PAVLODAR STATE UNIVERSITY NAMED AFTER S. TORAIGHYROV

MODULE HANDBOOK

of specialty 5B070900 Metallurgy,

ASIIN'e.V.

Akkreditierungsagentur fur Studiengangeder Ingenie
urwissenschaften, der Informatik, der
Naturwissensch aften und der Mathematik e.V.

Pavlodar, 2017

List «Modules Reference»

General disciplines Compulsory component	
Module name:	**History of Kazakhstan**
Module level,if applicable	History of Kazakhstan
Abbreviation, if applicable	---
Sub-heading,if applicable	History of Kazakhstan
Semester:	2
Module coordinator	Ye.K. Zhussupov., A.A. Kaskobasova., K.Zh Sadykova.
Lecturer	Associate professor
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format class hours per week during the semester:	Total contact hours - 45; including: Lectures - 30 hours; Practical classes - 15 hours; Tutorials 30 часов. Hours per week- 5; Lectures - 2 hours, practice- 1 hour, tutorials - 2 hours Number of students - 75 people.
Workload	Total hours- 150; including: Contact hours - 45, off-class hour- 105 (Tutorials - 30 hours, students' self study - 75 hours)
Credit points:	5 ECTS credits
Requirements under the examination regulations:	
Target learning outcomes:	To be aware of: the main ideological directions of Kazakhstan's history, the main stages and characteristics of the historical process on the territory of Kazakhstan from ancient times to the present day. To know the history of human society development in Kazakhstan as part of the world historical process, the dynamics of the country's history (driving forces, mechanisms, trends and patterns of historical development), the general course of history (the history of the structure, its dynamics), the traditions and culture of Kazakh people. To be able to: establish a cause-effect relationship in the history of Kazakhstan, to interpret historical events and phenomena on the basis of a comparative analysis, creativly apply historical knowledge into practice. To have the skills: of analyzing historical events To be competent: in developing forecasts of historical events. To be tolerant to the traditions and culture of other nations.
Content of lectures:	Ancient history of Kazakhstan. First states on the territory of Kazakhstan. Early Middle Ages states (VI-X cc.). High Middle Ages states (XI - beginning of the XIII c.). Kazakhstan during the Mongol conquest (XIII c.). The Golden Horde (1243 - middle of the XV c.). Formation of the Kazakh nation. Ethnonym 'Cossack" (Kazakh).

	Kazakh Zhuzes. Kazakh Khanate in the XV - XVI centuries. Kazakh Khanate in the XVII - early XVIII c. Kazakhstan in the first quarter of the XVIII c. Kazahstan and Russia. The beginning of the colonial era in Kazakhstan. Socio-economic and political development of Kazakhstan in the XIX - early XX century. The culture of Kazakhstan (XVIII - beginning of the XX c.). Kazakhstan in 1917 - 1920. NEP in Kazakhstan and the Soviet state building in the region. The collectivization of agriculture - the tragedy of the peasantry in Kazakhstan. Industrialization: the nature, pace, scope. Socio-economic development of Kazakhstan and the general political situation on the eve of the war. Kazakhstan during the World War II (1941-1945). Kazakhstan in the post-war years (1946-1953). Kazakhstan during the "Khrushchev decade" (1953-1964). Kazakhstan in the second half of 1960s - the first half of 1980s. The policy of "perestroika" in Kazakhstan (1985-91). Kazakhstan on the way to independence. State building of the Republic of Kazakhstan.
Content of practical classes:	Paleolith on the territory of Kazakhstan. Mesolite on the territory of Kazakhstan. Late Stone Age: the Neolithic Revolution. Kazakhstan hearth of Andronov culture. Arts and believes, homes of tribal settlement in the Bronze Age. Economy, social structure and the way of life of the Saks. Material and spiritual culture, believes, and art of the Huns, Usuns, and Kangyus. The historiography of the "Asiatic mode of production." Writing, material culture and art of the tribes belonging to the Western Turkic Khanate. The territory of Kazakhstan in the world civilization. Kazakhstan through the eyes of European travelers: Plano Carlini (1245-1247), William Rubruge (1253-1255), Marco Polo (1271-1295). Ethno-political structure of the Golden Horde and its state-administrative system. The influence of the Golden Horde on the historical events of Eurasia. Formation of the Kazakh nation. The writing of Mirza (Muhammad) Dulati Haidar (1500-1551) "Tarikh-i Rashidi," about the early history of the Kazakh Khanate. The ethnonym "Kazakh" in historical literature. Utemish Hodja's "Genghis-name" as a source for studying the history of the Kazakh nation. Khan Tauke's laws "Zheti Zhargy." Kadyrgaliya Dzhalai's "Jami-at-Tavarih" and Mohammed Haydar Dulati's "Tarikhi Rashidi". Folk art and heroic epics "Er Targyn", "Alpamys", "Edyge", "Koblandy." Social practices, rituals and beliefs of the Kazakh people. Writing. The history of the Junggar Khanate. Kazakh biys and baturs leading the anti-Junggar movement (the 18th century). The life and work of Abulhair - The Young Horde Khan. Kazakhs raids on the boundary line and the interior of Russia. The culture of Kazakhstan in the XVIII - first half of the XIXth century. Russia's influence on the economic lifes of the Kazakhs. The traditional judicial system and legal proceedings of the Kazakhs and its destruction in the second half of the XIXth century. Trade fairs in Kazakhstan. Culture and science in Kazakhstan. The February Revolution of 1917. The situation in Kazakhstan. The October Revolution of 1917. The establishment of Soviet power, the main stages. NEP. Industrialization: nature, pace, scope. Collectivization. Industrialization. The famine in Kazakhstan in the early 1930's. Portraits of political repression figures of Kazakhstan. Kazakhstan - the birthplace of the camps. Community and political situation on the eve of the war. Kazakhstan during the World War II.

	Community and political situation on the eve of the war. Help of the liberated areas of Kazakhstan. The participation of Kazakhstan in the guerrilla movement and the resistance movement. Culture and science of Kazakhstan during the war. Kazakhstan in the post-war years. The development of virgin and fallow lands. Creation of an integrated transport artery. The industrial development of Kazakhstan in 1945-64. The economic reform of 1965. The period of "stagnation." The policy of "perestroika" in Kazakhstan. Independent Kazakhstan - the main stages of nation-building. Religions and religious denominations in Kazakhstan. The state of agriculture in Kazakhstan at present.
Study/exam achievements:	examination
Forms of media	Power Point Presentation, slides, posters
Literature:	1. Кан Г.В. История Казахстана: Учебное пособие для вузов. - Алматы 2005. 2. Кляшторный С.Г., Султанов Т.И. Казахстан: Летопись трех тысячелетий. - Алматы, 1992. 3. Шаймерденова М.Д. История Казахстана с древнейших времен до середины XX века: Учебное пособие. - Алматы, 1999.

General disciplines Compulsory componeni	
Module name:	**Theory of scientific research**
Module level, if applicable	---
Abbreviation, if applicable	---
Sub-heading, if applicable	Philosophy, Political Science
Semester:	3, 4
Nodule coordinator	S.V. Nevmerzhitskiy, S. S. Aubakirova., Sh. K. Suleimenova, A. A. Azhenov, E. T. Yanchuk
Lecturer:	Professor, PhD in Philosophy
Language:	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format class hours per week during the semester:	Total contact hours- 75; including: Lectures - 30 hours; Practical classes- 45 hours; Tutorials - 45 hours. Hours per week - 8;of which: Lectures - 2 hours, practice - 3 hours, tutorials - 3 hours Number of students - 75 people.
Workload	Total hours- 240; including: Contact hours - 75, off-class hours- 165 (Tutorials- 45 hours, students' self study - 120 hours)
Credit points	8 ECTS credits
Requirements under the examination regulations:	
Targeted learning	To be aware of: the basic concepts and theories of law philosophy of

outcomes:	the main ideological trends in the development of philosophy, the essence and the basic concepts of political science as a social science, the main ideological trends in the development of political science. To know: the history of philosophy, milestones and cause-and-effect relationship of philosophy and contemporary trends in philosophy, the basic conceptual theories and laws of political science, milestones and cause-and-effect relationship of political science and contemporary trends in political science. To be able to: establish a cause-effect relationship in the development of philosophy applied to the basic laws of professional philosophy. To have skills: management objective and personal orientation, personal self-improvement. To be competent: in applying scientific methods of knowledge in professional work.
Content of lectures:	Philosophy, its object and functions. The philosophy of the cultural - historical context. The phenomenon of philosophy in the eastern culture. The philosophy of the ancient culture. The phenomenon of philosophy in medieval culture. The Arab-Muslim philosophy in the context of medieval Islamic culture. The philosophy of the culture of the Renaissance and the Reformation. Western European philosophy in the culture of the New Time. Western European philosophy in the culture of the XIXth century. Russian philosophy in the context of Russian culture of the XIX - XX centuries. The phenomenon of philosophy in Kazakh culture. Marxist philosophy in the context of Soviet culture of the XXth century. Western philosophy in the context of the culture of the XXth century. The eve of the XIXth century. Philosophy of life. Philosophical anthropology. Social philosophy: the philosophy of love, religion, politics and education. Problems of the theory of dialectics. Epistemology. The philosophy of global problems. Political science as a science of politics. The main stages in the development of political science. Politics in public life. Power as a political phenomenon. Socio-ethnic communities and national policies. The political system of the society. The state and civil society. Political parties and social movements. Political regimes. Democratization and political modernization of society. The political process and political activity. The political consciousness and political culture. Political elites and political leadership. Political technologies. World politics and international relations.
Content of practicall classes:	
Study/exam achievements	Examination
Forms of media	Power Point presentation, slides, posters.
Literature:	1. Антология мировой философии. В 4-х т. М.: Мысль, 2003. 2. Абишев К.А. Философия. Алматы, 2000. 3. Гаджиев К. С. Введение в политическую науку. М., 2005.

General disciplines Compulsory componeni	
Module name:	**Pollylanguage training**
Module level, if	Foreign language, Kazakh, Russian language.

applicable:	
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Foreing language, Kazakh, Russian language.
Semester:	1,2
Module coordinator:	B.K. Zhumabekova., E.I. Smolnikova., N.F. Krylova., G.K. Shaikova., N.A. Shahmetova., B.B. Zhumabekova., Z.K. Masolimova., Z.S. Mashrapova.,A.K. Kopaeva., G.E. Ergazinova., G.A. Kabzhanova., B.T. Kuanysheva., L.E. Asylhanova., E.S. Kulahmetova., .S. Mashrapova.,A.K. Kopaeva. G.M. Akumbaeva., B E. Yskak, G.M. Akumbaeva., A.S. Kurakbaeva, E.M. Rozhkova., D.E. Kapanova., N.V. Potselueva..
Lecturer:	Associate professor, Ph.D in Philology
Language:	Foreign, Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours- 165; including: Practical classes - 165 hours; Tutorials - 90 hours. Hours per week - 17; of which: practice - 11 hours, tutorials - 6 hours Number of students - 75 people .
Workload:	Total hours- 540; including: Contact hours - 165, off-class hours- 375 (Tutorials - 90 hours, Students' self study - 285 hours)
Credit points:	18 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To be aware of: the system of language and the way it is used in intercultural communication. To know: grammar, spelling, vocabulary and phraseology of the studied language. To be able to: navigate in the different areas and situations of communication, properly use language tools; compose dialogues, monologues, polylogues on a variety of topics and situations. To have skills of: writing scientific texts of different genres: abstracts, bibliographies, plans, notes, etc. Be competent in: forming the scientific world by means of language, ethics and respect for the language, the country's history of the foreign language.
Content of lectures:	
Content of practical classes:	The student and his entourage. Education and life, family ties, friends, house, apartment. My working day. Leisure. Interests and hobbies. Leisure and sports. Health. Healthy lifestyle. The system of higher and secondary education in Kazakhstan and in the foreign language country. Similarities and differences. The choice of profession. Kazakhstan. The English speaking country. The geographical position. Culture, political system of the state. Customs and traditions, holidays. My university. The choice of profession. Student's future profession. Sectors of the national economy of Kazakhstan and the country of the

	foreign language.
Study / exam achievements:	Examination
Forms of media	Power Point Presentation, slides, posters
Literature:	1 Раисова А.Б., Муканова Л.Ж., Немецкий язык. Методическое пособие для студентов, ПГУ им. С. Торайгырова: 2006. 2 Русско-англо-немецко-французский металлургический словарь. Основные термины. Ок. 5000 слов. - 2-е издание, стереотип. - М. : РУССО, 2006. - 360 с. 3 The 300 t EAF meltshop at the new Iskenderun minim / MPT International, № 2, 2008. - P. 52 - 58. 4 Sprachkurs Deutsch 2. Verlag Moritz Diesterweg Gmbh. Stutgartt: 2001 5 Dialog in Beruf. Max Hueber Verlag. Munchen: 2009. 6 Асылханова Л.Е., Жумабекова Б.К. и др. Учебно-методическое пособие для студентов неязыковых специальностей. Павлодар: 2008. 7 Themen 2. Kursbuch. Lehrwerk fur Deutsch als Fremdsprache. Max Hueber Verlag. Munchen: 2001. 8 Themen 3. Kursbuch. Lehrwerk fur Deutsch als Fremdsprache. Max Hueber Verlag. Munchen: 2001.

General disciplines Compulsory componeni	
Module name:	**Ecology and Social Safety**
Module level, if applicable	---
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Ecology and sustainable development , Basics of personal and social safety
Semester:	4
Module coordinator:	S.M. Aimuhanov., D.K. Zhumabekova., D.D. Seitzhanova., M.K. Semenova.
Lecturer:	Professor,Candidate of agriculture sciences
Language:	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours- 60; including: Lectures - 30 hours; Practical classes- 30 hours; Tutorials - 30 hours. Hours per week - 6; of which Lectures - 2 hours,practice - 2 hours,tutorials - 2 hours Number of students - 75 people.
Workload	Total hours- 180; including: Contact hours - 60, off-class hours- 120 (Tutorials - 30 hours, Students' self study - 90 hours)
Credit points:	6 ECTS credits
Requirements under the examination regulations:	

Targeted learning outcomes:	To be aware of: monitoring environmental conditions of habitat. To know: the basis of identifying factors and sources of negative environmental impacts.
Content of lectures:	Ecology of individuals - autoecology. Population ecology - demekology. Ecology of communities - synecology. Biosphere and its stability. The concept of sustainable development. Natural resources and environmental management as one of the aspects of sustainable development. Man-made causes of the instability in the biosphere. Social and environmental challenges of our time, sustainable development. Nature conservation and sustainable development. Current environmental problems of sustainable development of the Republic of Kazakhstan. Rationing of environmental quality, environmental assessment. Waste-free and low-waste technology. Disposal of waste. Environment and human health. The legislation of the Republic of Kazakhstan in the field of environmental protection. The state system of the Republic of Kazakhstan to prevent and act in emergency situations. The dangers of the human environment. Emergencies. Protecting the public. Emergency response. Indicators of technosphere negativity.
Content of practical classes:	Organizational and theoretical basis of their livelihoods. Man-made hazards habitat actions in providing first aid to victims of disaster. The principle of operation of devices and device radiological and chemical control. Personal protective equipment. Solving the assessment of the radiation situation. Terms of evacuation when disaster.
Study / exam achievements:	Examination
Forms of media:	Power Point Presentation, slaids, posters
Literature:	1. Новиков Ю.В. Экология, окружающая среда и человек: Уч.пособ. М.: Фаир, 1998. 2. Абдрахманов С.К. О государственной системе предупреждения и ликвидации чрезвычайных ситуаций в Республике Казахстан. Информационно-справочное пособие. Алматы, 2006 - 276 с. 3. Р.И. Айзман, С.Г.Кривощекова, И.В.Омельченко Основы безопасности жизнедеятельности и первой медицинской помощи. Учебное пособие. Издание 3-е, исправленное и дополненное. Сибирское университетское издательство, Новосибирск 2005. - 398 с.

