes	**Module objectives** To learn the basic principles and acquire practical skills in C++ programming. **Learning outcomes** Upon successful completion of the course, students will be able to: 1. Collect and interpret information to form reasoned judgments, considering social, ethical, and scientific aspects, and ensure interdisciplinary connections between mathematical, statistical, and other disciplines. 2. Solve problems in core branches of mathematics, including actuarial mathematics and statistics. 3. Demonstrate research skills in using information and communication technologies, software, computer networks, create databases, and effectively use Internet resources. 4. Understand and justify the choice of programming technologies, software tools, and hardware-software models for building information and computing systems. 5. Understand the concept of algorithms, their properties, and various types of algorithms; master the main data types and data structures, operations, and operators in C++. 6. Analyze the properties of algorithms and identify appropriate application scenarios; develop programs using fundamental computational algorithms, including linear, branching, and cyclic algorithms. 7. Evaluate algorithm efficiency and analyze program execution results. 8. Process arrays using internal sorting and search methods; practically apply model and data structure design, file handling, and user-defined functions in program development. 9. Demonstrate programming skills with a solid understanding of basic algorithm types and data structures.
Content	This discipline is designed to provide students with knowledge about the basic concepts of algorithmization and programming, about algorithm structures and data structures, algorithm construction methods, algorithm analysis, program construction methods and technologies, about various algorithms for internal information sorting and search tasks. When studying the discipline, the properties of algorithms and situations in which these algorithms can be useful, the basic operators and structures of the C++ language are considered. Algorithms. Programming languages. The programming paradigm. The C++ programming language. Types of data. Structured and basic data types. Operations of the C++ programming language. Arithmetic, logical, increment, and decrement operations. C++ language operators. Simple and compound operators. Functions. Organization of subprograms. Recursion. Pointers. Dynamic memory. The concept of dynamic memory. Pointers and their use in programming. Arrays. Representation of arrays. One-dimensional arrays. Two-dimensional arrays. Dynamic arrays. Sorting and search algorithms. An abstract data type. String processing algorithms. Structures. Files. Dynamic data structures.
Form of examination	Oral exam (ticket)

Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures, laboratory and practical classes, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.
List of literature	1. Berkinbaev K.M., Nurullaev A.N. Programming Practicum [Electronic resource]: Educational and Methodological Guide. – Almaty: NURPRESS, 2014. – 34 pages. 2. Zhangisina G.D. Algorithmization and Programming Languages. Educational and Methodological Guide. – Almaty: Epigraph, 2016. – 228 pages. 3. Kubekov B.S. Pointer Type in Programming Languages. Textbook (2nd edition). – Almaty, 2019. – 112 pages. 4. Pavlovskaya T.A. C/C++. High-Level Language Programming for Masters and Bachelors: Textbook / T.A. Pavlovskaya; Third Generation Standard. – St. Petersburg: Piter, 2021. 5. Pavlovskaya T.A. C/C++. High-Level Language Programming. Textbook. – St. Petersburg: Piter, 2013. – 461 pages. 6. Pavlovskaya T.A. C/C++. Procedural and Object-Oriented Programming. University Textbook. Third Generation Standard. – St. Petersburg: Piter, 2021. 7. Shaimerdenova L.E., Besbaev G.A. Algorithmization and Programming. Textbook for students of specialty 6B06130 - Computer Engineering and Software. – Almaty: CyberSmith, 2021. – 132 pages. 8. Shevchuk E.V., Kolyeva N.S. Programming in C++. Textbook. – Almaty: Evero, 2014. – 272 pages. 9. Shevchuk E.V. Collection of Problems and Exercises on Data Structures and Programming: Textbook, 2014. 10. Schildt Herbert. C++. Beginner's Guide. 2nd edition. Translated from English. – Moscow: Williams Publishing House, 2005. – 672 pages.

8.1. Module - Databases, Numerical and Statistical Methods

Module	ThD 3214 Theory of Database
Semester(s) when the module is taught	5
Responsible teacher	Talipova Meyramgul Zhubatkanovna
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Core discipline, university component
Forms of training	Lectures, practical classes, laboratory sessions, IWST (Independent Work with the Teacher), IWS (Independent Work of Students).
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures,10 hours of laboratory classes, 20 hours of practical classes) Self-study, including exam preparation, in hours: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge, skills, and competencies gained from studying the following courses are required: Algorithmization and Programming, Information and Communication Technologies.
Module objectives / expected learning outcomes	**Course Goal:** To study the methods and tools for developing databases and applications for working with them. **Learning Outcomes:** A) Understand the architecture of database management systems. B) Demonstrate proficiency in independent computer work, programming, and applying information processing and numerical methods to solve fundamental tasks. C) Develop programming skills in modern operating systems and database management environments. D) Possess a solid foundation in fundamental mathematics and computer science, and be prepared to apply this knowledge in professional practice. E) Apply fundamental and applied knowledge from mathematics and natural sciences in research and professional activities. F) Maintain the ability and readiness for continuous learning, skill enhancement, and rapid adaptation to new situations.
Content	In the modern world, it is difficult to imagine any field of activity without the use of information technologies, particularly information systems. Nearly all such systems involve, to some extent, functions related to the long-term storage and processing of information. As the volume of information flows grows, the demand for faster data processing increases accordingly. At the core of any modern information system lies the database. This course focuses on the theoretical foundations of database theory, methods, and tools for developing local databases and database management systems (DBMS). It covers the methodology for designing and developing relational databases, with particular emphasis on the relational approach to database access, the SQL language, and issues related to data security within databases.
Form of examination	Paper-based test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures, laboratory and practical classes, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.

List of literature	1. Bdullina V.Z. *Databases in Information Systems: Textbook*, 2015. 2. Zarubin M.Yu., Danilets E.V. *Database Systems: Tutorial*. Almaty: Отан, 2015. – 200 pages. 3. Karvin B. *Database Programming with SQL: Common Errors and Their Solutions*. Moscow: Reed Group, 2012. – 336 pages. 4. Petkovich D. *Microsoft SQL Server 2012: A Beginner's Guide*. St. Petersburg: BHV-Petersburg, 2013. – 816 pages. 5. Blyueva E.G., Dukenbaeva S.A. *Database Theory: Electronic Textbook*. Karaganda: KargTU, 2020.

Module	NM 3301 Numerical methods
Semester(s) when the module is taught	6
Responsible teacher	Tutkusheva Zh.S.
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Core discipline , university component
Forms of training	Lectures, practical exercises, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Mathematical Analysis I, II, III, Differential equations, Algebra and Number Theory, Programming, Courses on boundary value problems for ordinary differential equations.
Module objectives / expected learning outcomes	The course aims to form students' systematic understanding of approximate methods for solving applied problems, mathematical modeling techniques, sources of errors, and methods for evaluating the accuracy of results. A. Students should know the basic methods of computational mathematics. B. They should be able to apply classical methods to solve problems, become familiar with practical methods for describing physical processes, and conduct numerical and qualitative analyses. C. The course develops a culture of thinking, analytical skills, and the ability to generalize and process results effectively. D. Students should be able to argue their point of view, strive for professional growth, and possess skills in working with literature. E. They should also be capable of teamwork, expressing their own opinions, considering colleagues' viewpoints, and fostering mathematical culture.
Content	Numerical methods are a crucial discipline in the professional training of mathematics specialists. The main topics covered in the course include elements of error theory, methods for solving systems of linear algebraic equations, iterative methods, function approximation theory, numerical integration, methods for solving differential equations, and other related areas.
Form of examination	Blank test
Training and Examination requirements	1. Attendance to all classes is mandatory, and punctuality is required. 2. If unable to attend for a valid reason, prior notification must be given. 3. Assignments must be submitted by the specified deadlines. 4. Students should be able to defend their viewpoints, pursue professional development, and demonstrate proficiency in working with literature. 5. Late submissions of assignments will not be accepted.

List of literature	**Core Reading:** 1. Bektemesov M. A., Gusmanova F. R., Turganbaeva A. R. *Quantitative Methods: Teaching Methods*. Almaty: Kazakh University, 2020. – 252 p. 2. Babaliyev A. M. *Quantitative Methods*. Almaty: Association of Universities of RK, 2014. 3. Dilman et al. *Quantitative Methods*, учебно-методическое пособие, 2015. 4. Zholdasova K. *Quantitative Methods*, Laboratory Workshop, Teaching Post, 2015. 5. Mamaev K. S. *Quantitative Methods: Electronic Learning*, 2014. 6. Nurymbetov A. U. *Quantitative Methods*, учебное пособие, 2014. 7. Kurenkeev et al. *Quantitative Methods*, учебник, 2017. **Supplementary Reading:** 8. Baibaktina A. T. *Leadership in the Field of Laboratory Work in the Discipline "Quantitative Methods"*, Aktobe: Aktobe Regional University named after K. Zhubanova, 2011. 9. Omarbekova A. S. *Quantitative Methods*, учебник, 2013. **Electronic Resources:** 10. Baibaktina A. T. *Guidelines for Laboratory Work in the Discipline "Sandyk Adister"*, Aktobe Regional University named after K. Zhubanov, 2011. 11. Omarbekova A. S. *Sandyk Adister*, textbook, 2013. 12. K. Zhubanov Aktobe Regional University Electronic Library – neb.arsu.kz 13. "Epigraph" Database – elib.kz 14. "Epigraph" Multimedia Textbook – mbook.kz 15. "Smart Kitap" – web.smart-kitap.kz 16. "RJOAEK" Information System – rmebrk.kz 17. Republican Scientific and Technical Library – aktobe.rntb.kz

Module	SMDA 3215 Statistical methods of data analysis
Semester(s) when the module is taught	6
Responsible teacher	Akhmetova Ayymgul Utegulovna, Associate Professor of the Department of Mathematics
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Basic discipline, Elective component
Forms of training	Lectures, laboratory classes, practical exercises, SRSP, SRS
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures, 10 hours of laboratory classes, 20 hours of practical classes) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: MA(I) 1204 Mathematical Analysis I, MA(II) 2205 Mathematical Analysis II, Probability Theory and Mathematical Statistics, Database Theory
Module objectives / expected learning outcomes	**Module objectives** To familiarize students with topics such as data analysis and its basic concepts; the statistical and structural approach to data analysis; general principles of statistical hypotheses; statistical methods of data analysis; and the challenges of identifying patterns. **Learning Outcomes** Upon successful completion of the course "Statistical Methods of Data Analysis," students will be able to: 1. Understand and explain the basic concepts and methods of data analysis, including statistical, structural, and hypothesis testing approaches. 2. Collect, interpret, and analyze data effectively, making informed judgments that take into account social, ethical, and scientific considerations. 3. Apply statistical methods and techniques to solve problems in various branches of mathematics, including actuarial mathematics and statistics. 4. Recognize and address the applied aspects of scientific problems by competently presenting, interpreting, and critically analyzing results; refine underlying mathematical models when necessary. 5. Master mathematical and algorithmic modeling methods to analyze management tasks in scientific, technical, economic, business, and humanitarian contexts. 6. Demonstrate practical skills in solving typical data analysis problems through laboratory and practical exercises based on theoretical knowledge. 7. Communicate results clearly and logically through oral and written forms, constructing well-argued, coherent, and precise presentations. 8. Develop independence and initiative by being able to study new fundamental scientific sections and engage in self-directed learning. 9. Ensure interdisciplinary connections by linking mathematical and statistical concepts with other disciplines effectively.
Content	The subject and objectives of statistical methods of analysis. Methods of statistical observation. Summary and grouping of statistical data. Absolute and relative values. Methods of averages and indicators of variation. Selective observation. Methods of dynamic series analysis. The index method of statistical analysis. Statistical study of the interrelationship of socio-economic phenomena.
Form of examination	Blank test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures, laboratory and practical classes, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.

List of literature	1. Bektaev K.B. Theory of Probability and Mathematical Statistics. Textbook. – Almaty: Evero, 2014. – 432 p. 2. Akanbay N. Collection of Problems and Exercises in Probability Theory: Textbook. – Karaganda: Medet Group, 2016. 3. Rakhimzhanova S.K., Karataeva D.S. Theory of Probability and Mathematical Statistics: Educational-methodical guide. – Almaty: TechSmith, 2020. – 188 p. 4. Koschanova G.R., Kulzhagarova B.T. Theory of Probability and Mathematical Statistics: Textbook. – Almaty: LP-Zhasulan, 2020. – 143 p. 5. Iskakova A.S. Collection of Problems in Probability Theory. Almaty, TechnoErudit, 2018. 6. Gmurman V.E. Guide to Solving Problems in Probability Theory and Mathematical Statistics. Textbook for Universities. Moscow: Vysshaya Shkola, 2003. – 405 p. 7. Akanbay N. Solving Problems in Probability Theory and Mathematical Statistics using MS EXCEL. Almaty, Kazakh University, 2014. 8. Statistical Processing of Experimental Data: Textbook / P.S. Shpakov, V.N. Popov. – Moscow: MGSU, 2003. 9. Gmurman V.E. Probability Theory and Mathematical Statistics: Textbook. 2015. – https://rmebrk.kz/book/1005825 10. Akanbay N. Course in Probability Theory and Mathematical Statistics: Textbook for Higher Education “Mathematics” specialty. Vol. I – Almaty: Kazakh University, 2020. – 292 p. http://rmebrk.kz/book/87502 11. Akanbay N. Probability Theory and Mathematical Statistics II: Textbook. – Almaty: Kazakh University, 2017. – 458 p. http://rmebrk.kz/book/1180268 12. Zholdasov S.A. Collection of Problems for Probability Theory and Mathematical Statistics: Textbook. – Almaty: Evero, 2022. – 160 p. http://rmebrk.kz/book/1184228 13. Rakhimzhanova S.K., Karataeva D.S. Theory of Probability and Mathematical Statistics. Educational-methodical guide. – Almaty: TechSmith, 2020. – 188 p. https://neb.arsu.kz/kk/view?rid=10768&fid=10747

8.2. Module – Client-server applications, numerical methods and statistics

Module	DCSDA 3214 Development of client-server database applications
Semester(s) when the module is taught	5
Responsible teacher	Aliya Fanisovna Kayipova, Lecturer at the Department of Computer Science and Information Technology
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Basic discipline, Elective component
Forms of training	Lectures, laboratory classes, practical exercises, SRSP, SRS
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures,10 hours of laboratory classes, 20 hours of practical classes) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Discrete mathematics with elements of mathematical logic, Mathematical Analysis I, II, Algorithms and data structures
Module objectives / expected learning outcomes	**Module objectives** To develop skills in creating client-server applications for working with PostgreSQL databases. **Learning outcome**: 1. Understand the architecture of database management systems and the structural elements of databases. 2. Know the commands of SQL and PL/pgSQL languages. 3. Possess programming skills in modern operating environments, development tools, and database management systems. 4. Be able to identify and model the logical and physical structure of a database. 5. Have skills in developing tables, views, queries, triggers, stored procedures, and user-defined functions. 6. Have a fundamental background in mathematics and computer science, with the readiness to apply acquired knowledge professionally. Competencies: 1. Basic knowledge in theoretical and applied mathematics, computer science, and modern IT. 2. Research skills in information and communication technologies, software, and computer networks; ability to create databases and use Internet resources. 3. Mastery of mathematical and algorithmic modeling methods for analyzing management tasks across scientific, technical, economic, business, and humanitarian fields. 4. Ability to independently acquire new knowledge and skills in law, management, and business.
Content	This discipline focuses on technologies for developing client-server database applications and serves as a logical continuation of studying database design principles. During the course, students will explore the operation of the PostgreSQL server, including its features, server components, and database structure. Methods for working with remote databases will be covered. Additionally, the course will address the use of SQL and PL/pgSQL languages, as well as the Visual Studio and C# tools for creating the client side of database applications.
Form of examination	Oral (tickets)
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures, laboratory and practical classes, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.

List of literature	1. Morgunov, E.P. PostgreSQL. Fundamentals of the SQL Language: Textbook. St. Petersburg: BHV-Peterburg, 2018. – 336 p. 2. Luzanov, P., Rogov, E., Levshin, I. PostgreSQL for Beginners. PostgreSQL Professional, 2017. – 116 p. 3. Novikov, B.A., Gorshkova, E.A., Grafeeva, N.G. Fundamentals of Database Technologies: Textbook - 2nd ed. - Moscow: DMK Press, 2020. - 582 p. 4. Rogov, E.V. PostgreSQL 14 Inside. - Moscow: DMK Press, 2022. – 660 p. 5. Abdullina, V.Z. Databases in Information Systems: Textbook, 2015. 6. Zarubin, M.Yu. Database Systems: Textbook - Almaty: Otan, 2015. - 200 p. 7. Karvin, B. SQL Database Programming: Common Errors and Their Fixes. - Moscow: Read Group, 2012. - 336 p. 8. Klyueva, E.G., Dukenbayeva, S.A. Database Theory: Electronic Textbook. - Karaganda: KarGTU, 2020. 9. Elamanova, G.T. Development of Client-Server Database Applications: Educational-methodical complex, 2014. 10. Petkovich, D. Microsoft SQL Server 2012: Beginner's Guide - St. Petersburg: BHV-Peterburg, 2013. - 816 p. 11. Karpova, I.P. Databases. Lecture Course and Materials for Practical Assignments. Textbook. – Moscow: Piter, 2013. – 240 p.

Module	NM 3301 Numerical methods
Semester(s) when the module is taught	6
Responsible teacher	Tutkusheva Zh.S.
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Core discipline , university component
Forms of training	Lectures, practical exercises, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Mathematical Analysis I, II, III, Differential equations, Algebra and Number Theory, Programming, Courses on boundary value problems for ordinary differential equations.
Module objectives / expected learning outcomes	The course aims to form students' systematic understanding of approximate methods for solving applied problems, mathematical modeling techniques, sources of errors, and methods for evaluating the accuracy of results. A. Students should know the basic methods of computational mathematics. B. They should be able to apply classical methods to solve problems, become familiar with practical methods for describing physical processes, and conduct numerical and qualitative analyses. C. The course develops a culture of thinking, analytical skills, and the ability to generalize and process results effectively. D. Students should be able to argue their point of view, strive for professional growth, and possess skills in working with literature. E. They should also be capable of teamwork, expressing their own opinions, considering colleagues' viewpoints, and fostering mathematical culture.
Content	Numerical methods are a crucial discipline in the professional training of mathematics specialists. The main topics covered in the course include elements of error theory, methods for solving systems of linear algebraic equations, iterative methods, function approximation theory, numerical integration, methods for solving differential equations, and other related areas.
Form of examination	Blank test
Training and Examination requirements	1. Attendance to all classes is mandatory, and punctuality is required. 2. If unable to attend for a valid reason, prior notification must be given. 3. Assignments must be submitted by the specified deadlines. 4. Students should be able to defend their viewpoints, pursue professional development, and demonstrate proficiency in working with literature. 5. Late sbmissions of assignments will not be accepted.

List of literature	**Core Reading:** 18. Bektemesov M. A., Gusmanova F. R., Turganbaeva A. R. *Quantitative Methods: Teaching Methods*. Almaty: Kazakh University, 2020. – 252 p. 19. Babaliyev A. M. *Quantitative Methods*. Almaty: Association of Universities of RK, 2014. 20. Dilman et al. *Quantitative Methods*, учебно-методическое пособие, 2015. 21. Zholdasova K. *Quantitative Methods*, Laboratory Workshop, Teaching Post, 2015. 22. Mamaev K. S. *Quantitative Methods: Electronic Learning*, 2014. 23. Nurymbetov A. U. *Quantitative Methods*, учебное пособие, 2014. 24. Kurenkeev et al. *Quantitative Methods*, учебник, 2017. **Supplementary Reading:** 25. Baibaktina A. T. *Leadership in the Field of Laboratory Work in the Discipline "Quantitative Methods"*, Aktobe: Aktobe Regional University named after K. Zhubanova, 2011. 26. Omarbekova A. S. *Quantitative Methods*, учебник, 2013. **Electronic Resources:** 27. Baibaktina A. T. *Guidelines for Laboratory Work in the Discipline "Sandyk Adister"*, Aktobe Regional University named after K. Zhubanov, 2011. 28. Omarbekova A. S. *Sandyk Adister*, textbook, 2013. 29. K. Zhubanov Aktobe Regional University Electronic Library – neb.arsu.kz 30. "Epigraph" Database – elib.kz 31. "Epigraph" Multimedia Textbook – mbook.kz 32. "Smart Kitap" – web.smart-kitap.kz 33. "RJOAEK" Information System – rmebrk.kz 34. Republican Scientific and Technical Library – aktobe.rntb.kz

Module	FBS 3215 Finance and banking statistics (dual education)
Semester(s) when the module is taught	6
Responsible teacher	Izgarina Gulzhanat Kadirzhanovna
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Core discipline , university component
Forms of training	Lectures, practical exercises, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master the discipline "Financial and Banking Statistics" within the module, the following knowledge, skills, and competencies acquired from the study of these courses are required: basics of algebra, basics of geometry, probability theory, and general theory of statistics.
Module objectives / expected learning outcomes	**Module objectives:** To provide a comprehensive understanding of the patterns, aggregates, and statistical relationships that occur in the financial and banking sector, as well as to teach students how to apply statistical methods directly in the areas of finance, monetary circulation, and credit. **Learning outcomes:** As a result of studying the discipline, the student should know the main classifications in the financial and banking sectors according to international standards; the organization of statistics in financial institutions; and the methodology for evaluating and analyzing the presence, composition, and movement of financial assets. The student should be able to apply statistical methods and techniques to analyze the state, structure, and dynamics of monetary circulation and the use of financial results; master the methodology for quantitatively assessing the factors influencing the formation of processes in the financial sector; and establish statistical relationships between the process of creating gross national income, gross domestic product, and their distribution through financial and banking systems.
Content	The course covers the theoretical foundations of "Financial and Banking Statistics." It includes the statistics of the state budget and the statistics of financial performance in the "Non-financial enterprises" sector. Banking statistics and monetary statistics are also studied. The course examines insurance activity statistics and securities market statistics. It addresses modern financial balances at the micro level and the statistics of financial resources of the Republic of Kazakhstan. Additionally, it revisits the statistics of financial performance in the "Non-financial enterprises" sector.
Form of examination	Traditional
Training and Examination requirements	Mandatory attendance of classes, active participation in discussions, prior preparation for lectures and practical sessions, high-quality and timely completion of Independent Student Work (ISW), and participation in all forms of assessment.

List of literature	1. Avrov A.P., Nurlybayeva A.A. *Financial and Banking Statistics*. – Almaty: "Economy", 1997. 2. Belgibayeva K.K. *Financial and Banking Statistics*. – Almaty: "Economy", 2000. 3. Eslyuk M.E. *Statistics of Finance*. – Minsk: "Vyshaya Shkola", 1997. 4. *On State Statistics: Law of the Republic of Kazakhstan* dated May 7, 1997 – Kazakhstanskaya Pravda. 5. *Finance Statistics* / Ed. by Salin V.N. – Moscow: "Finance and Statistics", 2000. 6. Melnikov V.D. *State Financial Regulation of the Economy of Kazakhstan*. – Almaty: Economy, 1995. 7. *Statistics: Textbook* / Ed. by Ionin V.G. – Moscow: "UNITY", 2002. 8. Nazarov M.G. *Course of Socio-Economic Statistics*. – Moscow: Finance and Statistics, 2000.

Module 9 - Multidimensional analysis in geometry and theory of functions

Module	DGT 3302 Differential geometry and topology
Semester(s) when the module is taught	5
Responsible teacher	Kaidasov J., Tutkusheva Zh.S.
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Basic discipline, university component
Forms of training	Lectures, practical classes, guided self-study (GSS), self-study (SS).
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical classes) Self-study, including exam preparation: 25 hours of guided self-study (GSS), 80 hours of self-study (SS)
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Analytical Geometry, Mathematical analysis I, II, Differential equations, Algebra
Module objectives / expected learning outcomes	**Module objectives:** To introduce students to the fundamental concepts of modern geometry and topology and their applications, fostering a systematic understanding of the theory of curves and surfaces. **Learning Outcomes:** A. Understand the basic concepts of differential geometry and topology, and be able to evaluate the validity of related conclusions. B. Apply mathematical methods relevant to the specialty, and solve mathematical problems using these methods. C. Draw conclusions from mathematical reasoning and present them clearly, logically, and coherently both orally and in writing. D. Independently comprehend mathematical tools in academic literature, select appropriate methods, and apply necessary calculation techniques relevant to their specialty. E. Assess the significance of the course material, correlate conclusions, and interpret results effectively.
Content	Differential Geometry and Topology is a discipline that studies geometric shapes—primarily curves and surfaces—using methods from mathematical analysis. Differential geometry developed closely alongside mathematical analysis and emerged as a distinct branch of geometry in the 18th century, associated with notable mathematicians such as G. Monge and L. Euler. The course covers the theory of curves and surfaces in Euclidean space and introduces fundamental concepts of topology and elements of Riemannian geometry. The main goal of the course is to thoroughly explain these concepts and ensure students gain a deep understanding.
Form of examination	Traditional
Training and Examination requirements	1. Attendance is mandatory, and students must arrive on time. 2. If unable to attend for a valid reason, prior notification is required. 3. Assignments must be submitted by the deadline. 4. Students should be able to clearly argue their point of view and demonstrate a commitment to professional growth. They must also have skills in working with academic literature. 5. Late assignments will not be accepted.