Basic discipline Compulsory componeni	
Module name:	**Professional language training**
Abbreviated name (if applicable)	---
Sub-heading, if applicable	--
education / education courses subjects (if applicable)	Professionally oriented foreign language. Professionally oriented Kazakh and Russian language
Semester:	3, 4
Module coordinator:	Zh. Shoshay, A.G. Bakirov
Assistant Professor /	Master, assistant professor

Lecturer	
Language	Kazakh, Russian
Classification within the curriculum	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours - 60; including: Practical classes - 60 hours; tutorials- 30 hours. Hours per week - 6, of which: practice - 4 hours, tutorials - 2 hours Number of students - 75.
Workload	Total hours - 180; including: Contact hours - 60, off-class hours - 120 (tutorials - 30 hours, students' self study- 90 hours)
Credit points	6 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes	To be aware of: a terminological system of professional activities. To know: the terms and language turnovers in professional areas. To be able to: promptly conduct a conversation on a variety of topics: general, educational and professional, scientific, communicate without education, avoiding grammatical errors, without apparent restriction of speech styles. To have skills of: self-study of scientific literature in the language of the recording medium, use professional and stylistic turns of phrase. To be competent in: writing scientific and professional work: essays, business letters, etc.
Content of lectures:	
Content of practical classes	International contacts and their role in the life of the modern professional. Meeting arrangements, phone calls. The talks, professional debates, presentations and conferences. Business Writing (resume, cover letter, letter of recommendation, complaint, requests, request for information, the letter - confirmation, orders, contracts, etc.). International programs and projects. International co-operation of the university. Metallurgy. Basic concepts and definitions. General information on construction materials. Metals in Kazakhstan and abroad: the history, current status and prospects. The structure and organization of metallurgical enterprises. The key production units and their functions. Positions and job specialists. Professional activity in human life. Employment. Summary. Ways to improve skills. Equipment and technologies for the production of pig iron. Equipment and technology electric furnace steelmaking. Equipment and technologies for the production of aluminum. Equipment and technology for ferroalloy production. Equipment and technology for foundry. Equipment and technologies for the production of rolled products and pipes. Problems of development of equipment and technology in industry.
Study / exam achievements	Examination
Forms of media	Power Point Presentations, slides, posters
Literature:	1 Раисова А.Б., Муканова Л.Ж., Немецкий язык. Методическое пособие для студентов, ПГУ им. С. Торайгырова: 2006.

2 Русско-англо-немецко-французский металлургический словарь. Основные термины. Ок. 5000 слов. - 2-е издание, стереотип. - М. : РУССО, 2006. - 360 с.
3 The 300 t EAF meltshop at the new Iskenderun minim / MPT International, № 2, 2008. - P. 52 - 58.
4 Sprachkurs Deutsch 2. Verlag Moritz Diesterweg Gmbh. Stutgartt: 2001
5 Dialog in Beruf. Max Hueber Verlag. Munchen: 2009.
6 Асылханова Л.Е., Жумабекова Б.К. и др. Учебно-методическое пособие для студентов неязыковых специальностей. Павлодар: 2008.
7 Themen 2. Kursbuch. Lehrwerk fur Deutsch als Fremdsprache. Max Hueber Verlag. Munchen: 2001.
8 Themen 3. Kursbuch. Lehrwerk fur Deutsch als Fremdsprache. Max Hueber Verlag. Munchen: 2001.

General disciplines Compulsory componeni	
Module name:	**Processing and analysis of information**
Abbreviated name (if applicable)	---
Sub-heading, if applicable	---
education /education courses subjects (if applicable)	informatics
Semester:	1
Module coordinator:	D.B. Abykenova, A.Ye. Zhaksylykov, M.S. Kanagatova, A.B. Issimbayeva, N.K. Tokzhigitova, Zh.S. Alimova, M.S. Kazangapova
Lecturer:	Assistant professor
Language:	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours - 45, including: Lectures - 15 hours; Practical classes - 22,5 hours; Laboratory classes - 7, 5 hours Tutorials- 30 hours. Hours per week - 5, including: Lecture - 1 hour, practice - 1,5 hours, laboratory class - 0,5 hour,tutorials - 2 hours Number of students - 75.
Workload:	Total hours - 150; including: Contact hours- 45, off-class hours- 105 (tutoreials- 30 hours, students'self study- 75 hours)
Credit points:	5 ECTS credits
Requirements under the examination regulations:	
Targeted learning	To be aware of: the possibilities of modern information technology and

outcomes:	the prospects for its development. To know: the status and prospects of the hardware and software of computers and computer networks, algorithmic foundations tasks of building effective algorithms. To be able to: use software packages, to work on the universally recognized basic programming languages, model and design software. To have skills of us advanced software, advanced computing and communication systems and information transmission to practice office and scientific specialized software, software architecture and use of hardware and software To be competent in: using modern computer technology and information technology
Content of lectures:	The basic concepts of computer science. Fundamentals of Discrete Mathematics. The basic concepts of computer architecture. Algorithmic problem solving, analysis of algorithmic complexity. Familiarity with programming languages. Fundamentals of operating systems and networks. Graphics and Internet
Content of practical classes:	Working in the text editor MS Word. Formatting and editing a MS Word document. The use of automated lists in Word documents. Bulleted, numbered, multi-level lists. The creation of mathematical formulas. MS Excel. Types of data, the absolute and relative addressing. Standard functions of Excel. The format of the cell. Borders and Shading. Numeric, interest, currency format. Format Date & Time. The use of logical functions IF, AND, OR, NOT in the calculations. Statistical, financial, logical functions. Sort, modifying the database, the organization of simple queries. Smart Filter, Advanced Filter. Summing up the subtotals. Linking worksheets consolidation tables. Creating, editing, formatting pivot table. Creating tables. Table Mode. Design Mode. Linking tables. Create and modify forms. Create and modify reports. Create and modify forms. Create different types of queries. Request a sample. A query with a parameter. Crosstab query. The final request. Boolean algebra. Logic operations. Formulas and their conversion. Computer architecture. Storing information. Number systems. Linear algorithmic design. A branching algorithmic design. A recursive algorithm. Basic operations with files and directories in the File Explorer. Search for files. Search settings. More search options. Setting up the network. Installation of access to files and folders, mapped network drive and search for information on it. Mastering the work in the graphic editor PhotoShop. The basics of composition. Text effects. Imitation volume in PhotoShop. Photomontage.
Study / exam achievements:	Examination
Forms of media:	Power Point Presentations, slides, posters
Literature:	1. Макарова Н. В., Матвеев Л. А., Бройдо В. Л. и др. Информатика / Под ред. Макаровой Н. В. М., 2003. 2. Информатика / Под ред. С. В. Симоновича. - СПб., 2004. 3. Моисеев А.В. Информатика. - М.: Академия, 1998.

General disciplines Compulsory componeni	
Module name:	**Economics and Legal Literacy**
Module level, if	Basics of economic theory, Basics of law, Sociology.

applicable:	
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Basics of economic theory, Basics of law, Sociology
Semester:	1, 2
Module coordinator:	S.K. Ilyassov, D.K.Sulekeev, G.T. Artykbayeva, Zh. D.Seilkhanov, A.K. Kagibat, A. Azimkhan, L.K. Glamazdina, S.M. Karimova, S.K. Moldabayeva, A.Zh. Kuniyazova, G.S. Dyusembekova, A.T. Kuanyshbayev
Lecturer:	Associate professor, assistant professor
Language:	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours -90; including: Lectures - 45 hours; Practical classes - 45 hours; Tutorials- 45 hours. Hours per week - 9; including: Lecture - 3 hours, practice - 3 hours, tutorials - 3 hours Number of students - 75.
Workload:	Total hours - 270; including: Contact hours- 90,off-class hours - 180 (tutorials- 45 hours, students' self study 135 hours
Credit points:	9 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To be aware of: the basic theoretical ideas, accumulated scientific heritage on economic issues, the basic concepts relating to the state and law, morality in their modern sense, the essence and the basic concepts of sociology. To know: the essence of economic phenomena and the laws of socioeconomic development of the society in different economic systems, mechanisms of self-regulation of the market in resource-limited settings, the principles of government regulation of the economy, the foundations of the constitutional order of the Republic of Kazakhstan, the state power system and the interaction with other social and political institutions, the main conceptual theories and laws of sociology, modern trends of social development, social and ethical values based on public opinion, traditions, customs, social norms and navigate to them in their professional activities. To be able to: observe and organize information, apply logic and dialectics.
Content of lectures:	The subject and method of economic theory. Social production and its structure. Economic institutions: ownership and entrepreneurship. Types of economic systems and patterns of development. Forms of social economy. Commodity production. Money. Market: types, structure, model. Supply and demand. Competition and Monopoly. Capital (funds). Circuit and turnover. Costs of production. Revenues

	from production factors. The national economy as a system. Economic equilibrium and economic growth. Economic cycles. Inflation and unemployment. Government regulation: the nature, objectives and instruments. Social and Regional Policy of the State. International economic relations. Regulation of foreign economic activity. Normative regulation of social relations. The concept and essence of the right. The rule of law. Forms (sources) of law. Regulatory act. Legislating and systematization of legal acts. The system of law and a system of laws. The legal relationship. The implementation of law and its form. The application of legal norms. The interpretation of regulations. Legal consciousness. Legal culture and legal nihilism. Gaps in the law and ways to address them. Good behavior. Torts and legal responsibility. Legality, law and order, discipline. The right person, society. The scope of law. Sociology in the structure of social and human sciences. Trends in sociology. Society as a social system. Social institutions and social processes. Social structure and social stratification. Sociological characteristics of the individual. Deviance and Social Control. Sociology of Education. Political sociology. Economic sociology. Sociology of the Family. Sociology of culture. Sociology of Mass Communications. Methods and techniques of empirical sociological research. Methods of data processing and analysis of the results.
Content of practical classes:	The subject and method of economic theory. Social production and its structure. Economic institutions: ownership and entrepreneurship. Types of economic systems and patterns of development. Forms of social economy. Commodity production. Money. Market: types, structure, model. Supply and demand. Competition and Monopoly. Capital (funds). Circuit and turnover. Costs of production. Revenues from production factors. The national economy as a system. Economic equilibrium and economic growth. Economic cycles. Inflation and unemployment. Government regulation: the nature, objectives and instruments. Social and Regional Policy of the State. International economic relations. Regulation of Foreign activity. Normative regulation of public relations. The concept and essence of the right. The rule of law. Forms (sources) of law. Regulatory act. Legislating and systematization of legal acts. The system of law and the legal system of society. The legal relationship. The implementation of law and its form. The application of legal norms. The interpretation of regulations. Legal consciousness. Legal culture and legal nihilism. Gaps in the law and ways to address them. Good behavior. Torts and legal responsibility. Legality, law and order, discipline. The right person, society. The scope of law. Sociology in the structure of social and human sciences. Trends in sociology. Society as a social system. Social institutions and social processes. Social structure and social stratification. Sociological characteristics of the individual. Deviance and Social Control. Sociology of Education. Political sociology. Economic sociology. Sociology of the Family. Sociology of culture. Sociology of Mass Communications. Methods and techniques of empirical sociological research. Methods of data processing and analysis of the results.
Study / exam achievements:	Examination

Forms of media:	Power Point Presentations, slides, posters
Literature:	1. Добрынин А. И., Журавлева Г.П. Общая экономическая теория: Учеб.пособие.-СПб:Питер, 2005. 2. Алексеев С.С. Теория государства и права: Учебник, М., 2007 - 132с. 3. Волков Ю.Г. Социология:учебник для студ. вузов/Ю. Г. Волков; под ред. В. И. Добренькова.-3-е изд.-Ростов н/Д:Феникс, 2007.572 с.-(Высшее образование)

Basic discipline Compulsory componeni	
Module name:	**Mathematics and Natural Science 1**
Module level, if applicable:	---
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Mathematics, Physics
Semester:	1, 2
Module coordinator:	M.Kh. Khamitov, Yu.V. Tikhomirov, A.M. Abdrakhmanova, M. Kudaybergen, S.Ye. Minekeyeva, Zh. D. Ospanova, L.K. Kazangapova, N.A. Shakhmetova, N.Zh. Zhuspekova, Ye.A. Kustova,
Lecturer:	Candidate of Physics and Mathematics, Professor Candidate of Physics and Mathematics, Assistant professor
Language:	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours -112,5;including: Lectures - 45 hours; Practical classes - 60 hours; Laboratory classes - 7.5 hours; Tutorials- 60 hours. Hours per week – 11,5; including: Lecture - 3 hours, practice -4 hours,laboratory class - 0,5 hour,tutorials- 4 hours Number of students - 75.
Workload:	Total hours - 360; including: Contact hours- 112,5, off-class hours- 247,5 (tutorials- 60 hours, students'self study- 187,5 hours)
Credit points:	12 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To be aware of the following: - The application of mathematical knowledge in solving practical industrial problems; - the physical world, allowing the correct way in the flow of scientific and technical information and provides the ability to use new physical principles in the professional field; You should know: - The specificity of mathematics and its role in the solution of practical

	industrial problems; To know: the main part of the theoretical material; - The basic physical phenomena and laws of classical and modern physics, physical methods of research, the impact of physics as a science, the development of technology, the connection of physics and other sciences and its role and solving scientific and technical problems of the specialty. To be able to: - To apply theoretical knowledge in the study of specific applications and practical problems; - To use the scientific literature and develop their own mathematical knowledge; - Possess a certain amount of knowledge the basic techniques and methods of application solutions and practical industrial problems; - The use of modern physical principles in those areas of technology in which students specialize, to formulate the laws of physics, to determine the quantities that describe the phenomena and laws, build a model of a physical phenomenon, indicating the boundaries of application. Have skills: - The choice of methods for solving specific problems and finishing solutions to the final result; - To carry out mathematical analysis of the results and draw conclusions; - The planning of the experiment (partially) recording the results of measurements, processing and evaluation of the results when solving problems and conducting experiments, making tables and graphs; assessment tochnisti coincidence experiments with theoretical data. Be competent: in the choice of the mathematical and physical methods in occupational activities.
Content of lectures:	Elements of linear algebra and analytic geometry. Introduction to mathematical analysis. Differential calculus of functions of one variable. An investigation of using the derivative. Complex numbers. Polynomials. The indefinite integral. The definite integral. Differential calculus of functions of several real variables. Multiple integrals. The concept of curvilinear and surface integrals. Number series. Power series. The expansion of functions in power series. Trigonometric Fourier series. Ordinary Differential Equations. Basic concepts of probability theory and mathematical statistics. Mechanics. Molecular physics and thermodynamics. Electricity.
Content of practical classes:	Elements of linear algebra and analytic geometry. Introduction to mathematical analysis. Differential calculus of functions of one variable. Study function using the derivative. Functions of several variables. Complex numbers. Polynomials. The indefinite integral. The definite integral. Differential calculus of functions of several real variables. Multiple integrals. The concept of curvilinear and surface integrals. Number series. Power series. The expansion of functions in power series. Trigonometric Fourier series. Ordinary Differential Equations. Basic concepts of probability theory and mathematical statistics. The kinematic description of the motion. Kinematics of the translational and rotational motion of a point. Particle dynamics and

	translational motion of a solid body. Newton's laws. Forces in mechanics. Moment of force. The moment of inertia. Steiner's theorem. The basic equation of the dynamics of rotational motion. The law of conservation of momentum. The work force. Power. Moment of momentum. The law of conservation of angular momentum. Elements of Fluid Mechanics. Elements of the special theory of relativity. Lorentz transformation. The relativistic velocity addition law. Relativistic momentum and energy. Harmonic oscillations. Characteristics of harmonic oscillations. Pendulums: spring, Physics, Mathematics. Wave processes. The thermodynamic parameters. Gas Laws. The equation of state of an ideal gas. Statistical distributions. The average kinetic energy of the particles. The internal energy of an ideal gas. The first law of thermodynamics. Of iso. Carnot cycle and its efficiency. The molecular-kinetic theory of transport phenomena: diffusion, viscosity, thermal conductivity. The transfer coefficients. Electrostatic field Field characteristics of E and ϕ. The principle of superposition. Work movement of electric charge in the field. Potential. Gauss' theorem and its use for the calculation of electrostatic fields in vacuo and dielectrics. Capacitors. Capacitance. The energy of the electrostatic field. Electric current. Laws DC. Ohm's Law and Joule. Ohm's law is a complete circuit. Kirchhoff's rules. Work and power supply.
Study / exam achievements:	Examination
Forms of media:	Power Point Presentations, slides, posters.
Literature:	1. Бугров Я.С., Никольский С. М. Элементы линейной алгебры и аналитической геометрии. М, Наука. 2. Бугров Я.С., Никольский С. М. Дифференциальное и интегральное исчисление. М, Наука. 3. Гладской, В. М. Физика: Сборник задач с решениями:учебное пособие для студ. Втузов / В.М.Гладской, П.И.Самойленко.-2-е изд.,стер.- М. : Дрофа, 2004.

Basic discipline Compulsory componeni	
Module name:	**Mathematics and Natural Science 2**
Module level, if applicable:	---
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Physics, Chemistry
Semester:	3
Module coordinator:	F. P. Paramonov, C.Ye. Minekeyeva, Zh. D. Ospanova, L.K. Kazangapova, N.A. Shakhmetova, N.Zh. Zhuspekova, Ye.A. Kustova, G. Baygulova, M.O. Turtubayeva, A. Oraltayeva
Lecturer:	Candidate of chemistry, Professor, Assistant professor, senior lecturer
Language:	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format /	Total contact hours -75; including:

class hours per week during the semester:	Lectures - 30 hours; Practical classes - 22.5 hours; Laboratory classes - 22.5 hours; Tutorials- 60 hours. Hours per week –9; including: Lecture - 2 hours, practice – 1,5 hours, laboratory class - 1,5 hour,tutorials - 4 hours Number of students - 75.
Workload:	Total hours - 240; including: Contact hours- 75, off-class hours- 165 (tutorials- 45 hours, students' self study- 120 hours)
Credit points:	8 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To be aware of: - The limits of applicability of various physical concepts, laws, and theories; - An assessment of the reliability of the results obtained experimentally - GOVERNMENTAL or mathematical methods of research; - On the matter and it is taking form, the mechanism of conversion of chemical compounds on the properties of advanced inorganic materials and the use of chemical processes in modern technologies. You should know: - The basic physical phenomena and laws of classical and modern physics; - Methods of physical research; - The impact of physics as a science, the development of technology; - Relationship with other sciences of physics and its role in solving scientific and technical problems of the specialty; - The basic laws and concepts of chemistry, laws of chemical reactions, the chemical properties of elements and their compounds, special chemistry questions related to the future profession. Be able to: - The use of modern physical principles in those areas of technology in which students specialize; - Formulate the laws of physics; - To determine the quantities that describe the phenomena and laws, to establish the relationship between them (to express this relationship analytically and graphically, in words); - Apply the basic laws and principles of physics in standard situations; build a model of a physical phenomenon, indicating the boundaries of application; - To solve the problem and the design of a theoretical nature; - To predict the elementary chemical events (the promise of new materials, construction materials, technology); - Process the results and summarize them on the basis of knowledge of chemical laws. Have skills: - Design of experiments (in part); - Recording the results of measurements; - Processing and evaluation of the results when solving problems and

	carrying out the experiment; - Preparing tables and graphs; - Assess the accuracy of coincidence experiments with theoretical data. Be competent: - On issues related to physical problems and solutions in practice; - An experiment in the organization and selection of appropriate measuring and recording equipment; - A modern representation of the world and the state of scientific and technical progress. - A statement of the issues and solutions himcheskih tasks in practice;
Content of lectures:	Electromagnetism. Optics. Quantum physics. The atomic nucleus and elementary particles. The subject of chemistry. Basic laws and concepts of chemistry. The structure of the atom. The periodic law of DI Mendeleev and the theory of atomic structure elements. Chemical bond. Condensed state of matter. Fundamentals of chemical thermodynamics. Fundamentals of chemical kinetics. Solutions, electrolytic dissociation, hydrolysis of salts. Oxidation-reduction reactions. Fundamentals of electrochemistry. Special sections.
Content of practical classes:	The magnetic field in vacuo. Electromagnetic induction. Electromagnetic oscillations. The motion of charged particles in electric and magnetic fields. Alternating electric current. Geometric optics. Photometry. The interference of light. The diffraction of light. The polarization of the light. Dispersion and absorption of light. Quantum physics. Physics of atoms and molecules. The atomic nucleus and elementary particles. Radioactive transformations of atomic nuclei. The radioactivity. The law of radioactive decay. Radioactive radiation. The subject of chemistry. Basic laws and concepts of chemistry. The periodic law of DI Mendeleev and the theory of atomic structure elements. Fundamentals of chemical thermodynamics. Fundamentals of chemical kinetics. Fundamentals of electrochemistry.
Study / exam achievements:	Examination
Forms of media:	Power Point Presentations, slides, posters
Literature:	1. Трофимова Т.И. Курс физики. М.: Высшая школа, 2001. 2. Ахметов Н.С. Общая и неорганическая химия. - М.: Высшая школа, 2003.

Basic discipline Compulsory componeni	
Module name:	**Metallurgical Processes Theory**
Module level, if applicable:	--
Abbreviation, if applicable:	--
Sub-heading, if applicable:	Theory of metallurgical processes, Physical and Colloid Chemistry
Semester:	3, 4
Module coordinator:	Z.B. Karshigina, A.S. Oraltayeva, S.Zh. Zhumalin
Lecturer:	Senior lecturer
Language:	Kazakh, Russian
Classification within the	5B070900 - «Metallurgy» bachelor level Compulsory component

curriculum:	
Teaching format / class hours per week during the semester:	Total contact hours -75; including: Lectures –37,5 hours; Practical classes - 15 hours; Laboratory classes - 22.5 hours; Tutorials- 45 hours. Hours per week - 8; including: Lecture – 2,5 hours, practice - 1 hour, laboratory classes - 1.5 hour,tutorials- 3 hours Number of students - 75.
Workload:	Total hours - 180 contact hours- 75, off-class hours- 105 (tutorials- 45 hours, students'self study- 60 hours)
Credit points:	8 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To be aware of: - Of the theoretical foundations, current state and the practical application of physical chemistry and metallurgy and enrichment; - On the theoretical foundations of metallurgical methods of complex extraction of metals from minerals and industrial products. To know: - The basic laws and concepts of chemistry, laws of chemical reactions, the chemical properties of elements and their compounds, special issues of physical and colloid chemistry associated with the future profession. - The structure and properties of metallic, oxide, sulfide, and water systems; - Thermodynamics and kinetics of the pyro-hydro-and Electrometallurgical mineral processing and industrial wastes, salt solutions and melts; - Modern theories and methods of extractive metallurgy and direction of development of the theory and practice of extraction and refining of metals with the complex use of raw materials and modern environmental requirements. Be able to: - Calculate the possibility of processes, their speed, select the optimal reaction conditions, competently conduct processing of minerals, cleaning, selection of extractants, ion exchangers, truly understand and implement flotation implement measures to protect the environment from pollution, preservation of the purity of the atmosphere, improvement of working conditions industrial plants; - Perform calculations on the thermodynamics and kinetics of pyro- hydro-and electrometallurgic processes; - Analyze existing and projected long-term processes, and support the choice of the most appropriate processes; - Predict the performance of specific; - To assess the speed of individual stages of metallurgical processes and to identify rate-limiting steps in the process; - To analyze and summarize the results of studies of metallurgical

	processes, validate the accuracy and identify the causes of deviations from expected; - To use the thermodynamic models using computers; formulate recommendations for the intensification of the process, improve product quality and selection of equipment. Have skills: - Perform calculations and experimental studies on the thermodynamics and kinetics of pyro-hydro-and electrometallurgic processes. Be competent: - In the field of law fidicheskoy and colloid chemistry, the modern trends of development of the theory and practice of extraction and refining of metals with the complex use of raw materials and modern environmental requirements.
Content of lectures:	Physical and Colloid Chemistry. Chemical Thermodynamics. The theory of solutions. Phase equilibria in multicomponent systems. Electrochemistry. Diffusion. Chemical kinetics and catalysis. The thermodynamics of irreversible processes. Colloid Chemistry. Theory of metallurgical melting and crystallization processes. Theoretical basis of the processes of evaporation and condensation. Structure and properties of oxide melts. Fundamentals of redox processes. The theoretical bases of processing sulphides. Fundamentals of processes involving halides. Solubility in aqueous salt solutions. Thermodynamics of the exchange processes of leaching and separation of fluids sparingly soluble compounds. Thermodynamics of hydrometallurgical processes change the electrochemical potential of the solution. The mechanism and kinetics of leaching and precipitation of metals from solutions. Fundamentals of extraction processes. Basic ion exchange processes. The electrolysis of aqueous solutions. Electrolysis of molten salts.
Content of practical classes:	The study of the safety rules when performing laboratory work. Determination integral heat dissolving the salt in water. Determination of the heat of hydration. Determination of the heat of neutralization. Determination of rate constants for oxidation of hydriodic acid with hydrogen peroxide. Determination of the order of a chemical reaction. Changing the speed of the chemical reaction in the presence of catalysts. Coagulation of colloidal solutions. Phase equilibria. Solutions. Electrochemistry. Chemical kinetics. Surface phenomena and adsorption. Composition and properties of the gas atmosphere. The thermodynamic characteristics of leaching processes involving chemical reactions. Kinetic characteristics of the leaching process. The calculation of the basic parameters of electrolysis. The dissociation of carbonates. Investigation of various factors on the solubility of salts. The study of the thermodynamics of direct cation-exchange extraction of metals with different flow rate of alkali. Determination of heavy metals output current and power in the electrolysis of aqueous solutions.
Study / exam achievements:	Examination
Forms of media:	Power Point Presentations, slides, posters
Literature:	1. Евстратова К.И.,Купина Н.А., Малахова Е.Е. Физическая и коллоидная химия. М.: В.Ш., 1990. - 372 с. 2. Ванюков А. В., Зайцев В. Я. Теория пирометаллургических

процессов. - М.: Металлургия, 1973; 1993, 384 с.
3. _____ Е
ольдман Г.М., Зеликман А.Н. Теория гидрометаллургических процессов.

Basic discipline Compulsory componeni	
Module name:	**Introduction into engineering**
Module level, if applicable:	---
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Introduction into specialty and technology of construction materials, descriptive geometry and engineering graphics
Semester:	1,2
Module coordinator:	M.M. Suyundikov, B.G. Zhanahutdinov
Lecturer:	Candidate of technical sciences, Professor
Language:	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours –82,5; including: Lectures - 45 hours; Practical classes –37,5 hours; Tutorials - 45. Hours a week –8,5; including: Lectures - 3 hours, practice -2,5 hours, tutorials - 3 hours Number of students - 75.
Workload:	Total hours -270 Contact hours –82,5, off-class hours – 187,5 (tutorials - 45, stydents' self study – 142,5)
Credit points:	9 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To be aware of: - The credit system of education and the Internal Rules of PSU named after S. Toraighyrov; - The classification of metals and alloys and their applications; - Of the design documentation, as the production of the document. - The basic processes of metallurgical production and subsequent redistribution processes (casting, metal forming, welding, cutting, powder metallurgy, etc.); - The role of industry in the economic potential of the Republic of Kazakhstan; To know: - Basic projection mapping model space onto the plane, the unit of two - triangular complex drawing G. Monge, the laws of education plane and spatial forms, methods of construction of their images, the basic requirements of USDD (Unified system for design documentation); - Classification of metals and alloys and their field of

	application; - Basic metallurgical processes; - Basic processes subsequent redistribution (casting, metal forming, welding, cutting, powder metallurgy, etc. be able to: - To carry out the basic operation for the production of castings, billets and parts by casting, metal forming, machining, welding, etc. - To read, to solve problems in the mutual belonging and mutual intersection of geometric shapes, identify geometric shapes simple details from their images and perform these images from nature as well as the drawing assembly unit, read blueprints assemblies. To be able to: - Perform basic operations for the manufacture of castings, billets and details of the methods of casting, metal forming, machining, welding, etc.; - The use of reference materials and sources; - Imaging of the spatial forms on the plane Be competent: - In the basic processes of metallurgical production; - In reading images of objects, drawings, parts and assemblies of medium complexity
Content of lectures:	General information aboutPSU named after S.Toraigyrov. Credit system of education, its principles and general provisions. The order of evaluation of students' knowledge in the credit system of education, methods of calculating the final grades for the subjects and GPA. Historical information about the industry. Development of metallurgy in Kazakhstan. Metallic state. Physico-chemical properties of the metals, the periodic law, the classification of metals. Classification of constructional materials. The structure and methods of evaluating the properties of metals and alloys. The crystallization of metals and alloys. Plastic deformation and mechanical properties of metals. Raw and auxiliary materials. Ores and minerals. The main ore minerals and mineral deposits in Kazakhstan. The total concept of metallurgical processing. Metallurgical products. The main methods of enrichment. Concentration of ores by enterprises in Kazakhstan. Preparation of iron and steel. Blast furnace and converter process, etc. Boundary control in high school. Its functions and organization. Electric furnace and ferroalloy production. Alumina and aluminum. Metallurgy and other light metals. Production of heavy non-ferrous and precious metals (Cu, Ni, Pb, Zn, Au, Ag). Fundamentals of engineering production. Production of billets casting methods. Getting a blank metal forming. Welding Engineering. Powder metallurgy. Fundamentals of metal cutting. Examination session, its functions and organization. Graphic design drawings. Education projections. Point and straight. Plane. The relative position of the two planes, straight lines and planes. Image: types, sections and cross sections. How to convert projections. Separable and permanent connections. Polyhedra. Sketching. Assembly drawing. Scheme. Curves and Surfaces. The intersection of plane surfaces and straight. Reading and detalirovanie drawings assembly unit. The overlapping surfaces. Sweep surfaces. Axonometric projection.

Content of practical classes:	Forming in flasks and fill forms with molten metal. Coremaking. Chill casting. The study of the forging process. Welding Engineering. Powder metallurgy. Definition of technical and economic parameters of the electrodes. The study of the geometry of the cutting tool. ESDD standards for design drawings. General rules for design drawings. SOSE 2.301-68 "Formats", SOSE 2.104-68 "The main inscription" SOSE 2302-68 "scale", GOST 2.303-68 "Line Drawing", SOSE 2.304-81 "Fonts drawing." The drawing points in the 3-plane projection. Orthogonal projection and grid coordinates system. Projection of a straight line segment. Special provisions straight line relative to the planes of projection. Traces a straight line. The relative position of the two lines. The typical position of the plane relative to the planes of projection. Point and a line in the plane. Direct special position in the plane of the relative position of the two planes. The relative position of the straight line and a plane. The decision positional problems to determine the relative position of the point, line and plane. General Information. Types of products. Image. Species. Cuts. Section. Performing projection drawings "Views", "Cuts". A method of rotation. Method plane-parallel movement. How to replace the projection planes. Solutions metrical problems. Plug Connections. Permanent connections. Legend permanent connections. Picture Thread fasteners. The main parameters and designations thread. Image threaded fasteners. Drawing of the bolt and the hairpin connections in the assembly drawing Image of the polyhedron. The point on the surface of the polyhedron. intersection of a line with the surface of the polyhedron polyhedra intersection plane. Sketching. The order of the draft. Measuring instruments. General. Convention and taken to simplify assembly drawings. Implementation of sketches for the assembly drawing. Perform assembly drawing. Dimensioning on the assembly drawings. Drawing reference numerals of components of the product. Specification. Scheme. The intersection of the plane of rotation of the surfaces of the private provision and private equity positions. Reading and detalirovanie assembly drawings. The order detalirovaniya assembly drawing. Basic requirements for working drawings The intersection of the surfaces of polyhedra. The method of intersecting planes. The overlapping surfaces of revolution. Sphere method. Some special case of intersection of the second order. Building a sweep of polyhedra and solids of revolution. Isometric view. Dimetricheskaya projection. Circumference perspective.
Study / exam achievements:	Examination
Forms of media:	Power Point Presentation, slides, posters
Literature:	1. Технология конструкционных материалов. Под ред. Дальского А.М. - М. : Машиностроение, 2004. - 511 с. 2. Гордон В.О., Семенцов-Огиевский М.А. Курс начертательной геометрии: Учебное пособие /Под ред. Ю.Б.Иванова. - М.: Наука, 2006.