List of literature	**Core reading** 1. G.O. Kozhasheva. Differential Geometry, 2016. 2. G.O. Kozhasheva. Problems and Exercises in Differential Geometry, 2016. 3. A.T. Musin. Differential Geometry, electronic textbook, 2014. **Supplementary reading:** 1. Poznyak E.G., Shikin E.V. Differential Geometry. First Introduction. Moscow State University, 2005. 2. Collection of Problems and Exercises in Differential Geometry (edited by Vodnev I.). Minsk, 2005. 3. Kaidasov Zh. Elements of Differential Geometry and General Topology. Aktobe, 2004. 4. Kaidasov Zh. Some Figures in Lobachevsky Plane. Almaty: “Gylym”, 2002. 5. Mishchenko A.S., Fomenko A.T. Course of Differential Geometry and Topology. Moscow: MSU, 1980. 6. Taimonov I.A. Lectures on Differential Geometry. Moscow-Izhevsk: Regular and Chaotic Dynamics, 2006. 7. Bazylev V.T. Geometry of Differentiable Manifolds. Moscow: Higher School, 1989. **Electronic resources:** 1. Republican Interuniversity Electronic Library (RMEK) – http://rmebrk.kz/ 2. Electronic database of the publisher "Epigraph" – https://elib.kz/ 3. Electronic library of Kazakh-Russian University (ARU) – http://neb.arsu.kz/en 4. Internet library – https://math.ru/lib/ 5. Internet library of the Moscow Center for Continuous Mathematical Education (Vitaly Arnold) – http://ilib.mccme.ru/ 6. Electronic portal of multimedia textbooks of MU "Epigraph" – https://mbook.kz/en/index/ 7. Republican Scientific and Technical Library (RSTL) – http://aktobe.rntb.kz/ 8. Electronic educational physics-mathematics library of the EqWorld website – http://eqworld.ipmnet.ru/en/library/mathematics.htm 9. Electronic library of Zhubanov Aktobe Regional University – neb.arsu.kz 10. Multimedia textbook of "Epigraph" – mbook.kz

Module	FTFAE 3303 Elements of the theory of functions and functional analysis
Semester(s) when the module is taught	5
Responsible teacher	Utesov A. B
Language of instruction	Kazakh
Connection with the curriculum	Professional discipline, IE
Forms of training	Lectures, Practical Sessions, Instructor-Guided Independent Work (IGIW), Self-Directed Learning (SDL)
Academic load (incl. contact hours and SIW - Students' Independent Work	Total Academic Workload: 150 hours Contact Hours: 45 hours (Lectures: 15 hours, Practical Sessions: 30 hours) Independent Study (including exam preparation): IGIW - 25 hours, SDL - 80 hours
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills, and abilities acquired during the study of the following courses: Mathematical Analysis 1, 2, 3; Fundamentals of Algebra; Fundamentals of Geometry.
Module objectives / expected learning outcomes	**Module objectives** To present the basic concepts and principles of functional analysis, which form a core part of the research tools in theoretical and applied mathematics. It helps students understand concepts, principles, and facts that they may have previously encountered in isolated contexts, now viewed from a broad, functional-analytic perspective. **Learning outcomes** A) Students will be able to grasp the meaning of fundamental concepts and theorems in mathematics, which are important both directly and through their many applications. They should be able to study and master material that can be learned independently. B) Students will develop the ability to complete tasks independently. C) The course aims to reinforce and retain knowledge and skills, not only through introducing new concepts but also by revisiting classical material within the general framework of functional analysis. D) Students will cultivate the ability to argue their viewpoints, foster professional growth, and develop skills in working with academic literature. E) Students will gain the ability to work effectively in teams, express their opinions clearly, consider the viewpoints of colleagues, and develop a strong mathematical culture.
Content	The course is designed to introduce students to the basic concepts and methods of the theory of functions and functional analysis, which are essential for further study of modern mathematics. Topics include elements of set theory, metric spaces, linear spaces, linear functionals and operators. Special emphasis is placed on the Lebesgue integral and its properties, as well as on function spaces of integrable functions. Hilbert spaces, their structure, and applications are studied in detail. The concept of a stationary point and its role in function analysis are also considered.
Form of examination	Blank test
Training and Examination requirements	Regular attendance in both online and in-person classes is mandatory. Students are expected to engage actively in the discussion of course topics, demonstrate preparedness for lectures and practical sessions, and complete all Independent Study (IS) assignments with high quality and within set deadlines. Participation in all forms of assessment, including formative and summative evaluations, is required.

List of literature	1. Nauryzbayev K.Zh. Functional Analysis. Almaty, 2007. 2. Dosymov T.B. Fundamentals of Functional Analysis. Almaty, "Mektep", 1988. 3. Kenzhebayev K.K., Utarbayev S.I., Balmagambetova R.E. Functional Analysis and Integral Equations through Exercises and Problems. Aktobe, 2002. 4. Kolmogorov A.N., Fomin S.V. Elements of the Theory of Functions and Functional Analysis. Moscow, "Nauka", 1989. 5. Lusterik L.A., Sobolev V.I. A Short Course in Functional Analysis. Moscow, "Vysshaya Shkola", 1982. 6. Temirgaliev N. Mathematical Analysis. Vol. I. Textbook. Almaty: Mektep, 1987. 7. Temirgaliev N. Mathematical Analysis. Vol. II. Textbook. Almaty: Ana Tili, 1991. Mektep, 1987. – 288 pages.

Module	ThFCV 3304 The theory of functions of a complex variable
Semester(s) when the module is taught	6
Responsible teacher	Otarov K.T.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Basic discipline, Elective component
Forms of training	Lectures, practical classes, guided self-study (GSS), self-study (SS).
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical classes) Self-study, including exam preparation: 25 hours of guided self-study (GSS), 80 hours of self-study (SS)
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the following courses: Mathematical analysis-1,2,3, Functional theory, and functional analysis of elements.
Module objectives / expected learning outcomes	**Module objectives** To familiarize students with fundamental approaches to studying variable quantities, based on the analysis of infinitesimal quantities and the properties of the field of complex numbers. **Learning outcomes** A) Master the basic concepts and methods of the discipline, know important definitions, theorems, and key formulas, be able to prove theorems independently, and apply these results to problem-solving. B) Acquire essential concepts, knowledge, skills, and qualifications through the study of the discipline. C) Understand the concept of describing natural and technical phenomena through analytic functions of a single complex variable. D) Know and apply the laws of natural and technical phenomena using analytic functions of one complex variable. E) Students must learn the core concepts and methods of complex variable function theory, be capable of applying key definitions to prove theorems and formulas, and draw conclusions from these results.
Content	Complex numbers, sequences and series of complex numbers, curves and regions on the complex plane, continuous functions of complex variables, integration of functions of complex variables, regular functions, Laurent series, isolated special points, multivalued analytical functions, subtraction theory and its applications chapters.
Form of examination	Blank test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical exercises, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.

List of literature	**Core reading** 1. Otarov H. T., Turganbaev A. A. *Theory of Complex Variable Functions*. Aktobe, 2020. (in Kazakh) 2. Abduakhitova G. *Complex Variable Functions*. Almaty: Kazakh University, 2009. 3. Kairbekov T. *Methods of Solving Problems in the Theory of Complex Variable Functions*, 2008. 4. Beisebay P. B. *Theory of Complex Variable Functions*, 2009. 5. Privalov I. I. *Introduction to the Theory of Complex Variable Functions*. Almaty, 1991. **Supplementary reading** 6. Domrin A. V., Sergeev A. G., Ushakov N. G. *Lectures on Complex Analysis*. Moscow, Mian, 2004. 7. Volkovysky L. I., Lunts G. L., Aramonovich I. G. *Collection of Tasks on the Theory of Functions of a Complex Variable (TFCP)*. Moscow, FIZMATLIT, 2004. 8. Shvedenko S. V. *The Beginning of the Analysis of the FCCP*. Moscow, MEPhI, 2008. 9. Solomentsev E. D. *Functions of a Complex Variable and Their Applications*. Moscow: Higher School, 1988. 10. Sidorov Yu. V., Fedoryuk M. V., Shabunin M. I. *Lectures on the Theory of Analytic Functions*. Moscow: Nauka, 1982. **Electronic Resources:** 11. Republican Interuniversity Electronic Library (RMEB) – http://rmebrk.kz/ 12. Electronic Database of the Publishing House "Epigraf" – https://elib.kz/ 13. AGC Electronic Library – http://neb.arsu.kz/ru 14. Online Library – https://math.ru/lib/ 15. Internet Library of the Moscow Center for Continuing Mathematical Education (Vitaly Arnold) – http://ilib.mccme.ru/ 16. Multimedia Textbooks Portal of MU "Epigraf" – https://mbook.kz/ru/index/ 17. Republican Scientific and Technical Library (RNTB) – http://aktobe.rntb.kz/ 18. EqWorld Electronic Educational Physics and Mathematics Library – http://eqworld.ipmnet.ru/ru/library/mathematics.htm

Module 10 – Applied Mathematics

Module	**PThMS 3305 Probability Theory and Mathematical Statistics**
Semester(s) when the module is taught	5
Responsible teacher	Azhymbaeva D. T.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Basic discipline, Elective component
Forms of training	Lectures, Practical exercises, OSOZH, SOZH
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Independent training, including exam preparation: 25 h SRSP, 80 h SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills, and abilities acquired during the study of the following courses: Algebra and Mathematical Analysis.
Module objectives / expected learning outcomes	**Module objectives:** To professionally and methodically prepare future mathematics teachers to teach elements of probability theory and mathematical statistics at school. **Learning Outcomes:** A. Knowledge of the fundamental concepts of probability theory and mathematical statistics. B. Ability to state and justify the main conclusions of these topics. C. Ability to formulate typical problems based on the theoretical material and practical work. D. Ability to reach agreements, reconcile personal opinions with group consensus, and apply mathematical methods in professional activities. E. Ability to competently apply knowledge and skills in teaching, understand the social significance of the teaching profession, and develop motivation for professional activity.
Content	Combinatorics formulas. Theorems of addition and multiplication of probabilities. Full probability formula. Bayesian formula. Repeat tests. Random variables. Quantitative characteristics of random variables. The law of large numbers. Chebyshev inequality. General set and selection. Empirical distribution function. Evaluation of distribution parameters. Functional, statistical and correlation dependence. Random processes.
Form of examination	
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical classes, high-quality and timely completion of SRO tasks, participation in all forms of assessment.
List of literature	

Module	Eco 3307 Econometrics
Semester(s) when the module is taught	6
Responsible teacher	Akhmetova Ayymgul Utegulovna, Associate Professor of the Department of Mathematics
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Basic discipline, university component
Forms of training	Lectures, practical exercises, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Probability Theory and Mathematical statistics.
Module objectives / expected learning outcomes	**Module objectives:** To familiarize students with key topics such as statistical hypothesis testing, simple linear regression, correlation, multiple linear regression models, multicollinearity, dummy variables, statistical significance of regression coefficients, heteroscedasticity, and dynamic econometric models. **Learning Outcomes:** ● Be able to solve problems in core branches of mathematics, including actuarial mathematics and statistics. ● Master mathematical and algorithmic modeling methods for analyzing management tasks in scientific, technical, economic, business, and humanitarian fields. ● Be fluent in Kazakh, Russian, and a foreign language of instruction; possess foundational skills in various forms of oral and written communication within the specialist's competence in mathematics and statistics; understand general principles of academic writing. **Upon completion of the discipline, students will be able to:** 1. Know the basic definitions, theorems, rules, and mathematical methods of econometrics. 2. Apply methods to solve core econometric tasks. 3. Solve econometric problems effectively. 4. Formulate and present results of econometric problem-solving. 5. Evaluate the outcomes of econometric analyses.
Content	Method of least squares, estimation and analysis of parameters in simple and multiple regressions, evaluation of the quality of econometric models of dependencies, identification of trends in dynamic data, and determination of differences between variables and types of dependencies.
Form of examination	Blank test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical exercises, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.

List of literature	1. Saparbaev Ä.Zh., Maqulova A.T. Econometrics (electronic textbook). Almaty: “Economika,” 2018. – 240 pages. 2. Usbanova G.Sh., Shaikin D.N. Practicum on the subject "Econometrics": study-methodical guide. Petropavl: M. Kozybayev North Kazakhstan University, 2015. – 86 pages. 3. Rakhmetova R.Ö. Econometrics. Textbook. Astana: “Turan-Astana,” 2018. – 206 pages. 4. Molodykh V.A., Rubezhnoi A.A., Sosin A.I. Textbook (practicum) on the discipline "Econometrics": study guide (practicum). Stavropol: SKFU Publishing House, 2015. – 179 pages. 5. Magnus Ya.R., Katyshev P.K., Peresetsky A.A. Econometrics. Introductory Course. Moscow: Delo, 2004. – 576 pages. 6. Practicum on Econometrics: study guide / I.I. Eliseeva, S.V. Kurysheva, N.M. Gordeenko, et al., edited by I.I. Eliseeva. Moscow: Finance and Statistics, 2003. – 192 pages. 7. Tireuov Q.M., Akhmetov Q.A., Asaev R.A. Econometrics: Textbook / Ministry of Education and Science of the Republic of Kazakhstan; Association of Higher Education Institutions of RK. Almaty: LLP RPBK “Däuir,” 2011. – 304 pages. ISBN 978-601-217-265-2.