Basic discipline Compulsory componeni	
Module name:	**General engineering education 1**
Module level, if applicable:	---
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Electrical engineering, standardization, certification and technical metrology
Semester:	3
Module coordinator:	Yksan Zh.M., Orazova G.O., Krivko L.I., Tkachuk A.A.
Lecturer:	Assistant professor, candidate of technical science, senior lecturer
Language:	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours - 90; including: Lectures - 52,5 hours; Laboratory classes - 15 hours; Practical classes - 22,5 hours; Tutorials - 45. Hours a week - 9; including: Lectures - 3,5 hours, practice - 1,5 hour, laboratory - 1 hour; tutorials - 3 hours Number of students - 75.
Workload:	Total hours-300 hours Contact hours - 90, off-class hours - 210 (tutorials - 45 hours, students'self study- 165 hours)
Credit points:	10 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To be aware of: - The basics and especially - state system of standardization and certification of measurements, methods and means of measurement, how to achieve the required accuracy; - The basics of theoretical concepts and analysis of electrical circuits. To know: - Regulations of technical regulations of the Republic of Kazakhstan, the theoretical and legal framework; - The engineering approach of quality assurance; - Technical measurements and metallurgical engineering products; - The legal framework, organizational and methodological principles of certification; - Regulatory and methodological support of certification; - The basic laws of electrical engineering; - The principle of operation, the device, the application of various electromagnetic devices and machines; be able to: - Self-assessment of quality produce in the current production;

	- Analyze the performance of testing laboratories; - To carry out internal quality audits; - Include electrical appliances, apparatus and machines, manage and control their efficient and safe operation. - Understand the purpose and functions main components of modern electrical equipment, analyze their characteristics and modes of operation; Have skills: - Decision-making on the selection of technical standards for certain products and services; - Use electrical appliances, devices and machines. Be competent: - In stalndartizatsii, certification, technical measurements and electrical engineering.
Content of lectures:	The essence of standardization, certification, metrology. Technical legislation as the basis of standardization. Characteristics of the normative documents on standardization. Standardization documents. Standardization methods. Arrange Objects standardization. Systematization. Simplification. Typing. International and regional standardization. The nature and content of certification. Key concepts in the field of conformity assessment and certification. The rules and procedure of certification of products. Certification Rules. Certification in foreign countries and certification importirumoy products in the Republic of Kazakhstan. Environmental certification. Theoretical Foundations of metrology. Basic concepts and problems in the field of metrology. Basic concepts of measurement and measuring instruments. Mechanical measurements. Metering geometrical sizes. Metrological control issues and testing. The basic concept of interchangeability. Electric DC. Single-phase circuits with sinusoidal current. Three-phase circuits. Transformers. Electric machines. Electrical measurements and electric appliances. Fundamentals of electric drive and power supply
Content of practical classes:	Determination of surface roughness. Measuring the accuracy of the stepped shaft. Measuring the size and shape deviations plug gage and determine its validity. Assessment of the accuracy of case details. Electric DC. Single-phase circuits with sinusoidal current. Three-phase circuits. Transformers. Electric machines.
Study / exam achievements:	Examination
Forms of media:	Power Point Presentation, slides, posters
Literature:	1. Тартаковский Д.Ф., Ястребов А.С. Метрология, стандартизация и технические средства измерений. - М. : Высшая школа, 2001. - 208 с. 2. Общая электротехника. Ю.М. Борисов, Д.Н. Липатов - М.: Высшая школа.

Basic discipline Compulsory componeni	
Module name:	**General engineering education 2**
Module level, if applicable:	---
Abbreviation, if	–

applicable:	
Sub-heading, if applicable:	Applied mechanics, materials science
Semester:	4
Module coordinator:	Sembayev N.S., Artamonov V.P., prof. Altybasarov M.K., Kubdakbayeva A.E., Bystrova L.F.
Lecturer:	Assistant professor, candidate of technical sciences, candidate of chemical sciences, professor, candidate of technical sciences.
Language:	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours –92,5; including: Lectures –52,5 hours; Laboratory –15 hours; Practical classes –15 hours; Tutorials - 60. Hours a week –9,5; including: Lectures – 3,5 hours, practice – 1 hour, laboratory – 1 hour; tutorials - 4 hours Number of students - 75.
Workload:	Total hours-270 hours Contact hours –92,5, off-class hours- 177,5 (tutorials - 60 hours, students'self study- 117,5 hours)
Credit points:	9 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To be aware of: - The classification, structure and properties, applications, methods of heat treatment of metals, alloys and non-metallic materials. - The basics of calculation, design and operation of means of production processes. To know: - Classification, structure, basic properties, application of construction materials; - Methods for determining the mechanical properties and metallographic studies of metals and alloys; - Methods of heat treatment materilov; - The fundamentals of strength of materials, theory of mechanisms and machines, and the basis of calculation and design of machine parts be able to: - Choose the material for a specific application details assemblies of machinery; - To prove the method of heat treatment konstrukitsonnyh materials; - Perform the necessary calculations and design development to improve production processes in the first place to upgrade the equipment, development of mechanization and automation, to participate in the creation of the new equipment, taking into account operating experience.

	Have skills: - The use of different methods of testing of metals and alloys; - The design of units and parts of machines. Be competent: - In the field of materials science and engineering and operation of means of production processes.
Content of lectures:	The crystalline structure of metals, crystallization, plastic deformation and recrystallization. Fundamentals of the theory of alloys. The phase diagrams of alloys. The phase diagram of iron alloys - carbon. Fundamentals of the theory and practice of heat treatment. Carbon and alloy steel. Cast irons. Classification and labeling. Structural and tool steels, steel and alloys with special properties. Non-ferrous metals and their alloys. Non-metallic materials. Strength of materials. Tension - compression. Shear and torsion structural elements. Bend. Complex stress state and the theory of strength. Stability of compressed structural elements. Experimental methods for the study of deformation and stress. The concept of fatigue. Theory of mechanisms and machines. Fundamentals of structural analysis of mechanisms. Kinematic analysis of mechanisms. The synthesis of the pivotal mechanisms. Introduction to the dynamics of machines. Calculation and construction machinery parts. Mechanisms (transfer) rotary motion. Connection. Welded joints. Threaded connections. Gears. Worm gears. Belt transmission. Shafts and bearings. plain bearings
Content of practical classes:	Effect of chemical composition on the corrosion resistance of steel in acidic solutions. Effect of chemical composition on the heat resistance of steels. Thermal method of analysis of metals by cooling curves. Hardness of the metal. Preparation microsection to study the microstructure using metallographic microscope. Determination of the grain. The effect of plastic deformation of the mechanical properties of aluminum. Quenching and tempering of steel. Calculation of the strength and stiffness in tension and compression. Calculation of the strength and torsional rigidity. Calculate the strength and flexural rigidity to the construction of diagrams. Determining the degree of mobility. Class, order, sort of. The formula structure. Building plans velocities and accelerations. The calculation of the lap and butt joints. The calculation of the strength of the thread. Calculation bolting at different load cases. Kinematic calculation of the drive belt. The calculation of gearing for durability. Calculation of worm gears for contact stress and bending stresses. Calculation of V- belt transmission. Calculation of rolling bearings on the dynamic load capacity.
Study / exam achievements:	Examination and course paper
Forms of media:	Power Point Presentation, slides, posters
Literature:	1. Сильман Г. И. Материаловедение : учебное пособие. - М. : Академия, 2008. 2. Дубейковский Е.Н., Е.С. Савушкин, Л.А. Цейтлин. Техническая механика. М.: Машиностроение, 1980.- 344 с.: ил. 3. Дунаев П.Ф., Леликов О.П. Конструирование узлов и деталей машин: М.: Высшая школа, 1985.- 416 с.: ил.

Basic discipline Compulsory componeni	
Module name:	**Metallurgy of high conversion**
Module level, if applicable:	---
Abbreviation, if applicable:	
Sub-heading, if applicable:	Metal Forming, Foundry
Semester:	5
Module coordinator:	Smailova N.T., Suyundikov M.M., Bykov P.O.
Lecturer:	Professor, doctor of technical sciences; professor, candidate of technical science, assistant, candidate of technical sciences.
Language:	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» bachelor level Compulsory component.
Teaching format / class hours per week during the semester:	Total contact hours - 90; including: Lectures - 60 hours; Practical classes - 30 hours; Tutorials - 60. Hours a week - 10; including: Lectures - 4 hours, laboratory class - 2 hour,tutorials - 4 hours Number of students - 75.
Workload:	Total hours - 300 Contact hours - 90,off-class hours- 210 (tutorials - 60 hours, students' self study - 150 hours)
Credit points:	10 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To be aware of: - Physico-chemical basis of the technological processes of foundry, forging and stamping, rolling mills and their development trends; To know: - The role and place of the casting, forging and stamping and rolling in the structure of production of metallurgical and engineering industries; - Methods of molding and metal forming and their field of application; - The theoretical foundations of the foundry, forging and stamping and rolling mills; - Stages of the production of castings, forgings and rolled products, their essence, equipment and processes for their implementation. be able to: - The basic elements of design technology of castings, forgings and rolled products; - To carry out the necessary technological calculations. acquire practical skills: - Performance of individual process steps for making castings, forgings and rolled products; - The collection, interpretation, presentation, discussion and formulation of arguments to address the problems in the field of

	casting, forging and stamping and rolling mills, as with specialists and non-specialists in these fields. be competent: - In the implementation of the individual process steps for making castings, forgings and rolled products; - In the design issues in the technology of manufacturing of castings, forgings and rolled products.
Content of lectures:	Foundry production: the role and the place of foundry production in the structure of metallurgical and machinery production; casting method and the field of their application; casting production phases; theoretical fundamentals of foundry production; characteristic of the main technological stages of casting production; the fundamentals of cast- iron, steel, non-ferrous alloys casting production; classification of ingot and continuous cast steel billet production methods. Pressue metal treatment: the significance of pressure metal treatment (PMT) in metallurgy, machine manufacturing and development in other fields; the object of PMT under the conditions of market economy; the subject matter amf types of PMT; the characteristics of pressure metal treatment processes for obtaining billets and end products.
Content of practical classes:	Hand molding methods. Core molding. Chill casting. Centrifugal casting. Lost foam casting. Profit work research. Machine molding (shaking). Finishing operation of ingot production (flogging, dressing-off, cleaning). Casting defects. Heat treatment of ingots. Macro- and microstructure of steel ingots. Heat treatment of ingots. Macro- and microstructure of cast-iron ingots. Heat treatment of ingots. Macro- and microstructure of aluminium ingots. Examples of technological processes of ingot production at local enterprises. Characteristics of continuously cast steel production. Form change of samples under drawing-down platens. Punching-molding chamfered holes in flat billets in one operating press cycle. Fuctionl principle of forge-and-press equipment. Defining the resistance ofplastic deformation under uniaxial extension. Studying uneven deformation and stream velocity in stationary process of flat pressing. Checking the law of least resistance. The influence of external fiction on metal deformation in upending. Studying metal deformation in parallelepiped upending. Studying deformation under plastic deformation.
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Пикунов М.В. Плавка металлов, кристаллизация сплавов, затвердевание отливок. - М. : МИСиС, 2005. - 416 с. 2. Козлов Л.Я. Производство стальных отливок. - М. : МИСиС, 2005. - 351 с. 3. Чернышев Е.А., Паньшин В.И. Литейные технологии. Основы проектирования в примерах и задачах. - М. : Машиностроение, 2011. 4. Быков П.О. Литейное производство. Методические указания к лабораторным занятиям. - Павлодар : ПГУ им. С. Торайгырова, 2005. - 34 с. 5. Лукьянов В.П., Маткава И.И., Бойко В.А. Штамповка, гибка деталей для сварных сосудов, аппаратов и котлов.- М.: Машиностроение, 2003.-512 с. 6. Кузнецов Е.В., Галкин С.П. Технологические процессы

обработки металлов давлением: лабораторный практикум для студентов. - М. : МИСиС, 2002. - 78 с.
7. Машеков С.А., Кузьминов И.И. Технология прокатного производства. - Алматы : КазНТУ им. К. Сатпаева, 2007. - 334 с.
8. Шаповал А.Н., Горбатюк С.М., Шаповал А.А. Интенсивные процессы обработки давлением вольфрама и молибдена. - М. : Руда и металлы, 2006. - 351 с.
9. Лукашкин, Н.Д., Кохан Л.С., Мочалов Н.А. Художественная обработка металлов давлением: справочник. -М. : ЭКОМЕТ, 2006. - 445 с.
10. Машеков С.А., Биякаева Н.Т., Нуртазаев А.Е. Технология ковки в инструменте с изменяющейся формой. -Павлодар: Кереку, 2008. - 507 с.

Basic discipline Compulsory componeni	
Module name:	**Powder Metallurgy**
Abbreviation, if applicable:	----
Sub-heading, if applicable:	
Learning events / Discipline, if aplicable	Powder Metallurgy
Semester:	6
Module coordinator:	Богомолов А.В.
Lecturer:	Lecturer, candidate of technical sciences
Language:	Kazakh, Russian
Classification within the curriculum:	Bachelor's degree in 5B070900 - «Metallurgy» Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours –37,5; including: Lectures –22,5 hrs.; Practical - 15 hrs.; Tutorial - 30 hrs. Classes per week –4,5; including: Lectures – 1,5 hrs., practice - 1 h., tutorials - 2 hrs. Number of students - 75.
Workload:	Total hours -120 Including contact hours –37,5, extracurricular –82,5 (tutorials - 30 hrs., student's independent work –52,5 hrs.)
Credit points:	4 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To be aware of: about the methods of obtaining metal powders, theirs qualities and control methods; the technology of metal powder produce formation, varieties of pressing and baking processes, the principles of dies and compression molds manufacturing. To know: ingoing material of powder metallurgy; the main qualities and methods of obtaining metal powder; structures of instrumental fitting-out; organization and principles of produce pressing and baking equipment. To be able to: work out the technology of obtaining produce with

	powder metallurgy methods; select the equipment and design technological fitting-out; offer and support suggestions in planning the sections of powder metallurgy. Acquire practical skills of: - performing separate technological operations of producing powder goods; - gathering, interpreting, presenting, discussing information and formulating arguments in solving the problems in powder metallurgy both with specialists and non-specialists in these areas. Quality in: - subjects of designing the elements of produce technology with powder metallurgy methods.
Content of lectures:	General information on powder metallurgy and powder metals. Input materials of powder metallurgy. Pressing technology of powder materials and produce. Baking powder materials and produce. Producing and designing powder products. Tool inventory of powder metallurgy. Designing compression-mold. Technological equipment and organizing sections of powder metallurgy. The quality of powder products and ways of it its improvement.
Content of practical classes:	Evaluation of grain fineness of metal powders by means of sizing test method. Estimation of test charge powder mixture with weigh and volumetric methods. Solving problems in defining molding force. Fundamental principles of baking theory of powder alloys on the basis of mechanical powder mixtures. Estimation of baking speed and temperature. Defining complexity units, pressing schemes and major technological parameters. Defining major elements of die tooling. Estimation of loading chamber. Defining core diameter. Press selection according to necessary effort, shut height, size stamp area and hour productivity. Evaluating physical and chemical qualities. Ways of preventing and reconstruction.
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Кипарисов С.С., Либенсон Г.А. Порошковая металлургия - М.: Металлургия. 2. Либенсон Г.А. Основы порошковой металлургии. - М.: Металлургия.

Basic discipline Compulsory component	
Module name:	**Computer-aided design of metallurgical equipment**
Abbreviation, if applicable:	----
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	CAD and construction and Design of Metallurgical Equipment
Semester:	6
Module coordinator:	Deigraph, I. E.
Associate professor / lecturer	assistant professor, Master of Science
Language:	Kazakh, Russian
Classification within	Baccalaureate in 5B070900 - «Metallurgy»

the curriculum:	Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours –37,5; including: Lectures –22,5 hours; Practical classes - 15 hours; Tutorials - 30 hours. Hours per week –4,5; including: Lectures – 1,5 hours, practical classes - 1 hour, tutorials - 2 hours Number of students - 75
Workload:	Total hours - 120 Including contact hours –37,5, off-class hours –82,5 (tutorials - 30 hours, students' self-study – 52,5 hours)
Credits/credit points	4 ECTS credits
Module admission requirements	
Targeted learning outcomes: / competences	To be aware of: designing technological equipment, blocks and elements using automated design system. To know: - organization, purpose and work conditions of metallurgical equipment; - benefits and drawbacks of separate types of equipment; - perspectives and directions of equipment development; - advanced methods of mechanical equipment operation; - technical and engineering equipment parameters; - applied engineering programs used in designing technological equipment. To be able to: - choose optimized work conditions of equipment; - choose and support the most effective equipment design according to the technical task with accomplishing the necessary power calculations; - carry out the technical and economical analysis of metallurgical equipment. To be competent: - in designing technological equipment, blocks and elements using various software. - in computer modeling of metallurgical equipment.
Content of lectures:	The main stages of designing metallurgical machinery and aggregates. Modern computer systems of design and modeling. The technologies of quick prototyping elements and blocks of machines and mechanisms. The equipment for material preparation for metallurgical processing. Mechanical equipment for calcinations and preparation of charging material. Melting and pouring bay equipment.
Content of practical classes:	Calculating the main parameters of jaw-breaker using "Mathcad" Developing drawing of elements and blocks of jaw-breakers using "КОМПАСА"
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Лукашкин Н.Д., Кохан Л.С.,Якушев А.М. 1 Конструкция и расчет машин и агрегатов металлургических заводов. Москва: ИКЦ «Академкнига», 2003.

Basic discipline

Compulsory componeni	
Module title:	**Helth safety in metallurgy**
Abbreviation, if applicable:	---
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Helth safety in metallurgy
Semester:	7
Module coordinator:	Zhakupov A. N., Mazhimova M. B., Tleulessov A. K.
Associate professor / lecturer	assistant professor
Language	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours - 45; including: Lectures - 30 hours; Practical classes - 15 hours; tutorials - 30 hours. Hours per week - 5; including: Lectures - 2 hours, practical classes - 1 hour, tutorials - 2 hours Number of students - 75
Workload:	Total hours - 150 Including contact hours - 45, off-class hours - 105 (tutorials - 30 hours, students' self-study - 75 hours)
Credit points:	5 ECTS credits
Module admission requirements	
Educational objectives / competences	To be aware of: manufacturing processes determining violation of life safety requirements, multifunctional human activity, possibilities of progressive scientific cognitive methods necessary for solving safety, ethical, legal problems regulating human-culture relations. To know: fundamental principles of the Constitution of the Republic of Kazakhstan and regulations in the sphere of life safety, the system of job safety management on enterprise, social, economic and ecological safety issues and protection during emergency situations; To be able to: solve particular engineering problems for prevention of natural, industrial emergency situation and workplace injuries, to apply the security methods and facilities against harmful factors; forsee and timely prevent possible danger and hazards at the place of production; To possess skills of: effective usage of knowledge in the sphere of job and life safety, principles of thinking and summarizing the results of its professional activity; To be competent: in questions and regulatory framework, organization and carrying out the control, elaboration and composingtechnical and planning documents, experimental research work and all the aspects connected with life safety and labour protection.
Content of lectures:	Legal and organizational issues of job safety. Meteorological conditions of working environment. Studying microclimate parameters in industrial conditions. Industrial lighting. Studying the characteristics of industrial lighting. Protection from noise and vibration, hazardous substances and radiation. Protection from industrial noise. Electrical safety. Basic safety rules. Basic rules for CPR after electrical shock.

	Basics of fire safety. Studying industrial vibration and effectiveness of vibration protection. Fire-hazardous, highly explosive equipment. Lightning protection of buildings and constructions. Studying the effectiveness of grounding. Organizational and theoretical basics of life safety. Emergencies. Dangers of the environment. Industrial dangers and protection. Population protection. Sustainability of industrial objects. Rescue operations and other urgent work in damage centres.
Content of practical classes:	Studying microclimate parameters in industrial conditions. Studying the characteristics of industrial lighting. Protection from industrial noise. Basic rules for CPR after electrical shock. Studying industrial vibration and effectiveness of vibration protection. Studying the effectiveness of grounding.
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Безопасность производственных процессов на предприятиях машиностроения/ Под ред. Г.А. Харламова.- Москва, 2006. - с.418 2. Безопасность технологических процессов и производств. Охрана труда.- Москва, Высшая школа, 2001.- с.316

Basic discipline Compulsory componeni	
Module title:	**Theory and Technology of Metallurgical Processes**
Abbreviation, if applicable:	–
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Metallurgical Processes Tehnology, heat power engineering of metallurgical processes, Automatization of metallurgical objects
Semester:	5, 6
Module coordinator:	Ibrayeva O. T.
Lecturer:	associate professor, candidate of technical sciences
Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours - 120; including: Lectures - 60 hours; Practical classes - 60 hours; tutorials - 60 hours. Hours per week - 14; including: Lectures - 4 hours, practical classes - 4 hour, tutorials - 4 hours Number of students - 75
Workload:	Total hours - 390 Including contact hours - 120, off-class hours - 270 (tutorials - 60 hours, students' self-study - 210 hours)
Credit points:	13 ECTS credits
Module admission requirements	
Targeted learning outcomes:	To be aware of: The theory, technological and thermotechnical fundamentals of metallurgical processes and their automatization. To know: - main theoretical and technological guidlenes in ferrous and non- ferrous metal production; - fundamental principles about fuel and fuel combustion, mechanics of

	gases flow in furnace, the main principles of heat transmission in continuous media, qualities of fireproof materials, work and structure of metallurgical furnaces. - different types and categories of automation facilities; - the methods defining the characteristics of controlled elements; - measurement tools and control of thechnological parameters; - the structure of automized management systems of technological processes by standard metallurgical processes; To be able to: - solve thechnological problems in metallurgy; - calculate the main parameters of fuel combustion, pressure drop in gas motion in gas pipe system, choose ventilators and smoke extractors according to reference material, processes of heat consumption and heat losses in furnaces composing heat balance, choose fireproof materials for fettling the particular technological furnace. - control and analyse the technological process; - elaborate functional autoatization schemes; - define the ways of enhancing the quality of object management; To possess practical skills of: - carry out theoretical and practical research; - choose the estimation methods and media in accordance with the standards (technical regulations); - use the tools and equipment. To be competent: In theoretical, technological and thermotechnical bases of metallurgical processes and their automatization.
Content of lectures:	Theoretical fundamentals of metal fabrication process. Physical and chemical basics of combustion. Processes of formation and dissociation of sulphides, oxides, chlorides and fluorides. Theoretical fundamentals of reduction processes. Theoretical fundamentals of oxidizing melting. Fundamentals of metallurgical technology. The raw materials for steel making. Production of cast-iron. Steel production. Ferro-alloy production. Production of non-ferrous metals. Basics of thermotechnics. Thermodynamics of gases and vapors. Heat and mass transfer processes. Fuel and combustion fundamentals. Heat generation. Fundamentals of heat work and construction of funraces. The basic theory of automatic control. Special and physical chemical methods of controlling metallurgical processes. Key elements of measuring and automatic devices. Automation and computerization of technological processes and production in ferrous and non-ferrous metallurgy.
Content of practical classes:	Mechanics of liquids and gases. Calculation of pipe. Calculation of convective heat transfer. Radiative heat transfer. Thermal conductivity. The amount of heat transferred through the stiffening plate. Heating the metal in the furnace. Fuel and combustion fundamentals. Calculation burning gaseous fuels. Selecting devices for combustion. Nozzle selection. Calculation of heat exchangers. Calculation of regenerators. Calculation of the recovery boiler. Heat balance. Credit and debit items. Material balance of thermal reactor. Flow measurement by differential pressure. Experimental determination of the transient response of a hydraulic facility. Checking gauges spring. Examination of the actions and industrial

	devices - pH-meter and its calibration.
Study / exam achievements:	Exaqmination
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Воскобойников В.Г. Общая металлургия: Учебник для вузов. 6-е изд., перераб. и доп. / В.Г. Воскобойников, В.А. Кудрин, А.М. Якушев. - М. : ИКЦ «Академкнига», 2005. - 768 с. 2. Металлургическая теплотехника. Уч. для вузов. т. 1,2. Под ред. В.А. Кривандина. - М.: Металлургия. 3. Глинков Г.М. Теоретические основы автоматического управления металлургическими процессами: учебное пособие для вузов / Г.М. Глинков, М.Д. Климовицкий. - М. : Металлургия, 1985. -304 с.

Elective modules Optional component	
Module title:	**Design of Metallurgical Objects**
Abbreviation, if applicable:	---
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Bases of design of metallurgical objects, Economics and production management
Semester:	7
Moduile coordinator	Suyundikov M. M., Omarova G. T.
Lecturer:	Professor, assistant professor
Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours - 90; including: Lectures - 45 hours; Practical classes - 45 hours; tutorials - 45 hours. Hours per week - 9; including: Lectures - 3 hours, practical classes - 3 hours, tutorials - 3 hours Number of students - 75
Workload:	Total hours - 300 Including contact hours - 90, off-class hours - 210 (tutorials - 45 hours, students' self-study - 165 hours)
Credit points:	10 ECTS credits
Module admission requirements	
Targeted learning outcomes:	To be aware of: on design issues of metallurgical plants and economic feasibility of design solutions. To know: - classification of metallurgical plants; - principles for the selection of process equipment for the specific production conditions. To be able to - choose the technical equipment for specific conditions of production; - calculate the required amount of equipment for the specific conditions of production; - calculate the cost of production of metallurgical plant;

	- perform metallurgical plant layout drawings; have the skills to: - collect, interprete, present, discuss information and formulate arguments on the design and feasibility study stroitlstva metallurgical plants, both with specialists and non-specialists in this field. To be competent: - in the implementation of individual project activities and settlement of metallurgical plants; - on its implementation arrangement drawings of metallurgical plants using automated design system.
Content of lectures:	Introduction. Basis of object design. Design of blast furnace production. Basis of design steelmaking. Electric furnace production. Department of continuous casting machines. Plants for the production of ferroalloys. Designing other objects metallurgical purposes. Modern features of economic development of metallurgical production. Mineral raw materials and fuel energy resources industry. Productive capital and economic efficiency of its use. Economic efficiency of different forms of production. Forms of organization of social production. Industrial complexes. Organization of production processes in metallurgical enterprises. Organization and regulation of labor in the industry. Development of business plan and intra-planning. Cost estimates. Analysis of production business enterprises of nonferrous metallurgy. Basis of production economic activity of metallurgical production. Financial plan of an enterprise.
Content of practical classes:	Selection and justification process. Sources of raw resources base characteristic. Selecting modes, chemistry processes, products. Equipment selection and calculation of its amount. Selection and calculation of the basic parameters of the CCM. Material balance calculation of alumina production (on sites and departments). Mineral and energy resources industry. Productive capital and its economic efficiency. Organization of production processes in metallurgical enterprises. Organization and regulation of labor in the industry. Cost estimate.
Study / exam achievements:	Examination + course project
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Авдеев В.А. и др. Основы проектирования металлургических заводов: Справочное издание / В.А. Авдеев, В.М. Друян, Б.И. Кудрин. - М.: Интермет Инжиниринг, 2002. - 464 с. 2. Шокобаев Т.Д. Организация и планирование промышленных предприятий: Учебное пособие.- Алматы: КазНТУ, 2001г., 1-128 с. 3. Омарова Г. Т. Методические указания к выполнению курсовой работы по курсу «Организация и планирование производства» и дипломному проектированию для металлургических специальностей. - Павлодар: ПГУ им. С. Торайгырова, 2004. - 22 с.

Elective modules Optional component	
Module title:	**Ore Prepartation and Benefication / Ore Prepartation and Benefication**
Abbreviation, if	–

applicable:	
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Chrystallography and mineralogy, ore prepartation and benefication
Semester:	5
Module coordinator	Tussupbekova M. Z., Abdrakhmanov Y. S.
Lecturer:	associate professor, assistant professor
Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours –105; including: Lectures - 45 hours; Practical classes - 30 hours; laboratory classes - 30 hours; tutorials - 60 hours. Hours per week - 10; including: Lectures - 3 hours, practical classes - 2 hours, laboratory classes - 2 hours; tutorials - 3 hours Number of students - 75
Workload:	Total hours - 360 Including contact hours – 105, off-class hours –255 (tutorials - 60 hours, students' self-study –195 hours)
Credit points:	12 ECTS credits
Module admission requirements	
Targeted learning outcomes:	To be aware of: - the classification of crystals, minerals, ore and base metals; - research methods crystals, minerals and ore; - the theoretical foundations of ore preparation and enrichment; - about modern achievements and prospects of development of methods of ore concentration ; To know: - basic methods for studying the structure and properties of crystals and minerals; - distinctive features of various crystals and minerals; - minerals and rocks, which are of great practical importance for the industry; - classification and methods of ore preparation and enrichment; - equipment for ore dressing and enrichment. To be able to: - distinguish crystals, and minerals in their characteristics and properties; To know: - the basic characteristics of the ore deposits of Kazakhstan and enrichment methods used for the preparation of these ores to metallurgical processing; - choose the way of preparation and concentration of ores, depending on the characteristics of ores and their purpose; - carry out the necessary technological. To have the skills to: - implement of elements of metallographic studies of minerals, metals and alloys;

	- collect, interprete, present, discuss information and formulate arguments to solve problems in the field of crystallography, mineralogy, ore dressing and enrichment of ores, both with specialists and non-specialists in these areas. To be competent: - in matters of crystallography and mineralogy; - in matters of ore preparation and enrichment.
Content of lectures:	Fundamentals of Crystallography. Fundamentals of mineralogy. Methods of study of crystals and minerals. Fundamentals of descriptive mineralogy. Basics of petrography. Industrial types of deposits, examples of ores and minerals used in metallurgy. Genesis of fossil fuels, oil and gas. Ore preparation and grading characteristics and ore dressing products. Crushing. Screening. Shredding. Technological processes of ore dressing. Gravitational enrichment methods. Flotation processes enrichment. Magnetic and electrical methods of enrichment. Special and combined methods of enrichment. Dehydration.
Content of practical classes:	Definition of symmetry elements of crystal models, types of symmetry, category, symmetry, symmetry classes. Defining forms of crystalline polyhedra. The features of crystal morphology of minerals and their physical properties. Determining minerals using solder tube (dry analysis). Determining minerals using simple qualitative chemical reactions. Determining rocks by their external characteristics. Petrographic analysis of refractory materials. Determining of the degree of fragmentation. Defining technical enrichment indicators. Calculation of roasted ore. Determining the metal content in the concentrate.
Study / exam achievements:	Examination
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Коржова Р. В. Сырьевая база и обогащение руд. Учеб. пособие. В 2-ух частях: Ч.1 Руды и минералы. - М.: МИСиС, 2001. Ч. 2 Технология обогащения руд. - М.: МИСиС, 2002. 2. Коржова Р. В. Сырьевая база и обогащение руд. Учеб. пособие. В 2-ух частях: Ч. 2 Технология обогащения руд. - М.: МИСиС, 2002. 3. Леонов С. Б., Белькова О. Н. Исследование полезных ископаемых на обогатимость: Учебное пособие. - М.: «Интермет Инжиниринг», 2001. 4. Батти Х., Принг А. Минералогия для студентов: Пер. с англ. - М.: Мир, 2001. - 429 с. 5. Кленов А.С. Занимательная минералогическая энциклопедия. - М.: Педагогика-Пресс, 2000. - 224 с.: ил.