Module 11.1 – Theoretical and mathematical physics and boundary value problems

Module	RTUDE 3217 Regional tasks of usual differential equalizations
Semester(s) when the module is taught	5
Responsible teacher	Tokmurzin Zh.S. Senior lecturer. PhD
Language of instruction	Kazakh / Russian
Connection with the curriculum	Core Discipline, Elective Component
Forms of training	Lectures, Practical Sessions, Instructor-Guided Independent Work (IGIW), Self-Directed Learning (SDL)
Academic load (incl. contact hours and SIW - Students' Independent Work	Total Academic Workload: 150 hours Contact Hours: 45 hours (Lectures: 15 hours, Practical Sessions: 30 hours) Independent Study (including exam preparation): IGIW - 25 hours, SDL - 80 hours
ECTS	5
Mandatory and recommended prerequisites for studying the module	To successfully complete this module, students should have foundational knowledge and competencies gained from the following courses: Differential equations.
Module objectives / expected learning outcomes	The study of boundary value problems for differential equations involves both theoretical information and the theory of differential equations, including practical methods from this field. This covers solutions of single Cauchy problems and their extensions, elements of the theory of linear systems, and the main types of boundary value problems along with their interrelationships. **Learning outcomes** A. Know and be able to apply the fundamental laws of natural science disciplines in professional activities. B. Understand the theorems related to boundary value problems for partial differential equations, including the construction of Green's functions for basic boundary value problems. C. Develop a culture of critical thinking, present results clearly, and perform work aimed at developing logical reasoning skills. D. Be capable of independently exploring new directions in fundamental sciences and demonstrate readiness for self-directed learning. Formulate mathematical problems and solve practical tasks. E. Show willingness and ability to independently study new areas of fundamental sciences and work autonomously.
Content	Basic methods for solving boundary value problems using Green's functions, properties of the Sturm-Liouville problem. Their use for solving nonlinear boundary value problems.
Form of examination	Blank test
Training and Examination requirements	Regular attendance in both online and in-person classes is mandatory. Students are expected to engage actively in the discussion of course topics, demonstrate preparedness for lectures and practical sessions, and complete all Independent Study (IS) assignments with high quality and within set deadlines. Participation in all forms of assessment, including formative and summative evaluations, is required.

List of literature	1. Kolekeev K. D., Nazarova K. J. *Differentialdyk Tandeuler*. Almaty, 2012. 2. Nefedov N. N., Popov V. Yu., Volkov V. T. *Ordinary Differential Equations: A Course of Lectures*. Moscow: Faculty of Physics, Lomonosov Moscow State University, 2016. 200 p. 3. *Central Computational Methods for Solving Applied Problems*. Moscow: Mir, 1982. 296 p. 4. Paskonov V. M., Polezhaev V. I., Chudov L. A. *Numerical Modeling of Heat and Mass Transfer Processes*. Moscow: Nauka, 1984. 288 p. 5. Isachenko V. P., Osipova V. A., Sukomel A. S. *Heat Transfer*. Moscow: Energiya, 1975. 488 p. 6. Samarskiy A. A. *Introduction to the Theory of Difference Schemes*. Moscow: Nauka, 1971. 552 p. 7. Suleyman J. *Differentialdyk Tandeuler Courses.* Almaty, 2009. 8. Ashirbaev N. K. *Zhaibaldyk Tandeuler*. Almaty: Evero, 2014. 228 p.

Module	AL 3218 Academic letter
Semester(s) when the module is taught	5
Responsible teacher	Kagazbaeva A. K.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Profile discipline, university component
Forms of training	Lectures, practical classes, OSOZH, SOZH
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 120 hours Contact hours: 40 hours (20 hours of lectures, 20 hours of practical exercises) Independent training, including exam preparation: 60 h SRSP, 20 h SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills, and abilities acquired during the study of the following courses: Philosophy, Academic Ethics, Pedagogical Practice.
Module objectives / expected learning outcomes	**Module objectives:** To professionally and methodically prepare future mathematics teachers to teach elements of probability theory and mathematical statistics at school. **Learning outcomes:** A. Demonstrate knowledge and understanding of academic writing requirements, including key concepts, terminology, and the structure and sequence of writing. B. Apply academic writing skills in the preparation of a diploma project and in planned pedagogical activities at school. C. Analyze scientific works related to their field throughout their teaching career. D. Write scientific articles and supervise students' scientific projects. E. Assess research work at a professional knowledge level.
Content	Introduction to academic writing. Writing an abstract. Understanding the concept of a scientific article. Methods for teaching how to write a scientific article. Preparing a scientific report. Preparing an oral presentation. Creating a slide presentation. Preparing a thesis. Writing an annotation. Understanding projects and their types. Content and structure of a diploma project. Procedures for compiling a diploma project.
Form of examination	
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical classes, high-quality and timely completion of SRO tasks, participation in all forms of assessment.
List of literature	1. Grebennikova I. V. *The Study of Mathematical Physics* in Yekaterinburg, UrFU, 2016. 2. Bizhigitov T. *Methods of Mathematical Physics*. Textbook. Almaty, 2012. 3. Ramazanov M. I., Mukhtarov M., Adilbek N. *Basic Equations of Mathematical Physics*. Training manual. Karaganda: IP "AK Nur Publishing House", 2012. 4. Sarsekeeva A. S. *Equations of Mathematical Physics*. Almaty: Kazakh University, 2015. RSE. 5. Boykov V. A., Zhiber A. V. *The Study of Mathematical Physics*. Izhevsk: Institute of Computer Science, 2012. 254 p. 6. Omarov T. E., Shayakhmetova B. K. *Dates in Private Production*. Almaty: Evero, 2016. 7. Mamontov A. E. *Lectures on Mathematical Physics*. Novosibirsk: NGPU, 2016. 8. Orynbasarov M., Sakhaev Sh. *Collection of Problems and Exercises on Equations of Mathematical Physics*. Almaty: Kazakh University, 2009.

Module	EMPh 3219 Equations of Mathematical Physics
Semester(s) when the module is taught	6
Responsible teacher	Bekbauova A.U.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Basic discipline, optional component
Forms of training	Lectures, practical classes, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	General workload: 150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical classes) Self-study, including preparation for exams: 25 hours of SRSP, 80 hours of SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge, skills, and abilities acquired during the following courses are necessary: Differential Geometry and Topology, Differential Equations, and Academic Writing.
Module objectives / expected learning outcomes	Describe the laws of physical phenomena using equations of mathematical physics. Know how to classify second-order partial differential equations, formulate boundary value problems for all types of equations, and solve these problems using fundamental methods. A) Master in depth the basics of the theory of mathematical physics equations. B) Master the Cauchy problem and methods for solving boundary value problems related to mathematical physics equations through theoretical lectures combined with problem-solving. C) Develop skills in constructing mathematical models of physical processes and solving corresponding problems. D) Apply the acquired knowledge to study boundary value problems for hyperbolic, parabolic, and elliptic equations. E) Cultivate the ability to use various methods for solving these equations effectively.
Content	Differential equations and boundary value problems. Information about differential equations with independent derivatives. Maximum principle for the heat equation. The theorem on the uniqueness of the solution of the Cauchy problem for a parabolic equation. Elliptic-type equations. Dirichlet problem for a circle and a half-plane. Theory of potentials. Volume and surface potentials. Thermal potential. Wave potential. Reduction of boundary value problems for an elliptic equation to an integral equation.
Form of examination	Written (ticket)
Training and Examination requirements	Mandatory participation in both online and in-person classes, active engagement in discussions, advance preparation for lectures and practical sessions, high-quality and timely completion of SIS assignments, and participation in all forms of assessment are required.
List of literature	1. Bizhigitov T. *Methods of Mathematical Physics*. Textbook. Almaty, 2014. 2. Ramazanov M.I., Mukhtarov M., Adilbek N. *Basic Equations of Mathematical Physics*. Textbook. Karaganda: Publishing House "Ak Nur Baspasy", 2013. 3. Tokybetov Zh.A., Khairullin E.M. *Equations of Mathematical Physics*. Astana, 2015. 4. Orynbasarov M., Sakhaev Sh. *Collection of Problems and Exercises on Equations of Mathematical Physics*. Almaty: Kazakh University, 2015. 5. Sarsekeyeva A.S. *Equations of Mathematical Physics*. Almaty: Kazakh University, 2015. RMEB.

Module 11.2 – Theoretical and mathematical physics and sustainability problems

Module	ThS 3217 Theory of stability
Semester(s) when the module is taught	5
Responsible teacher	Otarov K.T.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Basic discipline, Elective component
Forms of training	Lectures, practical classes, guided self-study (GSS), self-study (SS).
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical classes) Self-study, including exam preparation: 25 hours of guided self-study (GSS), 80 hours of self-study (SS)
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, the knowledge, skills, and abilities acquired from the following courses are required: Mathematical Analysis 1, 2, 3, and Differential Equations.
Module objectives / expected learning outcomes	Study of constant coefficient equations. Dependence of solutions on the given initial conditions. Stability and asymptotic stability according to Lyapunov. Analysis of systems of differential equations using the Lyapunov function method. Lyapunov's theorem on asymptotic stability and the study of stability via the Lyapunov function. The concept of solution stability. **Learning outcomes:** A. Students must know the basic definitions and concepts of the covered chapters. The ability to prove and apply the main theorems of Lyapunov is mandatory. B. Development of general mathematical culture and enhancement of students' logical and algorithmic thinking. C. Expansion of mathematical knowledge and development of skills necessary for mathematical analysis applications. D. Ability to understand various accumulations of meaning and construct examples related to their interrelations. E. Willingness to independently study new fundamental science topics.
Content	Mathematical stability theory includes the basic concepts and fundamental theorems of stability. It covers the stability of solutions to linear homogeneous systems of differential equations, the first method for studying stability, stability based on the first approximation, and difference stability of equations.
Form of examination	Blank test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical exercises, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.
List of literature	**Core reading:** 1. Biyarov T. *Theory of Stability of Motion*. Almaty, 1991. 2. Demidovich B. P. *Lectures on Mathematical Theory of Stability*. Moscow, 1967. 3. Nysambayev Zh. *Differential Equations*. Almaty, 2016. 4. Stepanov V. V. *Course in Differential Equations.* Moscow: Fizmatgiz, 2012. 5. Suleimenov Zh. S. *Differential Equations*, Part 1. Almaty: Rauan, 2004. 6. Pontryagin L. S. *Detailed Differential Equations*. Moscow: Nauka, 2010. **Supplementary Reading:** 7. Agafonov S. A. *Ordinary Differential Equations*. Moscow, 2008. 8. Krasnov M. L., Makarenko G. I. *Collection of Problems in Ordinary Differential Equations*. Moscow, 2005. 9. Matveev N. M. *Collection of Problems and Exercises in Ordinary Differential Equations*. Minsk, 2008. 10. Arnold V. I. *Ordinary Differential Equations*. Moscow: Nauka, 2007.

Module	AL 3218 Academic letter
Semester(s) when the module is taught	5
Responsible teacher	Kagazbaeva A. K.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Profile discipline, university component
Forms of training	Lectures, practical lessons, OSOZH, SOZH
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 120 hours Contact hours: 40 hours (20 hours of lectures, 20 hours of practical exercises) Independent training, including exam preparation: 60 h SRSP, 20 h SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge, skills, and abilities acquired during the study of the following courses are required: Philosophy, Academic Integrity, and Pedagogical Practice.
Module objectives / expected learning outcomes	**Module objective** To professionally and methodically prepare a future mathematics teacher for teaching elements of probability theory and mathematical statistics at school. **Learning outcomes:** A. Knowledge and understanding of the requirements for academic writing, including concepts, terminology, the sequence, and formatting of academic texts. B. During training and while writing a diploma project, the student uses academic writing skills methodically as a specialist in pedagogical activities. C. The student analyzes scientific works related to their field throughout their pedagogical career. D. The student writes scientific articles and supervises students' scientific projects. E. The student conducts assessments of research work at a professional knowledge level.
Content	Introduction to academic writing. Writing an abstract. The concept of a scientific article. Methods for teaching how to write a scientific article. Scientific reporting. Preparation of an oral report. Preparation of a presentation. Preparation of a thesis. Writing an annotation. Project types. Content and structure of a diploma project. Procedure for preparing a diploma project.
Form of examination	
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical classes, high-quality and timely completion of SRO tasks, participation in all forms of assessment.
List of literature	

Module	MMPh 3219 Methods of mathematical physics
Semester(s) when the module is taught	6
Responsible teacher	Tokmurzin Zh.S. Senior lecturer. PhD
Language of instruction	Kazakh / Russian
Connection with the curriculum	Core Discipline, Elective Component
Forms of training	Lectures, Practical Sessions, Instructor-Guided Independent Work (IGIW), Self-Directed Learning (SDL)
Academic load (incl. contact hours and SIW - Students' Independent Work	Total Academic Workload: 150 hours Contact Hours: 45 hours (Lectures: 15 hours, Practical Sessions: 30 hours) Independent Study (including exam preparation): IGIW - 25 hours, SDL - 80 hours
ECTS	5
Mandatory and recommended prerequisites for studying the module	To successfully complete this module, students should have foundational knowledge and competencies gained from the following courses: Differential equations, Academic writing
Module objectives / expected learning outcomes	**Module objectives:** To describe the patterns of physical phenomena using mathematical physics methods; to formulate a boundary value problem for equations of all types; and to solve a boundary value problem using basic methods. **Learning outcomes:** A) Deep knowledge of mathematical physics methods. B) Mastery of theoretical lectures combined with problem solving: mastering the methods to solve Cauchy problems and boundary value problems. C) Formation of skills in constructing mathematical models of physical processes and solving relevant problems. D) Study and application of acquired knowledge on boundary value problems assigned to specific hyperbolic, parabolic, and elliptic equations. E) Formation of skills to use various methods to solve the equations.
Content	Partial differential equations and boundary value problems related to them. The maximum principle for the equation of thermal conductivity. The singularity theorem of the solution of the Cauchy problem posed by a parabolic equation. Elliptic type equations. Dirichlet calculation for round and half-planes. Theory of potentials. Volume and surface potentials. Thermal potential. The wave potential. Reduction of given boundary value problems to an integral equation for an elliptic equation.
Form of examination	Blank test
Training and Examination requirements	Regular attendance in both online and in-person classes is mandatory. Students are expected to engage actively in the discussion of course topics, demonstrate preparedness for lectures and practical sessions, and complete all Independent Study (IS) assignments with high quality and within set deadlines. Participation in all forms of assessment, including formative and summative evaluations, is required.