Elective modules Optional component	
Module title:	**Metallurgy of ferrous metals1**
Abbreviation, if applicable:	---
Sub-heading, if applicable:	–
Learning events /	Technology of ferrous metals production, steel electrometallurgy

Discipline, if aplicable	
Semester:	6
Module coordinator	Ibrayeva O.T.
Lecturer:	Candidate of technical sciences, associate professor
Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Optional component
Teaching format / class hours per week during the semester:	Total contact hours - 75; including: Lectures –37,5 hours; Practical classes –37,5 hours; tutorials - 45 hours. Hours per week - 8; including: Lectures –2,5 hours, practical classes –2,5 hours, tutorials - 3 hours Number of students - 75
Workload:	Total hours - 240 Including contact hours - 75, off-class hours - 165 (tutorials - 45 hours, students' self-study - 120 hours)
Credit points:	8 ECTS credits
Module admission requirements	
Targeted learning outcomes:	To be aware of: - physical and chemical and technological basis of the process of production of ferrous metals and alloys, modern methods of electric steel smelting and casting; trends in their development. To know: - the methods of iron ore preparation and other materials for metallurgical processing; - modern methods of iron production, steel and ferroalloys and design of the equipment for their production; - methods of production of ingots and continuously cast billets in steel mills; - methods of steelmaking in electric furnaces, their applicable scope; - the theoretical basis of steelmaking in electric furnaces, furnace steel processing units and calculation methods of smelting processes; - the order of electric smelting in electric furnaces, furnace processing units; - the procedure for casting continuous casting machines. To be able to: - choose the technological scheme of iron and steel production of specific brands; - carry out calculations in iron, steel and ferro-alloys production processes; - design the smelting and continuous casting technology; - carry out the necessary technological calculations. To have the skills to: - perform certain technological operations of iron and steel; - perform of individual process steps of melting and continuous casting; - collect, interprete, present, discuss the information and formulate arguments to solve problems in the field of metallurgy of iron, steel and ferroalloys, with both specialists and non-specialists in these areas. To be competent: - in the technology of production of iron, steel and ferroalloys.
Content of lectures:	Theoretical bases of metal production. Physical and chemical bases of

	burning. Processes of formation and dissociation of sulfides, oxides, chlorides and fluorides. Theoretical bases of recovery processes. Theoretical bases oxidized melting. The raw materials for steel making. Production of cast-iron. Steel production. Production of ferro-alloys. Role and place of electric steel production in steel production. Arc furnace. Furnace smelting plants and equipment for special purposes. Physical and chemical basis of melting steel in electric arc furnaces and furnace steel processing units. Steel smelting technology in open arc furnaces and furnace steel processing units. Special types of technological processes of electrical metallurgy.
Content of practical classes:	Calculation of material and heat balances of the recovery process. The design and calculation of the profile of the blast furnace. Calculation of structural dimensions of basic oxygen furnace. Calculations of the charge for the smelting of ferroalloys. Studying chipboard design and its preparation for work. Studying the design for the secondary treatment units. Studying the design of casting ladles and other auxiliary equipment. Their preparation for work. Classification of charge materials in steelmaking, their purpose, storage and preparation. Studying the technological regimes in steelmaking: loading and melting; oxidation period and release metal from the furnace; recovery period and deoxidation of steel by secondary treatment units. Studying thr CCM design and its preparation for use. Studying the technological modes of continuous casting of billets of square section. Metrological assurance processes of steelmaking and automation. Studying quality of steel.
Study / exam achievements:	Examination + course project
Forms of media:	Power Point Presentations, slides, posters
Literature:	1. Воскобойников В.Г. Общая металлургия: Учебник для вузов. 6-е изд., перераб. и доп. / В.Г. Воскобойников, В.А. Кудрин, А.М. Якушев. - М. : ИКЦ «Академкнига», 2005. - 768 с. 2. Жукебаева Т.Ж. Металлургия: учебное пособие / Т.Ж. Жукебаева, М.К. Альжанов. - Караганда: КарГТУ, 2002. - 87 с. 3. Ибраева О.Т. Теория и технология выплавки стали в кислородных конвертерах и мартеновских печах. Методическое указание / О.Т. Ибраева, И.К. Ибраев, Е.Б. Сулеймен. - Павлодар: ПГУ им. С. Торайгырова, 2005. - 40 с. 4. Лякишев Н.П. Металлургия хрома / Н.П. Лякишев, М.И. Гасик. - М. : ЭЛИЗ. - 1999. - 582 с. 5. Толымбеков М.Ж., Н^рымгалиев АД. Болат жэне феррокорытпалар электрометаллургиясы бойынша технологиялык есептеулер. Оку к^ралы - Алматы: ГБО «Еылым», 2006. - 262 с. 6. Тлеугабулов С.М. Теория металлургических процессов. Учебное пособие для вузов. - Алматы: издание РИК по учебной и методической литературе, 2007. - 351 с. 7. Пикунов М.В. Плавка металлов, кристаллизация сплавов, затвердевание отливок. - М. : МИСиС, 2005. - 416 с. 8. Машиностроение. Энциклопедия в 40 томах. Том IV-5 Машины и агрегаты металлургического производства. - М.: Машиностроение, 2004 - 912 с. 9. Голубцов В. А. Теория и практика введения добавок в сталь вне печи. - М. : Челябинск, 2006. - 423 с.

10. _____ К
аблуковский А. Ф. Производство электростали и ферросплавов. - М. :

Elective modules Optional component	
Module title:	**Metallurgy of ferrous metals1**
Abbreviation, if applicable:	---
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Ferroalloys Electrometallurgy
Semester:	6
Module coordinator	Ibrayev I. K.
Lecturer:	professor
Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Optional component
Teaching format / class hours per week during the semester:	Total contact hours –37,5; including: Lectures –22,5 hours; Practical classes - 15 hours; tutorials - 2 hours. Hours per week –4,5; including: Lectures –1,5 hours, practical classes - 1 hour, tutorials - 2 hours Number of students - 75
Workload:	Total hours - 120 Including contact hours –37,5, off-class hours –82,5 (tutorials - 30 hours, students' self-study –52,5 hours)
Credit points:	4 ECTS credits
Module admission requirements	
Targeted learning outcomes:	To be aware of: - physical and chemical and technological bases of ferroalloy production processes and trends. To know: - classification of ferro-alloys and their purpose; - the methods of preparation of ores for the production of ferro-alloys and other materials to the metallurgical processing; - modern methods of production of ferroalloys and design of the equipment for their production; - theoretical bases of obtaining ferroalloys and calculation methods of smelting processes; - order ferroalloy smelting of different brands; To be able to: - choose flowsheet ferroalloy production of specific brands; - carry out calculations of ferroalloy production processes; - design the technology of ferroalloy smelting of specific brands; - carry out the necessary technological calculations. To have the skills to: - collect, interprete, present, discuss the information and formulate arguments to solve problems in the field of metallurgy of iron, steel and ferroalloys, with both specialists and non-specialists in these areas. To be competent:

	- in the technology of ferroalloys production.
Content of lectures:	Electrometallurgical furnace for production of ferroalloys. Physical and chemical basis of ferroalloys production. Ferrosilicon production. Ferromanganese production. Ferrochrome production. Production of ferrowolfram. Production of ferromolybdenum. Production of ferrovanadium. Production of ferrotitanium. Production of zirconium alloys. Production of alloys of rare metals. Organization of production of ferroalloy plants.
Content of practical classes:	Calculations of charge for melting silicon alloys. Calculations of charge for melting chromium alloys. Calculations of charge for melting ferrovanadium Вд1brand with aluminiumsiliconthermal method.
Study / exam achievements:	Examination
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Воскобойников В.Г. Общая металлургия: Учебник для вузов. 6-е изд., перераб. и доп. / В.Г. Воскобойников, В.А. Кудрин, А.М. Якушев. - М. : ИКЦ «Академкнига», 2005. - 768 с. 2. Гринко В.И. Хром Казахстана: Справочник. - М. : Металлургия, 2001. - 216 с. 3. Каблуковский А.Ф. Производство электростали и ферросплавов. - М.: ИКЦ «Академкнига», 2003. - 456 с. 4. Лукашкин Н.Д. Конструкция и расчет машин и агрегатов металлургических заводов: учебник для вузов / Н.Д. Лукашкин, Л.С. Кохан, А.М. Якушев. - М. : ИКЦ «Академкнига», 2003. - 456 с. 5. Лякишев Н.П. Металлургия хрома / Н.П. Лякишев, М.И. Гасик. - М. : ЭЛИЗ. - 1999. - 582 с. 6. Муканов Д. Металлургия Казахстана: состояние, инновационный потенциал, тренд развития. - Алматы, 2005. - 290 с. 7. Друинский М.И. Получение комплексных ферросплавов из минерального сырья Казахстана / М.И. Друинский, В.И. Жучков. - Алма-ата: Наука, 1988. - 208 с.

Elective modules Optional component	
Module title:	**Metallurgy of ferrous metals3**
Abbreviation, if applicable:	----
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Technology of production of non-ferrous metals, rolling production
Semester:	7
Module coordinator	Ibrayeva O. T., Bogomolov A. V.
Lecturer:	candidate of technical sciences, assistant professor
Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Optional component
Teaching format / class hours per week during the semester:	Total contact hours - 90; including: Lectures - 60 hours; Practical classes - 30 hours; tutorials - 45 hours.

	Hours per week - 9; including: Lectures - 4 hours, practical classes - 2 hours, tutorials - 3 hours Number of students - 75
Workload:	Total hours - 300 Including contact hours - 90, off-class hours - 210 (tutorials - 45 hours, students' self-study - 165 hours)
Credit points:	10 ECTS credits
Module admission requirements	
Content of lectures:	To be aware of: - physical and chemical and technological basis of the process of non- ferrous metals and alloys; production of rolled products and pipes made of metals and alloys. To know: - the methods of preparation of ores and other materials for the metallurgical processing; - modern methods of production of non-ferrous metals and alloys (aluminum, copper, nickel, zinc, lead, precious and rare metals) and the design of the equipment for their production; - theoretical fundamentals of rolling processes. - methods of producing rolled products and pipes in steel mills and construction equipment; - classification of impairments of long products and pipes, their causes and methods of detecting defects. To be able to: - choose the technological scheme of production of nonferrous metal depending on harakteritiki raw materials; - carry out calculations on the production processes of nonferrous metals and alloys; - choose the technological scheme of production of rolled and pipes; - carry out the necessary technological calculations. To have the skills to: - perform certain technological operations of non-ferrous metals; - perform individual process steps of manufacturing rolled products and pipes; - identify defects rolled products and pipes; - collect, interprete, present, discuss information and formulate arguments to solve problems in the field of crystallography, mineralogy, ore dressing and enrichment of ores, both with specialists and non-specialists in these areas. To be competent: - in the implementation of certain manufacturing operations produce of non-ferrous metals, manufacturing rolled products and pipes.
Content of lectures:	The theoretical basis of the metal production. Raw material for non- ferrous metals. Production of aluminum, copper, nickel, zinc, lead, precious and rare metals. Introduction. Basics of the rolling process, and the main types of rental equipment production. Assortment profiles are rolled steel production scheme. Main provisions of the calibration rolls of simple profiles. Manufacturing process of simple rolled profiles. Equipment and manufacturing process for the production of the semi-products. Production of large-size, medium-grade and small sections and wire rod. Rolling characteristics and quality defects.

	Quality management and finishing grade rolling. Common questions of production of sheet steel. The starting materials and their preparation for hot-rolled steel sheet. Production processes of cold-rolled steel. Manufacture of tubes and special profiles.
Content of practical classes:	Zinc metallurgy. Calculation of the rational concentrate. Calculation of output and flue-dust make. Calculation of output and stub end. Calculation of the required amount of air. The calculation of the exhaust gases. Compilation of material and heat balance firing. The study the characteristics of continuously cast billets in producing rolled products and their preparation for rolling. Technological study of heating cast billets for rolling. The study of production technology of longs (rebar, wire). The study of the production technology of special types of products (grinding balls). Brief characteristics of the production technology of seamless pipes. Metrological assurance of manufacturing processes and automation of rolling. The study of grade rolling quality.
Study / exam achievements:	Examination
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Уткин Н.И. Производство цветных металлов. - 2-е изд. - М. : Интермет Инжиниринг, 2004. - 442 с. 2. Худайбергенов Т.Е. Металлургия легких металлов: Учебник - Алматы, 2001. - 235 с. 3. Воскобойников В.Г. Общая металлургия: Учебник для вузов. 6-е изд., перераб. и доп. / В.Г. Воскобойников, В.А. Кудрин, А.М. Якушев. - М. : ИКЦ «Академкнига», 2005. - 768 с. 4. Жукебаева Т.Ж. Металлургия: учебное пособие / Т.Ж. Жукебаева, М.К. Альжанов. - Караганда: КарГТУ, 2002. - 87 с. 5. Муканов Д. Металлургия Казахстана: состояние, инновационный потенциал, тренд развития. - Алматы, 2005. - 290 с. 6. Машиностроение. Энциклопедия в 40 томах. Том IV-5 Машины и агрегаты металлургического производства. - М.: Машиностроение, 2004 - 912 с. 7. Технология трубного производства: Учебник для вузов/ Данченко В.Н., Коликов А.П.,. Романцев Б.А, Самусев С.В. - М.: Интермет Инжиниринг, 2002. - 640 с.

Elective modules **Optional component**	
Module title:	**Metallurgy of ferrous metals4**
Abbreviation, if applicable:	–
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Ladle metallurgy
Semester:	7
Module coordinator	Bykov P.
Lecturer:	assistant professor
Language:	Kazakh, Russian
Classification within	Baccalaureate in 5B070900 - «Metallurgy»

the curriculum:	Optional component
Teaching format / class hours per week during the semester:	Total contact hours - 45; including: Lectures - 15 hours; Practical classes - 30 hours; tutorials - 30 hours. Hours per week - 5; including: Lectures - 1 hour, practical classes - 2 hours, tutorials - 2 hours Number of students - 75
Workload:	Total hours - 150 Including contact hours - 45, off-class hours - 105 (tutorials - 30 hours, students' self-study - 75 hours)
Credit points:	5 ECTS кредита
Module admission requirements	
Targeted learning outcomes:	To be aware of: - physical and chemical and technological bases of secondary steel treatment processes; trends in their development. To know: - classification methods furnace steel processing, their scope; - the theoretical basis of furnace steel processing and calculation methods of smelting processes; - the order of electric smelting in electric furnaces with further processing of steel ladle treatment units; To be able to: - design the technology of smelting furnace obrabboki steel; - carry out the necessary technological calculations. To have the skills to: - perform the individual process steps of steelmaking; - collect, interprete, present, discuss information and formulate arguments to solve problems in the field of crystallography, mineralogy, ore dressing and enrichment of ores, both with specialists and non-specialists in these areas. To be competent: - in the technology of steel production.
Content of lectures:	Objectives and methods of secondary treatment of melts. Melt blown with inert gas. Vacuum treatment melts. Melt processing with particulate materials. Combinations of secondary treatment melts. Ladle treatment of steel continuous casting machines. Preventing oxidation of the steel in the casting. The production of steel with ultra low carbon content. Furnace processing and environmental problems. Trends in the development of steelmaking.
Content of practical classes:	Study the design and principles of operation of the main technological equipment for secondary steel treatment. Classification of the main steelmaking charge materials and their purpose. Study of technological modes of processing different grades of steel to ACT. Study of technological processing modes for different grades of steel vacuum degasser. Metrological assurance process for furnace steel processing and automation. Study steel quality after secondary treatment of different ways.
Study / exam achievements:	Examination
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Воскобойников В.Г. Общая металлургия: Учебник для вузов.

6-е изд., перераб. и доп. / В.Г. Воскобойников, В.А. Кудрин, А.М. Якушев. - М. : ИКЦ «Академкнига», 2005. - 768 с.
2. Толымбеков М.Ж., Н^рымгалиев АД. Болат жэне феррокорытпалар электрометаллургиясы бойынша технологиялык есептеулер. Оку к^ралы - Алматы: ГБО «Еылым», 2006. - 262 с.
3. Пикунов М.В. Плавка металлов, кристаллизация сплавов, затвердевание отливок. - М. : МИСиС, 2005. - 416 с.
4. Машиностроение. Энциклопедия в 40 томах. Том IV-5 Машины и агрегаты металлургического производства. - М.: Машиностроение, 2004 - 912 с.
5. Голубцов В. А. Теория и практика введения добавок в сталь вне печи. - М. : Челябинск, 2006. - 423 с.
6. Каблуковский А. Ф. Производство электростали и ферросплавов. - М. : ИКЦ «Академкнига», 2003. - 456 с.

Elective modules Optional component	
Module title:	**Metallurgy of nonferrous metals1**
Abbreviation, if applicable:	
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Technology of ferrous metals production, Light Metals Metallurgy
Semester:	6
Module coordinator	Ibrayev I. K., Karshagina Z. B.
Lecturer:	assistant professor, senior lecturer
Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Optional component
Teaching format / class hours per week during the semester:	Total contact hours - 75; including: Lectures –37,5 hours; Practical classes –37,5 hours; tutorials - 45 hours. Hours per week - 8; including: Lectures –2,5 hours, practical classes –2,5 hours, tutorials - 3 hours Number of students - 75
Workload:	Total hours - 240 Including contact hours - 75, off-class hours - 165 (tutorials - 45 hours, students' self-study - 125 hours)
Credit points:	8 ECTS credits
Module admission requirements	
Targeted learning outcomes:	To be aware of: about: - physical and chemical and technological basis of the process of production of ferrous and non-ferrous light metals and alloys, the trends of their development; - importance of these processes and industries to the economy of the Pavlodar region. To know: - the methods of preparation of iron ore and other materials for metallurgical processing; - modern methods of production of iron, steel and ferroalloys and

	design of the equipment for their production; - methods of production of ingots and continuously cast billets in steel mills; - methods of production of light metals, their field of application; - theoretical and technological bases of light metals production processes and methods of calculation of production processes. To be able to: - choose the technological scheme of production of iron, steel and ferroalloys specific brands; - perform calculations on the production processes of iron, steel, ferroalloys; - choose the technological scheme of production of light non-ferrous metals and make the necessary technological calculations; To have the skills to: - perform certain technological operations of iron and steel ; - perform the individual process steps for producing light non-ferrous metals; - collect, interprete, present, discuss information and formulate arguments to solve problems in the field of metallurgy of iron, steel , ferroalloys and light non-ferrous metals , as with specialists and nonspecialists in these areas. To be competent: - in the technology of production of ferrous and non-ferrous light metals.
Content of lectures:	The theoretical basis of the production of metals. Physical and chemical bases burning. Processes of formation and dissociation of sulfides and oxides, chlorides and fluorides. Theoretical bases of recovery processes. Theoretical bases oxidizing smelting. The raw materials for steel making. Production of pig iron. Steel production. Production of ferro-alloys . Classification and characteristics of light non-ferrous metals. Raw materials for the production of light non-ferrous metals. Aluminum production. Magnesium production. Beryllium production. Production of titanium. Prospects for the development of light non-ferrous metals in Kazakhstan and the world.
Content of practical classes:	Calculation of material and heat balances of the recovery process. The design and calculation of the profile of the blast furnace. Calculation of structural dimensions of basic oxygen furnace. Calculations of the charge for the smelting of ferroalloys. Process calculations for the production of light non-ferrous metals.
Study / exam achievements:	Examination + course project
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Воскобойников В.Г. Общая металлургия: Учебник для вузов. 6-е изд., перераб. и доп. / В.Г. Воскобойников, В.А. Кудрин, А.М. Якушев. - М. : ИКЦ «Академкнига», 2005. - 768 с. 2. Жукебаева Т.Ж. Металлургия: учебное пособие / Т.Ж. Жукебаева, М.К. Альжанов. - Караганда: КарГТУ, 2002. - 87 с. 3. Ибраева О.Т. Теория и технология выплавки стали в кислородных конвертерах и мартеновских печах. Методическое указание / О.Т. Ибраева, И.К. Ибраев, Е.Б. Сулеймен. - Павлодар: ПГУ им. С. Торайгырова, 2005. - 40 с.

4. Лякишев Н.П. Металлургия хрома / Н.П. Лякишев, М.И. Гасик. - М. : ЭЛИЗ. - 1999. - 582 с.
5. Толымбеков М.Ж., Н^рымгалиев АД. Болат жэне феррокорытпалар электрометаллургиясы бойынша технологиялык есептеулер. Оку кдоалы - Алматы: ГБО «Еылым», 2006. - 262 с.
6. Тлеугабулов С.М. Теория металлургических процессов. Учебное пособие для вузов. - Алматы: издание РИК по учебной и методической литературе, 2007. - 351 с.
7. Уткин Н. И. Производство цветных металлов. - 2-е изд. - М. : Интермет Инжиниринг, 2004. - 442 с.

Elective modules Optional component	
Module title:	**Metallurgy of nonferrous metals2**
Abbreviation, if applicable:	
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Alumina and Aluminum Production
Semester:	6
Module coordinator	Karshigina Z. B.
Lecturer:	senior lecturer
Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Optional component
Teaching format / class hours per week during the semester:	Total contact hours –37,5; including: Lectures –22,5 hours; Practical classes - 15 hours; tutorials - 30 hours. Hours per week –4,5; including: Lectures –1,5 hours, practical classes - 1 hour, tutorials - 2 hours Number of students - 75
Workload:	Total hours - 120 Including contact hours –37,5, off-class hours –82,5 (tutorials - 30 hours, students' self-study –52,5 hours)
Credit points:	4 ECTS credits
Module admission requirements	
Targeted learning outcomes:	To be aware of: - physical and chemical and technological basis of the process of production of alumina and aluminum and trends . To know: - classification and harakteritiku alumina, aluminum , aluminum ores; - the methods of preparation of ores for the production of alumina and other materials for metallurgical processing; - modern methods of production of alumina and aluminum construction and equipment for their production; - theoretical and technological bases of obtaining alumina and aluminum and calculation methods; - order the production of alumina and aluminum; To be able to: - choose the technological scheme of production of alumina and

	aluminum; - Carry out calculations on processes of production of alumina and aluminum; - design technology to produce alumina and aluminum; - carry out the necessary technological calculations. To have the skills to: - perform certain technological operations the production of alumina and aluminum; - collect, interprete, present, discuss information and formulate arguments to solve problems in the field of metallurgy aluminum, as with specialists and non-specialists in these areas. To be competent: - in the technology of production of alumina and aluminum.
Content of lectures:	Aluminum minerals, ores and their deposits. Properties of alumina. Methods for producing alumina from aluminum raw material. Preparation of alumina from bauxite in the Bayer process. Preparation of alumina from bauxite in the sintering. Combinations of Bayer- sintering. Complex processing of nepheline ores and concentrates on alumina, soda products and cement sintering method. Hydrochemical method of processing nepheline and other aluminosilicate rocks (Sazhina-Ponomariov method). Production of alumina from alunite. The properties of aluminum and its use. The production of carbon electrodes. Production of fluorides. Theoretical Foundations of electrolytic aluminum production. Technology of the electrolysis process. Cell designs. Electrolysis plant. Refining aluminum. Preparation of aluminum and its alloys by thermal methods.
Content of practical classes:	Sheet material in the Bayer process streams. Preparation of alumina from bauxite in the sintering. Payment batch sintering bauxite. Combinations of Bayer-sintering. Calculation of material flows consistent scheme of Bayer-sintering. Material calculation cell. Electric calculation cells. Energy calculation cells. Constructive settlement of the cell.
Study / exam achievements:	Examination
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Худайбергенов Т. Е. Металлургия легких металлов. Учебник - Алматы, 2001. 2. Уткин Н. И. Производство цветных металлов. - 2-е изд. - М. : Интермет Инжиниринг, 2004. - 442 с. 3. Лайнер А.И. Производство глинозема. - М., Алматы, 2001. 4. Ибрагимов А. Т., Будон С. В. Развитие технологии производства глинозема из бокситов Казахстана. - Павлодар : ТОО «Дом печати», 2010. - 304 с.

Elective modules Optional component	
Module title:	**Metallurgy of nonferrous metals3**
Abbreviation, if applicable:	---
Sub-heading, if applicable:	–
Learning events /	Technology of Non-Ferrous Metals Production, Metallurgy of Heavy

Discipline, if aplicable	Non-ferrous and rare Metals
Semester:	7
Module coordinator	Karshigina Z. B.
Lecturer:	senior lecturer
Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Optional component
Teaching format / class hours per week during the semester:	Total contact hours - 90; including: Lectures - 60 hours; Practical classes - 30 hours; tutorials - 45 hours. Hours per week - 9; including: Lectures - 4 hours, practical classes - 2 hours, tutorials - 3 hours Number of students - 75
Workload:	Total hours - 300 Including contact hours - 90, off-class hours - 210 (tutorials - 45 hours, students' self-study - 165 hours)
Credit points:	10 ECTS credits
Module admission requirements	
Targeted learning outcomes:	To be aware of: - physical and chemical and technological basis of the process of non- ferrous metals and alloys. To know: - the methods of preparation of ores and other materials for the metallurgical processing ; - modern methods of production of non-ferrous metals and alloys (aluminum, copper, nickel, zinc, lead, precious and rare metals) and the design of the equipment for their production. To be able to: - choose the technological scheme of production of nonferrous metal depending on harakteritiki raw materials; - carry out calculations on the production processes of nonferrous metals and alloys; To have the skills to: - perform certain technological operations of non-ferrous metals, including heavy non-ferrous and precious metals; - collect, interprete, present, discuss information and formulate arguments to solve problems in the field of metallurgy heavy non- ferrous and precious metals, as with specialists and non-specialists in these areas. To be competent: - in the implementation of certain manufacturing operations produce non-ferrous metals.
Содержание лекции	The theoretical basis of metal production. Raw material for non-ferrous metals. Production of aluminum, copper, nickel, zinc, lead, precious and rare metals.
Содержание практических занятий	Zinc metallurgy. Rational calculation of the concentrate. Calculation of output and Flue-Dust Make. Calculation of output and stub end. Calculation of the required amount of air. The calculation of the exhaust gases. Compilation of material and heat balance of firing.
Результаты учебной деятельности / формы	Examination

итогового контроля	
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Уткин Н.И. Производство цветных металлов. - 2-е изд. - М. : Интермет Инжиниринг, 2004. - 442 с. 2. Худайбергенов Т.Е. Металлургия легких металлов: Учебник - Алматы, 2001. - 235 с. 3. Воскобойников В.Г. Общая металлургия: Учебник для вузов. 6-е изд., перераб. и доп. / В.Г. Воскобойников, В.А. Кудрин, А.М. Якушев. - М. : ИКЦ «Академкнига», 2005. - 768 с. 4. Жукебаева Т.Ж. Металлургия: учебное пособие / Т.Ж. Жукебаева, М.К. Альжанов. - Караганда: КарГТУ, 2002. - 87 с. 5. Муканов Д. Металлургия Казахстана: состояние, инновационный потенциал, тренд развития. - Алматы, 2005. - 290 с.

Elective modules Optional component	
Module title:	**Metallurgy of nonferrous metals4**
Abbreviation, if applicable:	
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Rare Metals Metallurgy
Semester:	7
Module coordinator	Karshigina Z. B.
Lecturer:	senior lecturer
Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Optional component
Teaching format / class hours per week during the semester:	Total contact hours - 45; including: Lectures - 15 hours; Practical classes - 30 hours; tutorials - 30 hours. Hours per week - 5; including: Lectures - 1 hour, practical classes - 2 hours, tutorials - 2 hours Number of students - 75
Workload:	Total hours - 150 Including contact hours - 45, off-class hours - 105 (tutorials - 30 hours, students' self-study - 75 hours)
Credit points:	5 ECTS credits
Module admission requirements	
Targeted learning outcomes:	To be aware of: - the basics of metallurgy of rare metals, methods of complex processing of metallurgical raw materials and waste products . To know: - metals belonging to the group of rare; - classification of rare metals; - the role of rare metals in modern technology; - especially in the technology of rare metals; - the basis of powder metallurgy ; - practical application and sorbitsionnyh extraction processes;

	- physical and chemical basis of specific processes of rare technologies; - specific processes for preparing compact refractory metals; - methods for refining metals in order to obtain its high purity. To be able to: - to select the optimum technology for processing of rare metal materials of the existing ambient conditions; - evaluate the original minerals ferrous metallurgy in terms of its complex processing with the extraction of rare metals; - create a basic flow chart of processing of metallurgical raw materials and waste products; - choose the equipment in accordance with the specific rare metal industry; - select the necessary material equipment; - consider when choosing technology environmental issues. To have the skills to: - select flowsheet metallurgical processing of raw materials and waste products; To be competent: - in matters of metallurgy of rare metals.
Content of lectures:	Refractory rare metals. Wolfram. Molybdenum. Titan. Tantalum and niobium. Zirconium and hafnium. Vanadium. Scattered rare metals. Gallium. Germanium. Rare earth metals. Scandium, yttrium, lanthanum and the lanthanides. Radioactive rare metals. Thorium. Uranus.
Content of practical classes:	Material calculations in the production of wolfram. Material calculations in the production of molybdenum. Calculation of molybdenite concentrate roasting process. Material calculations in the production of zirconium. Material calculations in the production of gallium.
Study / exam achievements:	Examination
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Зеликман А Н. Металлургия редких металлов. Учебник для вузов / А. Н. Зеликман, Б. Г. Коршунов. - М. : Металлургия, 1991. - 432 с. 2. Кобжасов А. К. Пиро- и гидрометаллургические процессы (лабораторный практикум по общему курсу «Металлургия редких металлов») / А. К. Кобжасов, Г. А. Литвиненко. - Алматы: КазНТУ, 2002.