List of literature	1. Grebennikova I. V. *The Study of Mathematical Physics in Yekaterinburg*. UrFU, 2016. 2. Bizhigitov T. *Methods of Mathematical Physics*. Textbook. Almaty, 2012. 3. Ramazanov M. I., Mukhtarov M., Adilbek N. *Basic Equations of Mathematical Physics*. Training manual. Karaganda: IP "AK Nur Publishing House", 2012. 4. Sarsekeeva A. S. *Equations of Mathematical Physics*. Almaty: Kazakh University, 2015. 5. Boykov V. A., Zhiber A. V. *The Study of Mathematical Physics*. Izhevsk: Institute of Computer Science, 2012. 254 p. 6. Omarov T. E., Shayakhmetova B. K. *Dates in Private Production*. Almaty: Evero, 2016. 7. Mamontov A. E. *Lectures on Mathematical Physics*. Novosibirsk: NGPU, 2016. 8. Tikhonov A. N., Samarsky A. A. *Equations of Mathematical Physics*. Moscow: MGU Publishing, 2009. 520 p. 9. Abdikalikova G. A., Berzhanov A. B. *Tasks on the Achievements of Mathematical Physics*. Academic publication. Aktobe: Litera-a, 2007. 10. Emelyanov V. M., Rybakina E. A. *The Study of Mathematical Physics: Practice on Solving Tasks*. St. Petersburg: LAN, 2008. 11. Tokybetov Zh. A., Khairullin E. M. *Equations of Mathematical Physics*. Astana, 2010. 12. Orynbasarov M., Sakhaev Sh. *Collection of Problems and Exercises on Equations of Mathematical Physics*. Almaty: Kazakh University, 2009.

12.1. Module – Differential equations and their applications

Module	VCOM 4220 Variation Calculus and Optimization Methods
Semester(s) when the module is taught	7
Responsible teacher	Akhmetova Ayymgul Utegulovna, Associate Professor of the Department of Mathematics
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Basic discipline, elective component
Forms of training	Lectures, practical exercises, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	3
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge, skills and abilities acquired during the study of the following courses are required: MA(I) 1204 Mathematical Analysis I, MO(II) 2205 Mathematical Analysis II.
Module objectives / expected learning outcomes	**Module Objectives:** To familiarize students with such branches of mathematics as calculus of variations, linear programming, nonlinear programming, convex programming, numerical methods of minimizing linear programming, and optimization methods. **Learning Outcomes:** A. Possess basic knowledge in the field of theoretical and applied mathematics, computer science, and modern information technologies. B. Be able to see the applied aspect in solving a scientific problem, competently present and interpret the result, analyze the result, and correct the mathematical model underlying the problem. C. Master the methods of mathematical and algorithmic modeling in the analysis of management tasks in the scientific and technical field, as well as in economics, business, and humanitarian fields of knowledge.
Content	Learning outcomes: (learning outcomes should be consistent with the purpose of the discipline) 1. Know the methods of solving extreme problems of functionals and functions, and possess basic knowledge in theoretical and applied mathematics. 2. Build mathematical models of practical extreme problems, apply known methods, draw conclusions, and analyze the results. 3. Understand the implementation of algorithms for solving extreme problems related to specific tasks; be able to correct the underlying mathematical model; master mathematical and algorithmic modeling methods in management tasks across scientific, technical, economic, business, and humanitarian fields. 4. Work independently with basic techniques, including studied elements, and develop plans for solving assigned tasks. 5. Assess the significance of the course material and draw informed conclusions.
Form of examination	Variational tasks. Nonlinear and convex programming. Basic concepts. Linear programming and numerical minimization methods in finite-dimensional space.
Training and Examination requirements	Blank test
List of literature	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical exercises, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.

Module	IE 4306 Integral equations
Semester(s) when the module is taught	7
Responsible teacher	Utesov A.B.
Language of instruction	Kazakh
Connection with the curriculum	Professional subject , elective component
Forms of training	Lectures, practical lessons, SSIS, SSIS
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact Hours: 45 hours (15 hours) lectures, 30 hours experimental lessons) Self-study, including exam preparation: 25 hours of SSIS, 80 hours of SSIS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To study this module, the following courses' knowledge and skills are required: Mathematical Analysis 1, 2, and 3, Theory of Functions, and Elements of Functional Analysis.
Module objectives / expected learning outcomes	**Learning Outcomes** A. Know the basic definitions of sections related to integral equations. B. Be able to state and prove the main conclusions of the studied sections. C. Be able to solve typical problems studied in the main theoretical materials based on practical work. D. Be able to work in a group, express opinions, and achieve professional advancement. E. Be able to work independently with basic methods of solving given problems; communicate effectively with colleagues and consider their opinions.
Content	Classification of linear integral equations, linear operators in infinite-dimensional Euclidean spaces, Fredholm equations of the second kind including both homogeneous and inhomogeneous equations, boundary value problems for eigenvalues and eigenfunctions such as the Sturm-Liouville problem, the Volterra equation, and the concept of well-posed and ill-posed problems.
Form of examination	Blank test
Training and Examination requirements	Mandatory participation in both online and classroom classes; active participation in discussions; advance preparation for lectures and practical classes; high-quality and timely completion of SIS tasks; participation in all types of assessments.
List of literature	1. Orynbasarov M., Sakhaev Sh. *Course of Integral Equations*. Almaty, 2014. 2. Vasilieva A.B., et al. *Differential and Integral Equations, Variational Calculus in Examples and Problems*. 2nd ed., revised. Moscow: FIZMATLIT, 2005. 3. Krasnov M.L., Kiselev A.I., Makarenko G.I. *Integral Equations*. Moscow: Nauka, 1968. 4. Kenzhebayev K.K., Utarbayev S.I., Balmagambetova R.E. *Functional Analysis and Integral Equations: Exercises and Reports Collection*. October 2002. 5. Nauryzbayev K.Zh. *Functional Analysis*. Almaty, 2007. 6. Kolmogorov A.N., Fomin S.V. *Elements of the Theory of Functions and Functional Analysis*. Moscow: Nauka, 1989. 7. Lusternik L.A., Sobolev V.I. *Short Course of Functional Analysis*. Moscow: Vysshaya Shkola, 1982. 8. Dosymov T.B. *Fundamentals of Functional Analysis*. Almaty: School, 1988. 9. Temirgaliev N. *Mathematical Analysis, Volume II*. Reading Material. Almaty: Mother Tongue, 1991; School, 1987. 288 pages.

Module	MTh 4307 Matrix theory
Semester(s) when the module is taught	7
Responsible teacher	Tutkusheva Zh.S.
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Core discipline , university component
Forms of training	Lectures, practical exercises, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total working load:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, knowledge, skills, and abilities acquired from the following courses are required: elementary mathematics, mathematical analysis, and algebra.
Module objectives / expected learning outcomes	A. Know the basic definitions and concepts of the studied sections in matrix theory. B. Be able to formulate and prove the main results of these sections. C. Master skills in solving typical problems based on the theoretical material studied. D. Be able to argue your point of view, strive for professional growth, and work effectively with literature. E. Be able to work in a team, express your opinions, consider colleagues' viewpoints, and develop mathematical culture.
Content	Matrix theory is essential for the study of many specialized disciplines. As part of the mathematics training program, the following main sections of the matrix theory course are considered: the normal form of a matrix, unimodular λ-matrices, matrix polynomials, Jordan normal form, minimal polynomial, the study of systems of inhomogeneous linear differential equations using matrix methods, the transformation of systems of linear differential equations into vector-matrix form.
Form of examination	Blank test
Training and Examination requirements	1. Attendance and punctuality in all classes are mandatory. 2. Notify in advance if you cannot attend for a valid reason. 3. Assignments must be submitted on time. 4. Be prepared to argue your point of view and pursue professional growth; develop skills in working with literature. 5. Late assignments will not be accepted.
List of literature	**Core Reading:** 1. Logvenkov, S. A., & Samovol, V. S. *Linear Algebra: Fundamentals of Theory, Examples and Tasks*. Moscow: ICNMO, 2017. 188 p. 2. Kurnosenko, N. M., & Parukevich, V. V. *Matrix Analysis: The General Theory of Matrices — A Practical Guide*. Podgornaya: Ministry of Education of the Republic of Belarus, F. Skorina State University, Gomel, 2015. 45 p. **Supplementary Reading:** 1. Kurosh, A. G. *Course of Higher Algebra*. Moscow: Nauka, 1975. 432 p. 2. Faddeev, D. K., & Sominsky, I. S. *Collection of Problems in Higher Algebra*. Moscow: Nauka, 1964. 304 p. 3. Gantmacher, F. R. *Theory of Matrices*. Moscow: Sciences, 2016. 560 p. 4. Bugrov, Ya. S., & Nikolsky, S. M. *Elements of Linear Algebra and Analytical Geometry*. Moscow: Bustard, 2004. 5. Bugrov, Ya. S., & Nikolsky, S. M. *Differential and Integral Calculus*. Moscow: Bustard, 2004. 6. Danko, P. E., Popov, A. G., & Kozhevnikova, T. Ya. *Higher Mathematics in Exercises and Tasks*, Parts 1 and 2. Moscow, 2007.

Module	NCEMP 4311 Nonclassical equations of mathematical physics
Semester(s) when the module is taught	7
Responsible teacher	Abdikalikova G.A.
Language of instruction	Kazakh / Russian
Connection with the curriculum	Profile discipline, elective component
Forms of training	Lectures, practical classes, IWST, independent work student.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 lectures, 30 practical) Independent study including exam prep: 25 hours guided, 80 hours independent
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need knowledge, skills and abilities acquired while studying the following courses: Differential equations, Boundary value problems for ordinary differential equations, Equations of mathematical physics, Theory of functions, Functional analysis and theory of integral equations.
Module objectives / expected learning outcomes	Statement of boundary value problems for non-classical equations of mathematical physics and their study using various methods for solving differential equations and equations of mathematical physics. The course teaches an in-depth study of solution methods, the construction of mathematical models of physical processes, and the formulation of corresponding problems using analytical methods. **Learning outcomes:** A. Understand current problems and the significance of non-classical equations of mathematical physics; know the connection between non-local boundary value problems and the general theory of differential equations. B. Formulate boundary value problems with non-local conditions for non-classical equations of mathematical physics; apply research methods from mathematical physics and the theory of differential equations. C. Compare research methods in fundamental mathematical physics and the theory of differential equations during the process of solving boundary value problems. D. Construct mathematical models of physical processes and use analytical methods to formulate and analyze the solvability of corresponding problems. E. Ability to compare and evaluate research methods of mathematical physics and the theory of differential equations in solving boundary value problems for non-classical equations of mathematical physics.
Content	The statement of a boundary value problem for a partial differential equation and its physical interpretation. Unique and correct solvability of boundary value problems for non-classical equations of mathematical physics. Formulation of boundary value problems for second-order non-classical equations of mathematical physics. Investigation of solutions to boundary value problems using iterative methods.
Form of examination	Oral (ticket)
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in discussions of issues, preliminary preparation for lectures and practical classes, high quality and timely completion of SRO assignments, participation in all forms of assessment.

List of literature	1. Arnold V.I. Lectures on Partial Differential Equations. Moscow: MCNMO, 2017. 182 p. 2. Sobolev S.L. Equations of Mathematical Physics. Moscow: Nauka, 1966. 444 p. 3. Vragov V.N. Boundary Value Problems for Non-classical Equations of Mathematical Physics. NSU, 1983. 84 p. 4. Bitsadze A.V. Some Classes of Partial Differential Equations. Moscow: Nauka, 1981. 5. Vladimirov V.S. Equations of Mathematical Physics. Moscow: Nauka, 1981. 512 p. 6. Courant R. Partial Differential Equations. Moscow: Mir, 1964. 830 p. Nakhushev A.M. Shift Problems for Partial Differential Equations. Moscow, 2006. 287 p. 7. Tokybetov Zh.E., Khairullin E. Equations of Mathematical Physics. 2010. 8. Ramazanov M.I., Mukhtarov M., Adilbek N. Basic Equations of Mathematical Physics. Karaganda, 2014. 324 p. 9. Orynbasarov M.O., Sakhaev Sh. Problems of Mathematical Physics Equations. 2009. RMEb. 10. Pikulin V.P., Pokhozhaev S.I. Practical Course on Equations of Mathematical Physics. MCNMO, 2004. 208 p. 11. Amelkin V.V. Differential Equations in Applications. Moscow: KD Librocom, 2012. 208 p. 12. Apollonsky S.M. Differential Equations of Mathematical Physics in Electronics. St. Petersburg: Piter, 2012. 352 p. 13. Umbetjanov D.U. Almost Periodic Solutions of Evolutionary Equations. Almaty, 1988. 240 p. 14. Collection of Problems on Equations of Mathematical Physics / V.S. Vladimirov et al. Moscow: Fizmatlit, 2001. 15. Abdikalikova G.A., Berzhanov A.B. Problems on Equations of Mathematical Physics: Textbook. Aktobe: Litera-A, 2007. 143 p.

Module	PhThM 4309 Physics and theoretical mechanics
Semester(s) when the module is taught	7
Responsible teacher	Taskaliyev Abish Kanievich, senior lecturer
Language of instruction	Kazakh
Connection with the curriculum	Necessary component
Forms of training	CER, MOOC, etc.
Academic load (incl. contact hours and SIW - Students' Independent Work	Lectures – 15 hours, practical classes – 30 hours, IWST – 25 hours, IWS – 80 hours (lecture, lesson, laboratory work, project, seminar, etc.).) / 150 hours
ECTS	5
Mandatory and recommended prerequisites for studying the module	Methods of mathematical physics, equations of mathematical physics, and non-classical equations of mathematical physics.
Module objectives / expected learning outcomes	**Module objectives:** To show students the basic ideas of theoretical mechanics containing the physical basis of classical mechanics predictions and modern ideas about space and time, the important role of conservation laws and their relationship with the properties of space and time and the symmetry of force fields, and to teach students to solve various problems in the movement of a material point and a solid body. **Learning outcomes:** **A.** Master basic knowledge in the field of theoretical and applied mathematics, computer science, and modern information technologies. **B.** Formulate the main results of fundamental and applied research in physics and mathematics related to studied phenomena or laws. **C.** Apply mathematical knowledge and methods to solve practical problems and analyze quantitative data presented in graphs, diagrams, and statistical formats. **D.** Use mathematical methods to analyze and synthesize physical processes, facts, and phenomena. **E.** Recognize the applied aspect of scientific problems and correctly interpret the results. **F.** Analyze outcomes and adjust the underlying mathematical model. **G.** Verify results, compile data tables, construct graphs, process outcomes, calculate errors, and determine percentage deviations from theoretical expectations. **H.** Draw conclusions, defend findings, and clearly explain completed work.
Content	Physics and theoretical mechanics are essential components of the physical and mathematical literacy of future specialists. This course presents the physical foundations of the laws of theoretical mechanics and describes various types of motion using vector and coordinate methods. It emphasizes the important role of conservation laws and their connection to the properties of space and time, as well as the symmetry of force fields. The course also explores different methods of analytical mechanics and focuses on solving problems related to the motion of a material point and a rigid body.
Form of examination	Written
Training and Examination requirements	Students who have mastered the course material and scored at least 50% of the overall rating based on the results of the 1st and 2nd intermediate tests are allowed to take the final exam

List of literature	**Core reading:** 1. Adyrbekov, M. A. *Theoretical Mechanics*. 2018. (in Kazakh) 2. Torekozhaev, A. N., Tuganbayeva, D. T., & Kyrykbayev, B. Zh. *Theoretical Mechanics*. Almaty, 2019. – 502 pages. (in Kazakh) 3. Alimzhanov, M. D., Duzelbayev, S. T., & Tuyakbayev, Sh. T. *Theoretical Mechanics*. 2018. (in Kazakh) 4. Imanbayeva, L. H. *Theoretical Mechanics: Textbook*. 2019. (in Kazakh) 5. Odiyak, B. P., Nametkulova, R. Zh., & Kadirimbetova, A. K. *Problems and Exercises of the Course of General Physics (Fundamentals of Classical Mechanics, Molecular Physics, and Thermodynamics), Part 1*. 2020. (in Kazakh) 6. Inkarbekov, A. *Theoretical Mechanics: Dynamics: Teaching Manual*. Almaty: Bastau, 2014. – 292 pages. (in Kazakh) 7. Kurenkeev, T. B. *Course of Theoretical Physics: Book 1. Theoretical Mechanics. Oculus*. Almaty: Evero, 2017. – 106 pages. (in Kazakh) 8. Abdula, Zh., & Ayazbaev, T. *Lectures of the Physics Course: Textbook*. Almaty: LLP RPBK "ERA", 2014. – 520 pages. (in Kazakh) 9. Akilbekov, A. T., Dauletbekova, A. T., & Zdorovets, M. V. *Condensed Matter Physics*. Astana: L. N. Gumilyov ENU, 2014. – 129 pages. (in Kazakh) 10. Aikeeva, A. A. *Errors of Measurement of Physical Quantities: Educational and Methodical Manual*. Almaty: SSK, 2018. – 100 pages. (in Kazakh)

Module 12.2 – Economic and statistical

Module	OR 4220 Operations research
Semester(s) when the module is taught	7
Responsible teacher	Tavanova N.M.
Language of instruction	Kazakh / Russian
Connection with the curriculum	Basic Discipline, Elective Component
Forms of training	Lectures, Practical Sessions, Instructor-Guided Independent Work (IGIW), Self-Directed Learning (SDL)
Academic load (incl. contact hours and SIW - Students' Independent Work	Total Academic Workload: 90 hours Contact Hours: 30 hours (Lectures: 15 hours, Practical Sessions: 15 hours) Independent Study (including exam preparation): IGIW - 15 hours, SDL - 45 hours
ECTS	3
Mandatory and recommended prerequisites for studying the module	To successfully complete this module, students should have foundational knowledge and competencies gained from the following courses: Fundamentals of Algebra, Fundamentals of Geometry, Mathematical Analysis I, Mathematical Analysis II, Mathematical Analysis III, Algebra and Number Theory, Numerical Methods.
Module objectives / expected learning outcomes	**The purpose of the course** is to teach students how to master models and research methods in the context of automated control systems, construct models of the system or operation under study, create research reports, and apply mathematical methods effectively. **Learning Outcomes:** A. Know and understand the main stages and principles of operations research, methods for evaluating the usefulness of results, and approaches to multi-criteria selection and decision-making. B. Be able to identify applied aspects of problems, correctly interpret and analyze results, and adjust the underlying mathematical models. C. Possess professional-level knowledge and be capable of analyzing its practical applications. D. Be able to correctly select mathematical methods for solving research problems, apply relevant knowledge and skills, and understand the importance of applied problems. E. Demonstrate the ability to provide preliminary quantitative justification for the effectiveness of managed operations in scientific, technical, economic, business, and humanitarian fields, and evaluate the significance of acquired knowledge during the course of operations research.
Content	Basic concepts, principles and tools of operations research, general theory of constructing mathematical models of operations. Linear programming problems (nonlinear programming problems) and their formulation, extreme graph and node problems and methods for solving them, transport problems, game theory, simulation modeling.
Form of examination	
Training and Examination requirements	Regular attendance in both online and in-person classes is mandatory. Students are expected to engage actively in the discussion of course topics, demonstrate preparedness for lectures and practical sessions, and complete all Independent Study (IS) assignments with high quality and within set deadlines. Participation in all forms of assessment, including formative and summative evaluations, is required.

List of literature	1. Aysagaliev S.E., Imankul T.Sh. Lectures on Optimization Methods. – Almaty: Kazakh University Press, 2004. – 249 p. 2. Gusmanova F.R. Fundamentals of Operations Research. – Almaty: Dauir, 2007. – 472 p. 3. T. Dilman, A. Madelkhanova, M. Serikbol Operations Research: Textbook. – Astana, Foliant, 2018. – 232 p. 4. Dilman T.B., Madelkhanova A.Zh., Serikbol M.S. Operations Research. Electronic Textbook. – Kyzylorda, Korkyt Ata Kyzylorda State University, 2014. – 162 p. 5. Imankul T.Sh. Lectures on Operations Research. – Almaty: Kazakh University, 2014. – 196 p. 6. Rakhmetova R.O. Mathematical Models and Methods in Economics: Textbook. – Almaty: Economia, 2008. – 236 p. 7. Taha, Hamdy A. Introduction to Operations Research, 7th edition. Translated from English. Moscow: Williams Publishing House, 2007. 912 p. with illustrations. Parallel title in English.

Module	EMM 4306 Economic and Mathematical Modeling
Semester(s) when the module is taught	7
Responsible teacher	Akhmetova Ayymgul Utegulovna, Associate Professor of the Department of Mathematics
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Basic discipline, elective component
Forms of training	Lectures, practical exercises, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total working load:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, it is necessary to possess the knowledge, skills, and competencies acquired through the study of the following courses: MA(I) 1204 Mathematical Analysis I, MA(II) 2205 Mathematical Analysis II.
Module objectives / expected learning outcomes	**The purpose of studying the discipline "Economic and Mathematical Modeling"** is to familiarize students with major topics such as the basic concepts of economic and mathematical modeling, linear programming problems, methods for solving linear programming problems, the Simplex method, transport models, and the balance model. **Learning outcomes:** 1. Be able to identify the applied aspect of solving a scientific problem, competently present and interpret the result, analyze outcomes, and adjust the mathematical model underlying the problem. 2. Master methods of mathematical and algorithmic modeling in analyzing management tasks in scientific, technical, economic, business, and humanitarian fields. 3. Possess skills for independently acquiring new knowledge and competencies in the fields of law, management, and business. As a result of studying the discipline, the student should: A. Know the basic concepts and definitions, the formulations of main theorems, and the foundations of the mathematical tools used to study economic processes. B. Be able to solve problems related to the studied topics. C. Possess skills in the mathematical modeling of economic processes. D. Use mathematical tools to describe economic phenomena, correctly interpret research results, and develop practical recommendations for their application.
Content	Data collection; hypothesis testing of the law of magnitude distribution; statistical evaluation of parameters; reliability domain; torque theory; correlation analysis; confidence interval of a dependent variable; time series analysis; components of a time series; trend determination; seasonal and cyclical fluctuations; time series processing; stationary time series; stationarity testing; cointegration; time series forecasts; adaptive and multiplicative forecasting methods; exponential processing; autoregressive model; moving medium method; mathematical model; linear planning accounting; objective function; system of constraints; production planning; accounting for the creation of an effective diet; accounting for the effective use of resources; simplex schedule; primary baseline plan; effective plan; method of gradual improvement of the primary baseline plan; artificial basis; M-method; subsystem and its formulation; auxiliary simplex method; calculation of transport links.
Form of examination	Blank test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical exercises, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.

List of literature	1. Besbaev G.E., Meldebekova S.K. Variational Calculus and Optimization Methods: Study Guide. – Almaty: CyberSmith, 2021. – 140 p. 2. Dilman T.B., Dilmanova A.T. Optimization Methods. Textbook. Almaty: Evero, 2016. – 248 p. 3. Bayaly A.T. Modeling of Production and Economic Processes. Study Guide. Almaty: CyberSmith, 2019. – 224 p. 4. Kazagachev V.N. Mathematical Models. Textbook. Vol. 1. Almaty: CyberSmith, 2021. – 324 p. 5. Kazagachev V.N. Mathematical Models. Textbook. Vol. 2. Almaty: CyberSmith, 2021. – 284 p. 6. Garmash A.N., Orlova I.V., Fedoseev V.V. Economic-Mathematical Methods and Applied Models: Textbook for Bachelor's and Master's Students. Ed. by V.V. Fedoseev. 4th ed., revised and supplemented. Moscow: Yurayt, 2022. – 328 p. Educational platform Yurayt [website]. – URL: https://urait.ru/bcode/507819 7. Isin M.E. Mathematics for Economists: Textbook. – Almaty: CyberSmith, 2021. – 116 p. 8. Mukhanbetkaliyeva A.K. Models and Control Methods. Almaty: Evero, 2011. – 160 p. 9. Gusmanova F.R. Fundamentals of Operations Research. Textbook. Almaty: Dauir, 2011. – 472 p. 10. Krass M.S., Chuprynov B.P. Mathematics for Economists. St. Petersburg: Piter, 2005. – 464 p. 11. Zamkov O.O., Tolstopatenko A.V., Cheremnykh Yu.N. Mathematical Methods in Economics: Textbook / Ed. by Doctor of Economics, Prof. A.V. Sidorovich; Moscow State University named after M.V. Lomonosov. – Moscow: Delo i Servis, 2011. – 368 p. 12. Kazeshev A.K., Nurpeyisov S.A. Mathematics for Economists: Textbook / Ed. by Rakhmetova R.O. Almaty: Economia, 2011. – 528 p. 13. Kazeshev A., Nurpeyisov S. Higher Mathematics for Economic Majors. Problem Book. Almaty: Evero, 2007. – 294 p. 14. Vlasov M.P., Shimko P.D. Modeling of Economic Processes. Rostov-on-Don: Phoenix, 2005. – 409 p. http://simulation.su/uploads/files/default/2005-uch-posob-vlasov-shimko-1.pdf

Module	AM 4307 Actuarial Mathematics
Semester(s) when the module is taught	7
Responsible teacher	Izgarina G.K., Senior lecturer
Language of instruction	Kazakh
Connection with the curriculum	Core discipline, elective component
Forms of training	Lectures, practical exercises, IWOSWT, SIW
Academic load (incl. contact hours and SIW - Students' Independent Work	Total working load:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation: 25 hours IWOSWT, 80 hours SIW.
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Probability Theory and mathematical Statistics, Financial Mathematics.
Module objectives / expected learning outcomes	The purpose of the Actuarial Mathematics course is to familiarize students with the basic elements of actuarial models, estimation of deterministic payment flows, calculation of insurance transaction parameters, mathematical models of insurance transactions, as a result of which students gain the necessary knowledge and form the basic skills of the actuarial profession. A. Students should know the basic definitions and concepts of the discipline. B. Apply actuarial methods. calculations for assessing insurance risks and building insurance models. C. Analyze the impact of various factors (age, gender, type of insurance) on the amount of insurance premiums and reserves. D. Develop actuarial models for new insurance products or pension schemes, make long-term forecasts for the sustainability of the insurance portfolio. E. Assess the adequacy of insurance reserves and the compliance of insurance policy with established standards.
Content	Compound and simple percentages. Rents. Annuities paid several times a year. The survival function. The mortality curve. The intensity (rate) of mortality. Macrocharacteristics of life expectancy. Analytical laws of mortality. The remaining lifetime. Life expectancy tables. Approximation of fractional ages. Life insurance up to a certain age. Insurance rent. Life insurance. Insurance premiums. Pension insurance. Joint life insurance. Reversible annuities
Form of examination	Verbally (ticket)
Training and Examination requirements	Compulsory attendance of in-person classes, preliminary preparation for lectures and practical exercises, high-quality and timely completion of assignments, participation in all forms of assessment. The final assessment takes place in the format of an exam. The exam is conducted in accordance with the university's academic integrity policy and the exam rules.
List of literature	1. Seilkhanova D.K. Actuarial and Financial Mathematics. Textbook. Almaty: Epigraf, 2019. – 176 p. 2. Akhmetov G.B. Actuarial Calculations. Almaty: Otan, 2014. – 102 p. 3. Askanbayeva G. Actuarial Mathematics, 2013, RMEB. http://rmebrk.kz/book/1025480 4. Denisov D.V., Kotlobovsky I.B. Actuarial Calculations in Life Insurance. Moscow: Moscow University Press, 2013. – 126 p 5. Kazantsev A.V. Fundamentals of Actuarial Calculations in Life Insurance. Kazan: Kazan University Press, 2015. – 194 p. 6. Nazarchuk I.M. Insurance. Almaty: NURPRESS, 2014. – 160 p. 7. Falin A.G., Falin G.I. Introduction to Mathematics of Finance and Investments for Actuaries. 2nd ed., revised and supplemented. Moscow: MAKS Press, 2019. – 359 p. 8. Kuznetsova N.L., Sapozhnikova A.V. Actuarial Mathematics. Textbook. Tyumen: Tyumen State University Press, 2010. – 180 p.

Module	SA 4308 Statistical analysis
Semester(s) when the module is taught	7
Responsible teacher	Akhmetova Ayymgul Utegulovna, Associate Professor of the Department of Mathematics
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Core discipline, elective component
Forms of training	Lectures, practical exercises, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total working load:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Probability Theory and mathematical Statistics, General Theory of Statistics.
Module objectives / expected learning outcomes	**The purpose of studying the discipline** is to familiarize students with key sections of mathematical statistics, including variation series, empirical distribution functions, polygons, histograms, point estimates of unknown sample parameters, confidence intervals for the mean and variance, hypothesis testing, goodness-of-fit tests, tests for sample uniformity, correlation analysis, and regression analysis. **Learning outcomes:** A. Demonstrate the ability to collect and interpret information for forming reasoned judgments, considering social, ethical, and scientific perspectives, and ensuring interdisciplinary connections between mathematical-statistical and other disciplines. B. Solve problems in core areas of mathematics, including actuarial mathematics and statistics. C. Recognize the applied aspect of solving scientific problems, competently present and interpret results, and analyze and adjust the mathematical model underlying the problem.
Content	The study of quantitative characteristics, statistical patterns of the development of socio-economic phenomena and processes and their application in practical work in the study of topics: The subject and objectives of statistical analysis. Statistical observation. Summary and grouping. Absolute and relative values. Average values and indicators of variation. Analysis of variance. Selective observation. Rows of dynamics. Indexes. Statistical study of the interrelationship of socio-economic phenomena.
Form of examination	Blank test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical exercises, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.
List of literature	1. Bektaev Q.B. Probability Theory and Mathematical Statistics. Textbook. Almaty: Evero, 2014. – 432 p. 2. Croft E., Davison R. Fundamentals of Mathematics. Part 2: Textbook. Translated by S.Zh. Kabakbaev. Almaty, 2014. – 324 p. 3. Tokbergenov Zh.B. Higher Mathematics: Textbook / Zh.B. Tokbergenov. Almaty: Otan LLP, 2014. – 373 p. 4. Jean J. Mathematics for Economics and Business. Vol. 1: Textbook / Jacques Jean. Almaty: Association of Universities of the Republic of Kazakhstan, 2016. – 440 p. (Ministry of Education and Science of the Republic of Kazakhstan). 5. Jean J. Mathematics for Economics and Business. Vol. 2: Textbook / Jacques Jean. 8th edition. Almaty: RPBK "Däwir" LLP, 2017. – 304 p. 6. Duzelbayeva S.T. Elements of Higher Mathematics: Textbook / S.T. Duzelbayeva, G.S. Bararbaeva, Ä.S. Omarbekova. Almaty: Bastau, 2016. – 360 p.

Module	FCS 4309 Financial Computing statistics (Dual Education)
Semester(s) when the module is taught	7
Responsible teacher	Izgarina Gulzhanat Kadirzhanovna
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Core discipline , university component
Forms of training	Lectures, practical exercises, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total working load:150 hours Contact hours: 45 hours (15 hours of lectures, 30 hours of practical exercises) Self-study, including exam preparation, in hours: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master the discipline "Financial and Banking Statistics" within the module, knowledge, skills, and competencies acquired from the following courses are necessary: Fundamentals of Algebra, Fundamentals of Geometry, Probability Theory, and General Theory of Statistics.
Module objectives / expected learning outcomes	The goals of mastering the discipline are studying the methodological principles of conducting quantitative financial analysis of the conditions and results of financial-credit and commercial transactions; forming a system of fundamental knowledge in the field of financial calculations; acquiring theoretical knowledge of the organizational, scientific, and methodological foundations of financial calculations in modern economic conditions; and acquiring practical skills in applying financial calculations to solve applied financial and economic tasks. **Learning outcomes:** **Knowledge:** ● Basic concepts of financial markets: deposit, credit, stock, bond, bill of exchange, etc. ● Types of interest rates and methods of interest calculation ● Equivalence formulas for interest rates ● Methods of calculating accumulated amounts under inflationary conditions ● Types of payment streams and their main parameters ● Methodology of financial calculations ● Excel tools for financial calculations **Skills:** ● Performing calculations for simple and compound interest ● Calculating the yield of deposit, loan, and accounting operations ● Performing discounting and accounting using simple and compound interest rates ● Calculating loan terms and interest rates under different repayment schemes ● Evaluating the consequences of replacing one financial obligation with another ● Calculating interest rates for different options and situations **Competencies:** ● Skills in using modern information technologies for financial calculations ● Skills in calculating interest according to various financial schemes

Content	**Basic concepts and methods of financial calculations:** ● Directions of financial operations within the system of quantitative financial analysis. ● Types of operations with debt obligations. ● Key historical stages in the development of financial calculations. ● Classification of financial calculation methods. ● Time and monetary scales. ● Directions of financial calculations. ● Deferred and anticipatory methods of interest accrual. ● Accumulation rates and discount rates. ● Yield of a financial operation, effective rate, and equivalent rates. **Simple interest:** ● Simple interest accrual. ● Accumulation with simple interest. ● Simple accounting rates and accounting operations. ● Accumulation with floating interest rates. ● Interest capitalization operation. ● Equivalence of events in the scheme of simple interest. ● Interest accrual with changes in deposit amounts over time. ● Interest accumulation in consumer credit. **Compound interest:** ● Accrual of compound annual interest. ● Comparison of growth with compound and simple interest. ● Accumulation of interest *m* times a year. ● Nominal and effective rates. ● Discounting at a compound rate. ● Operation with a compound accounting rate. **Inflation and profitability:** ● Determining the profitability of operations under inflation conditions. ● Inflation index. ● Accumulated amounts considering inflation. ● Real profitability of a financial operation considering inflation. ● Minimum interest rate to neutralize the effect of inflation. ● Gross rates. **Equivalence of interest rates:** ● Payment consolidation. ● Fixed financial annuities. ● Variable financial annuities. ● Conversion of financial annuities.
Form of examination	Traditional
Training and Examination requirements	Mandatory attendance of classes, active participation in discussions, preparation for lectures and practical sessions, high-quality and timely completion of independent work assignments, participation in all types of assessments.

List of literature	1. Brusov, P. N., Brusov, P. P., Orekhova, N. P., Skorodulina, S. V. *Financial Mathematics*. Textbook for Bachelors. KnoRus, 2010. 2. Brusov, P. N., Brusov, P. P., Orekhova, N. P., Skorodulina, S. V. *Problems in Financial Mathematics*. Textbook for Bachelors. KnoRus, 2011. 3. Brusov, P. N., Filatova, T. V. *Financial Mathematics*. Textbook for Masters. Infra-M, 2011. 4. Brusov, P. N., Filatova, T. V. *Application of Mathematical Methods in Financial Management*, Parts 3 and 4. Moscow: Financial Academy under the Government of the Russian Federation, 2010. 5. Filatova, T. V. *Financial Management*. Textbook. Moscow: Infra-M, 2010. 6. Kasimov, Yu. F. *Financial Mathematics*. Textbook. Moscow: Yurait, 2012. 7. Kellison, S. G. *The Theory of Interest*. Irwin/McGraw-Hill, 1991. 8. Malykhin, V. I. *Optimal Portfolios and Packages of Securities*. Moscow: GUU, 2002. 9. Malykhin, V. I. *Financial Mathematics*. Moscow: UNITY-DANA, 2000. 10. Chetyrkin, E. M. *Financial Mathematics*. Moscow: Delo, 2001. 11. Brusov, P. N., Filatova, T. V. *Application of Mathematical Methods in Financial Management*, Parts 1 and 2. Moscow: Financial Academy under the Government of the Russian Federation, 2007.

Module 13.1 – Programming in the Maple system and forecasting

Module	PMS 4310 Programming in the Maple system
Semester(s) when the module is taught	7
Responsible teacher	Nugaeva Z.T.
Language of instruction	Kazakh/Russian
Connection with the curriculum	Profile discipline, optional component
Forms of training	Lectures, practical classes, SRSP, SRS.
Academic load (incl. contact hours and SIW - Students' Independent Work	General working load: 150 hours Contact hours: 45 hours (15 hours of lectures, 10 hours of laboratory classes, 20 hours of practical classes) Self-study , including preparation for exams: 25 hours of SRSP, 80 hours of SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, the knowledge, skills, and abilities acquired in the following courses are necessary: Programming and Fundamentals of Probability Theory.
Module objectives / expected learning outcomes	**Learning Outcomes** A. Know the definitions of programming sections within the Maple system. B. Be able to formulate and prove the main results related to these sections. C. Master the skills necessary to solve typical tasks based on the theoretical material taught. D. Develop logical reasoning skills to construct clear and simple arguments in communication. E. Be able to work independently using key methods for problem-solving, communicate effectively with colleagues, and consider their opinions.
Content	The course is designed to introduce students to the capabilities of the Maple analytical computing system and to develop practical skills in its application for solving mathematical, engineering, and applied problems. It covers basic system commands and the use of core Maple packages, including LinearAlgebra, ImageTools, plot, plot3d, plottools, DEtools. Students gain experience in Maple programming, learning how to create procedures, use loops and conditional statements, and develop custom modules. Special attention is given to the visualization of mathematical objects, the construction of two- and three-dimensional plots, the solution of systems of equations and differential problems, as well as image processing with Maple packages. The course also introduces the MCM Maple environment and additional SCM Maple packages, which extend the functionality of the system and support its use in scientific research and applied computations. By completing the course, students acquire modern tools for analytical computing and programming.
Form of examination	Blank test
Training and Examination requirements	Mandatory participation in both online and in-person classes, active engagement in discussions, advance preparation for lectures and practical sessions, high-quality and timely completion of SIS assignments, and participation in all forms of assessment are required.

List of literature	**Core reading** 1. Korolkov O.G., Chebotarev A.S., Shcheglova Yu.D., *Maple in Examples and Tasks: Textbook for Universities* — Voronezh: Publishing and Printing Center, 2011. — 132 p. 2. Matrosov A.V., *Maple 6 Solutions to Problems of Higher Mathematics and Mechanics: Tutorial* — St. Petersburg: Peter, 2001. 3. S.E. Savotchenko, T.G. Kuzmicheva, *Methods of Solving Mathematical Problems in Maple: Educational Manual* — Belgorod: Izd. Belaudit, 2001. — 116 p. 4. Dyakonov V.P., *Maple 8 in Mathematics, Physics and Education* — Moscow: SOLON-Press, 2010. — 656 p. (Series "Complete User Guide") **Supplementary reading** 5. Perezhogin A.S., *Software for Solving Mathematical Problems: Gnuplot, LaTeX, Maple, Maxima, Scilab: Teaching Manual* — Petropavlovsk-Kamchatsky, 2012. 6. Savotchenko S.E., Kuzmicheva T.G., *Methods and Solutions of Mathematical Problems in Maple: Teaching Manual* — Belgorod, 2001. 7. Aladiev V.Z., Boyko V.K., Rovba E.A., *Programming and Development of Applications in Maple: Monograph* — Grodno-Tallinn, 2007. 8. Dyakonov V., *Maple 7: Study Course* — St. Petersburg: Peter, 2002. — 672 p.

Module	MMF 4311 Mathematical methods of Forecasting
Semester(s) when the module is taught	7
Responsible teacher	Akhmetova Ayymgul Utegulovna, Associate Professor of the Department of Mathematics
Language of instruction	Kazakh/ Russian
Connection with the curriculum	Core discipline, elective component
Forms of training	Lectures, laboratory classes, practical exercises, SRSP, SRS
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures,10 hours of laboratory classes, 20 hours of practical classes) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Probability Theory and mathematical statistics, Differential equations.
Module objectives / expected learning outcomes	The purpose of studying the discipline "Mathematical Forecasting Methods" is to familiarize students with modern methods for stable estimation of process parameters, which are essential for solving predictive tasks in the financial sector, as well as in natural, technical, and social sciences. The course focuses in detail on regression analysis and time series from a wide range of forecasting methods. **Learning Outcomes :** 1. Be able to solve problems in the main branches of mathematics, including actuarial mathematics and statistics. 2. Be able to identify the applied aspects of scientific problems, competently present and interpret results, analyze outcomes, and adjust the underlying mathematical models accordingly. 3. Master methods of mathematical and algorithmic modeling for analyzing management tasks in scientific and technical fields, as well as in economics, business, and humanitarian disciplines. **As a result of studying this discipline, students must:** 1. Know the methods of mathematical forecasting and possess basic theoretical and applied mathematical knowledge. 2. Be able to perform predictive calculations, apply well-known methods, draw conclusions, and analyze results. 3. Master practical skills in performing various forecasting calculations, implement algorithms to solve optimization problems specific to the tasks, and adjust the underlying mathematical models as necessary. 4. Be able to work effectively in groups, express their opinions clearly, and strive for professional growth. 5. Be able to work independently with fundamental methods for solving tasks, collaborate well with colleagues, consider their opinions, and master mathematical and algorithmic modeling techniques in management analysis across scientific, technical, economic, business, and humanitarian fields.
Content	Mathematical processing of the observation results. Assessment of measurement accuracy. The least squares method. Determination of parameters of empirical formulas. Tasks of statistical forecasting. Conditional mathematical expectation. The effective predictor and its properties. From the history of regression. Linear forecast. Using additional variables in the forecast. The algorithm of predictive updating. Forecasting of stationary time series. Elements of the time series. Requirements for the source information. The main indicators of the dynamics. Alignment of time series. Characteristics of growth curve models. Calculation of forecast confidence intervals. Assessment of the model's compliance. Characteristics of the model's accuracy.
Form of examination	Blank test
Training and Examination requirements	Mandatory attendance of online and in-person classes, active participation in the discussion of issues, preliminary preparation for lectures and practical exercises, high-quality and timely fulfillment of SRO tasks, participation in all forms of assessment.

List of literature	1. Usipbaeva, M. E. *Econometrics*. Evero, 2014. 2. Garmash, A. N., Orlova, I. V., Fedoseev, V. V. *Economic and Mathematical Methods and Practical Models: Textbook for Bachelor's and Master's Degrees*, edited by V. V. Fedoseev. 4th edition, revised and enlarged. Moscow: Yurayt, 2022. 328 p. Educational platform Yurayt [online]. Available at: https://urait.ru/bcode/507819 3. Usbanova, G. Sh., Shaikin, D. N. *Workshop on the Discipline "Econometrics": Teaching Methods*. Petropavlovsk: NKSU named after M. Kozybayev, 2015. 86 p. 4. Rakhmetova, R. U. *Econometrics: Textbook*. Astana: Turan-Astana, 2018. 206 p. 5. Young People, V. A., Rubezhnoy, A. A., Sosin, A. I. *On the Discipline "Econometrics"*. Stavropol: SKFU Publishing, 2015. 179 p. 6. Gusarova, O. M. *Mathematical Methods of Forecasting: Methodological Recommendations for Self-Study Control Work for 3rd Year Students*. Smolensk: Smolensk branch of the Finuniversity, Department of Mathematics and Computer Science, 2015. 59 p. 7. Isin, M. E. *Mathematics for Economists: Educational Guide*. Almaty: CyberSmith, 2021. 116 p. 8. Gusak, A. A. *Higher Mathematics*, Vol. 2: Textbook for University Students. 3rd edition. Minsk: Tetrasystems, 2001. 448 p. 9. Zamkov, O. O., Tolstopyatenko, A. V., Cheremnykh, Yu. N. *Mathematical Methods in Economics: Textbook*, edited by D. E. N. and Prof. A. V. Sidorovich. Moscow: Delo i Servis, 2011. 368 p. 10. Krass, M. S., Chuprynov, B. P. *Mathematics for Economists*. St. Petersburg: Peter, 2005. 464 p. 11. Ivchenko, G. I., Medvedev, Yu. I. *Introduction to Mathematical Statistics: Textbook*. Moscow: LKI, 2010. 600 p. 12. Magnus, Ya. R., Katyshev, P. K., Peresetsky, A. A. *Econometrics: The Beginning of the Course*. Moscow: Delo, 2004. 576 p. 13. Kaspersky, S. A. *Forecasting and Planning Economics: Lecture Course*. Minsk: BSTU, 2007. 172 p. 14. Kazeshev, A. K., Nurpeisov, S. A. *Mathematics for Economists: Textbook*, edited by Rakhmetova, R. U. Almaty: Economics, 2011. 528 p. 15. Kazeshev, A., Nurpeisov, S. *Higher Mathematics for Economic Specialties: Collection of Reports*. Almaty: Evero, 2007. 294 p.

Module 13.2 – Solving Problems in MathCad, MathLab, and BigData

Module	SSPMCADM 4310 Solving Statistical Problems in MathCAD, MATLAB
Semester(s) when the module is taught	7
Responsible teacher	Baisheva K.S.
Language of instruction	Kazakh
Connection with the curriculum	Specialization subject, elective component
Forms of training	Lectures, practical classes, laboratory sessions, IWST (Independent Work with the Teacher), IWS (Independent Work of Students)
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact hours: 45 hours (15 hours of lectures,10 hours of laboratory classes, 20 hours of practical classes) Self-study, including exam preparation: 25 hours SRSP, 80 hours SRS
ECTS	5
Mandatory and recommended prerequisites for studying the module	To successfully master this module, students should have the knowledge, skills, and competencies gained from studying the course Probability Theory and Mathematical Statistics.
Module objectives / expected learning outcomes	**Module Objective:** To equip students with the principles of using **MathCAD** and **MATLAB** tools in scientific calculator modes for solving statistical problems. **Learning Outcomes:** **A.** To know the main definitions and concepts of studied distributions in MathCAD and MATLAB environments. **B.** To be able to formulate and prove the key results of the relevant topics. **C.** To develop skills for solving typical problems based on the studied theoretical material. **D.** To enhance students' abilities to work independently. **E.** To be able to independently apply basic methods for solving given problems; to interact effectively with peers and consider their opinions.
Content	Variables and functions in the MathCAD and MATLAB mathematical systems, data types, plotting function graphs and surfaces, numerical expressions, simplifying and transforming expressions, solving equations and systems of equations, solving inequalities, performing basic matrix computations, matrix functions, calculating derivatives, integrals, series and limits, solving basic differential equations, typical statistical functions, determining the regression line, and polynomial regression.
Form of examination	Blank test
Training and Examination requirements	Variables and functions in the mathematical system MathCad, Matlab, data types, drawing function graphs, surfaces, numerical expressions, simplifying and transforming expressions, solving equations, solving systems of equations, solving inequalities, performing simple matrix calculations, matrix functions, finding the derivative, calculating integrals, series and limits, solving ordinary differential equations, typical statistical functions, determining the regression line, polynomial regression.
List of literature	1. Potapova, N. N., & Zabrodina, O. M. (2014). *Statistical Data Processing in the MathCAD System*. Volgograd: VolgGASU. 2. Buzaubakova, K. Zh. (2014). *Innovative Technologies in Education*. Taraz. 3. Belova, N. D. (2007). *Solving Problems with the MathCAD Package*. Khabarovsk. 4. Kusainov, G. M., Kagazbayeva, A. K., Abykanova, B. T., et al. (2019). *Science of Teaching and New Educational Practices*. Nur-Sultan–Almaty: Techsmith. 5. Kaskataeva, B. R. (2015). *Methods and Technologies of Teaching Mathematics*. Almaty. 6. Alimov, A. (2013). *Issues of Using Interactive Methods in Higher Education Institutions: Textbook*. Almaty.

Module	BDAS 4311 BigData Analytics systems
Semester(s) when the module is taught	7
Responsible teacher	Toleuov T.Zh.
Language of instruction	Kazakh
Connection with the curriculum	KP
Forms of training	Lectures, practical classes, laboratory classes, BLS, BLS.
Academic load (incl. contact hours and SIW - Students' Independent Work	Total workload: 150 hours Contact time: 45 hours (15 hours of lectures, 15 hours of practical lessons. 15 Laboratory lessons) Hours of self-study, including exam preparation: 25 hours of BLS, 80 hours of CLS
ECTS	5
Mandatory and recommended prerequisites for studying the module	Basic definitions and principles of report presentation. Introduction to Big Data. Overview of the main stages involved in data analysis reporting. Familiarization with specialized Python libraries for scientific computing and data analysis.
Module objectives / expected learning outcomes	**Course Goal:** To introduce the basic concepts of data analysis and machine learning, including foundational algorithms, their characteristics, and the application of these tools in professional contexts. **Learning Outcomes:** A. Understands the general content, principles, and tools of the relevant subject area. B. Applies machine learning methods in professional activities. C. Analyzes data analysis and machine learning algorithms. D. Develops effective machine learning and data analysis algorithms. E. Analyzes and evaluates trends in data analytics.
Content	**Basic concepts of data analysis and machine learning.** NumPy, SciPy, pandas. Familiarization with various methods of data preprocessing, basic methods of statistical analysis, and data visualization. Fundamentals of machine learning and the main types of problems. Classification of machine learning problems. Linear models. Linear regression. Quality function and gradient descent. Ensemble models. Decision trees. Random forests. Gradient boosting. Unsupervised learning. Clustering techniques and methods. K-means method. DBSCAN and its practical applications. Dimensionality reduction methods. Principal Component Analysis (PCA). Singular matrix classification and its relationship to PCA. **Teaching methods:** Lecture formats: narrative lecture, interactive lecture, lecture-conference, and "question-answer-discussion" lecture. Online compiler, presentations, video lectures, test tasks. **Resources used in practical and laboratory lessons:** Online compiler and portals, ColabResearch service, Anaconda integrated environments.
Form of examination	Traditional
Training and Examination requirements	Mandatory participation in both online and in-person classes, active engagement in discussions, advance preparation for lectures and practical sessions, high-quality and timely completion of SIS assignments, and participation in all forms of assessment are required."
List of literature	1. N.N. Potapova, O.M. Zabrodina, "Statistical Data Processing in MathCad System," Volgograd, VolgGASU, 2014. 2. K.Zh. Buzaubakova, "Innovative Technologies in Education," Taraz, 2014. 3. N.D. Belova, "Problem Solving in MathCad Package," Khabarovsk, 2007. 4. G.M. Kusainov, A.K. Kagazbaeva, B.T. Abykanova, et al., "Science of Teaching and New Educational Practice," Nur-Sultan-Almaty: Techsmith, 2019. 5. B.R. Kaskataeva, "Methods and Technologies of Teaching Mathematics," Almaty, 2015. 6. Ashat Alimov, "Issues of Applying Interactive Methodology in Higher Education Institutions," textbook, Almaty, 2013.