Elective modules **Optional component**	
Module title:	**Designing Metallurgical Objects**
Abbreviation, if applicable:	----
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Bases of design of foundary objects, Economics and Production Management
Semester:	7
Module coordinator	Abdrakhmanov Y. S., Omarova G. T.
Lecturer:	candidate of technical sciences, assistant professor, senior lecturer

Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Optional component
Teaching format / class hours per week during the semester:	Total contact hours - 90; including: Lectures - 45 hours; Practical classes - 45 hours; tutorials - 45 hours. Hours per week - 9; including: Lectures - 3 hours, practical classes - 3 hours, tutorials - 3 hours Number of students - 75
Workload:	Total hours - 300 Including contact hours - 90, off-class hours - 210 (tutorials - 45 hours, students' self-study - 165 hours)
Credit points:	10 ECTS credits
Module admission requirements	
Targeted learning outcomes:	To be aware of: - design issues foundries and economic feasibility of design solutions. To know: - classification of foundries; - principles for the selection of process equipment for the specific production conditions. To be able to: - choose the technological equipment for the foundry specific conditions of production; - calculate the required amount of equipment area; - calculate the cost of production of the foundry; - perform layout drawings foundry; To have the skills to: - collect, interprete, present, discuss information and formulate arguments on the design and feasibility study for construction of foundries, as with specialists and non-specialists in this field. To be competent: - in the implementation of individual project activities and calculations foundries; - in performance layout drawings foundries using CAD .
Content of lectures:	The organizing principle of design work. Designing melting department. Design and form-filling knock-out compartment. Rod design departments. Designing smeseprigotovitelnogo department. Designing termoobrubnogo department. Organization warehousing and support services. Modern features of economic development of metallurgical production. Mineral raw materials and fuel energy resources industry. Productive capital and economic efficiency of its use. Economic efficiency of different forms of production. Forms of organization of social production. Industrial complexes. Organization of production processes in metallurgical enterprises. Organization and regulation of labor in the industry. Development of business plan and intra-planning. Cost estimates. Analysis of production business enterprises of non-ferrous metallurgy. Basis of production economic activity of metallurgical production. Financial plan of the company.
Content of practical classes:	Selection and calculation of the amount of melting equipment compartment. Selection and calculation of the amount of equipment

	form-filling knock-out compartment. Selection and calculation of the amount of equipment rod separation. Selection and calculation of the amount of equipment smeseprigotovitelnogo department. Selection and calculation of the amount of equipment thermoblower department. Mineral and energy resources industry. Productive capital and economic efficiency of its use. Organization of production processes in metallurgical enterprises. Organization and regulation of labor in the industry. Cost estimates.
Study / exam achievements:	Examination + course project
Forms of media:	Power Point presentations, slides, posters
Literature:	1. Абдрахманов Е.С. Проектирование литейных цехов. Учебное пособие для студентов специальности 250340 «Машины и технология литейного производства». - Павлодар, 2005. 2. Шуляк В.С. Проектирование литейных цехов. - М. : МГИУ, 2007. - 92 с. 3. Кипнис Л.С. Проектирование литейных цехов. - Караганда: КарГТУ, 2003. - 83 с. 4. Шокобаев Т.Д. Организация и планирование промышленных предприятий: Учебное пособие.- Алматы: КазНТУ, 2001г., 1-128с

Elective modules Optional component	
Module title:	**Theory and modelling of foundry engineering**
Abbreviation, if applicable:	---
Sub-heading, if applicable:	---
Learning events / Discipline, if aplicable	Foundry Processes Theory and Modeling, Chrystallography and Mineralogy
Semester:	5
Module coordinator	Suyundilov M. M., Tussupbekova M. Z.
Lecturer:	candidate of technical sciences, assistant professor, senior lecturer
Language:	Kazakh, Russian
Classification within the curriculum:	Baccalaureate in 5B070900 - «Metallurgy» Optional component
Teaching format / class hours per week during the semester:	Total contact hours - 105; including: Lectures - 45 hours; Practical classes - 30 hours; laboratory classes - 30 hours; tutorials - 60 hours. Hours per week - 10; including: Lectures - 3 hours, practical classes - 2 hours, laboratory classes - 2 hours; tutorials - 3 hours Number of students - 75
Workload:	Total hours - 360 Including contact hours - 105, off-class hours - 255 (tutorials - 60 hours, students' self-study - 195 hours)
Credit points:	12 ECTS credits
Module admission requirements	
Targeted learning outcomes:	To be aware of : - the classification of crystals , minerals, ores and base metals;

	- research methods crystals, minerals and ores; - the theoretical foundations of technological processes for castings; - modern achievements and prospects of the development of computer simulation of casting processes; To know: - basic methods for studying the structure and properties of crystals and minerals; - distinctive features of various crystals and minerals; - minerals and rocks, which are of great practical importance for the industry; - properties of metals and alloys; - basic theory of crystallization and solidification of metals and alloys. To be able to: - distinguish crystals, and minerals in their characteristics and properties; - analysis of the processes occurring during heating and cooling of metals and alloys by the state diagram; - determine the proportion of phases and their chemical composition on the state diagram; - calculate the charge for melting alloys given chemical composition; - determine the time of solidification of castings; To have the skills to: - implement the elements of metallographic studies of minerals, metals and alloys; - collect, interprete, present, discuss information and formulate arguments to solve problems in the field of crystallography, mineralogy, theory of foundry processes, as with specialists and nonspecialists in these areas. To be competent: - in matters of crystallograph, mineralogy, and the theory of casting processes; - in the investigation of crystals, minerals and metals.
Lecture content	Basics of crystallography. Basics of mineralogy. Methods of crystals and minerals study. Basics of descriptive mineralogy. Basics of petrography. Industrial types of deposits, examples of ores and minerals used in metallurgy. Genesis of combustible minerals, oil and gas. Basics of metallography. Properties of metals and alloys. The interaction of metal melts with gases and refractory materials. Basics of metal melting. Metallic melts as liquids. Filling of the casting mold by the melt. The interaction of the melt with the casting mold material. Crystallization of metallic melts. Solidification and cooling of castings. Casting properties of alloys.
Practical classes content	Analysis of transformations in metals and alloys during heating and cooling dew to Fe - Fe3C phase equilibrium diagram. Calculating of the number of charge materials for melting metal alloys of the predetermined chemical composition in foundry furnaces. Investigation of the casting work profits. Specification of the elements of crystal models symmetry, types of symmetry, categories, syngony, symmetry classes. Specification of crystal polyhedra forms. Peculiarities and physical properties of minerals crystal morphology. Soldering torch measurement of minerals. Basic qualitative chemical measurements of

	minerals. External characteristics measurements of subsurface rocks. Petrographic analysis of refractory material.
Study/Exam achievements	Examination
Forms of media	Power Point Presentation, slides, posters
Literature	1. Пикунов М.В. Плавка металлов, кристаллизация сплавов, затвердевание отливок: Учебное пособие. - М. : МИСиС, 2005. - 416 с. 2. Васильев В.А. Физико-химические основы литейного производства. - М. : Интермет инжиниринг, 2001. - 336 с. 3. Инкин С.В., Мазалов И.Ф., Пикунов М.В., Тен Э.Б., Шуголь Б.М. Инженерные расчеты по теории литейных процессов. Под ред. Шуголя Б.М. Алма-Ата: Рауан, 1991. - 224 с. 4. Батти Х., Принг А. Минералогия для студентов: Пер. с англ. - М.: Мир, 2001. - 429 с. 5. Кленов А.С. Занимательная минералогическая энциклопедия. - М.: Педагогика-Пресс, 2000. - 224 с.: ил.

Elective module Optional component	
Module title:	**Foundry technology 1**
Abbreviation, if applicable:	
Sub-heading, if applicable:	---
Disciplines	Technology of ferrous metals production, Foundry of iron and steel
Semester:	6
Module coordinator:	Ibrayeva O.T., Bykov P.O.
Associate professor/lecturer	Candidate of technical science, associate professor
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor's programme) Optional component
Teaching format / class hours per week during the semester:	Total hours - 75; Including lectures –37,5 hours; Practical classes –37,5 hours; tutorials - 45 hours. Hours per week - 8; including lectures –2,5 hours, practical classes –2,5 hours, tutorials - 3 hours Students number -75.
Workload:	Total hours - 240 Including contact hours - 75, off-class hours - 165; (Tutorials - 45 hours, Students' self study - 125 hours)
Credit points:	8 ECTS
Module admission requirements	
Targeted learning outcomes:	to be aware of: - physico-chemical and technological bases of ferrous metals production technology, iron and steel casting and development tendencies

	to know: - methods of preparation of iron ore and other materials for metallurgical processing; - modern methods of production of iron, steel and ferroalloys and design of the equipment for their production; - methods of producing ingots and continuously cast billets at the metallurgical plants; - methods of making iron castings and steel, their area of application; - theoretical foundations of iron and steel casting; - stages of the production of iron and steel castings, their essence, equipment and processes for their implementation to be able to: - choose technological scheme of iron and steel of specific brands production; - perform calculations on the processes of production of iron, steel, ferro-alloys; -design a technology for making of iron and steel castings; - perform the necessary technological calculations. acquire practical skills of: - performing separate technological operations of iron and steel production; - performing individual process steps of castings production; -gathering, interpreting, presenting, discussing information and formulating arguments in solving the problems of metallurgy of iron, steel and ferroalloys, foundry, both with specialists and non-specialists in these areas. to be competent: - in the implementation of certain technological operations of iron, steel and ferroalloys obtaining, production of iron and steel castings; - in technological matters of of iron, steel and ferroalloys production and iron and steel castings.
Lecture content	The theoretical basis of the production of metals. Physico - chemical bases of burning. Processes of formation and dissociation of sulfides and oxides, chlorides and fluorides. Theoretical bases of recovery processes. Theoretical bases of oxidizing smelting. The raw materials for steel making. Production of cast iron. Steel production. Production of ferroalloys. Classification of iron and steel for castings. Peculiarities of designing technology of iron castings and steel. Smelting of iron and steel foundries. Characteristic of manufacturing methods of iron castings and steel. Production of iron and steel in sand molds. Peculiarities of technology for casting methods.
Practical classes content	Calculation of material and thermal balances the recovery process. The design and calculation of the profile of the blast furnace. Calculation of structural dimensions of basic oxygen furnace. Calculations of the charge for the smelting of ferroalloys. Analysis of the technological design of cast parts. Justification of the manufacturing method of the casting. Analysis of variants of casting mold. Design of model-snap flask. Development of drawing casting. The choice of materials for the manufacture of molds. Appointment and choice of technological regimes of making a mold. Choice and

	justification of the method of melting. Development and calculation of gating systems and modes casting. Calculation of the length and duration of the solidification of the casting in the form of extracts under cooling. Appointment of shakeout of flasks modes, rods removing, cleaning, thermal processing and quality control of castings.
Study/exam achievements	Exam + course paper
Forms of media	Power Point Presentation, slides, posters
Literature	1. Воскобойников В.Г. Общая металлургия: Учебник для вузов. 6-е изд., перераб. и доп. / В.Г. Воскобойников, В.А. Кудрин, А.М. Якушев. - М. : ИКЦ «Академкнига», 2005. - 768 с. 2. Жукебаева Т.Ж. Металлургия: учебное пособие / Т.Ж. Жукебаева, М.К. Альжанов. - Караганда: КарГТУ, 2002. - 87 с. 3. Ибраева О.Т. Теория и технология выплавки стали в кислородных конвертерах и мартеновских печах. Методическое указание / О.Т. Ибраева, И.К. Ибраев, Е.Б. Сулеймен. - Павлодар: ПГУ им. С. Торайгырова, 2005. - 40 с. 4. Лякишев Н.П. Металлургия хрома / Н.П. Лякишев, М.И. Гасик. - М. : ЭЛИЗ. - 1999. - 582 с. 5. Толымбеков М.Ж., Н^рымгалиев АД. Болат жэне феррокорытпалар электрометаллургиясы бойынша технологиялык есептеулер. Оку к^ралы - Алматы: ГБО «Еылым», 2006. - 262 с. 6. Тлеугабулов С.М. Теория металлургических процессов. Учебное пособие для вузов. - Алматы: издание РИК по учебной и методической литературе, 2007. - 351 с. 7. Пикунов М.В. Плавка металлов, кристаллизация сплавов, затвердевание отливок. - М. : МИСиС, 2005. - 416 с. 8. Чернышев Е.А., Паньшин В.И. Литейные технологии. Основы проектирования в примерах и задачах. - М. : Машиностроение, 2011.

Elective module Optional component	
Module title:	**Foundry Equipment**
Abbreviation, if applicable:	----
Sub-heading, if applicable:	----
Disciplines	Foundry Equipment
Semester:	6
Module coordinator:	Abdrakhmanov Ye.S.
Associate professor/lecturer	associate professor
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor’s programme) Optional component
Teaching format / class hours per week during the semester:	Total hours –37,5; including: Lectures –22,5 hours; Practical classes - 15 hours; tutorials - 30 hours. Hours per week –4,5; including: Lectures – 1,5 hours, practical classes - 1 hour , tutorials - 2 hours

	Students number - 75.
Workload:	Total hours - 120, including: contact hours –37,5, off-classes hours – 82,5; (tutorials - 30 hours, students' self-study –52,5 hours)
Credit points:	4 ECTS
Module admission requirements	
Targeted learning outcomes:	to be aware of: - the design and operation of the foundry machinery; development of of foundry machinery design to know: - modern techniques of mechanization and automation process of obtaining a single casting sand-clay forms perpetrated by the technological machines; theory of these processes, the operating principle, workflows, design, the calculation of machines and their components, design of these machines and automatic casting lines. to be able to: Efficiently exploit the manufacturing equipment, to solve specific problems by choosing, improving and implementing of the equipment, including automatic, to make technical assignments for the casting lines designing. acquire practical skills of: : - performing separate technological calculations of foundry; - gathering, interpreting, presenting, discussing information and formulating arguments in solving the problems of foundry machinery both with specialists and non-specialists in these areas. to be competent: - in construction and operation of foundry machinery; in tendencies of the foundry machinery construction development.
Lecture content	Molding and core equipment. Operations performed by molding and core machines. Storage and transportation of molding materials. Equipment for the preparation of molding and core mixtures. Technological equipment of smelting and priming chambers. Equipment to mold knockout. Separation of the molding from the mixture. Installations of the core breaker. Core vibrator. Installation of the casting cleaning machine. Modern automatic molding lines.
Practical classes content	Calculation of the pneumatic shaking. Calculation of the pneumatic press molding unit. Calculation of the pneumatic billet caster. Calculation of the lever-type billet caster. Calculation of the pneumatic shaking billet caster. Calculation of the core sand shooter. Calculation of the impeller head of sand-throwing machine. Calculation of the pneumatic transporter plant. Calculation of the handling means. Calculation of the star wheel extractor. Calculation of the pneumatic drying plant. Calculation of the alligator. Calculation of the crushing mill. Calculation of the centrifugal mill. Calculation of the vibrating grizzly. Calculation of the revolving screen. Calculation of the pneumatic regenerator. Calculation of the planet-gear regenerator. Calculation of the roller stirrer. Calculation of the centrifugal-type stirrer. Calculation of the paddler blade-type mixture of continuous- motion. Calculation of the drum mixer. Calculation of the inertial

	knockout grid. Calculation of the eccentric knockout grid.
Study/exam achievements	Exam
Forms of media	Power Point Presentation, slides, posters
Literature	1. Матвеенко И.В., Тарский В.Л. Оборудование литейных цехов. 2-е изд., перераб. и доп. М.: Машиностроение, 2005. - 400 с. 2. Чернышев Е.А., Паньшин В.И. Литейные технологии. Основы проектирования в примерах и задачах. - М. : Машиностроение, 2011. 3. Абдрахманов Е.С. Проектирование литейных цехов. Учебное пособие для студентов специальности 250340 «Машины и технология литейного производства». - Павлодар, 2005.

Elective module Optional component	
Module title:	**Technology of foundry processes 3**
Abbreviation, if applicable:	----
Sub-heading, if applicable:	---
Disciplines	Technology of production of non-ferrous metals, continuous casting of metals.
Semester:	7
Module coordinator:	Ibrayeva O.T., Bykov P.O
Associate professor/lecturer	associate professor, candidate of technical science
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor's programme) Optional component
Teaching format / class hours per week during the semester:	Total hours - 90; including: Lectures - 60 hours; Practical classes - 30 hours; tutorials - 45 hours. Hours per week- 9; including: Lectures - 4 hours, practical classes - 2 hours , tutorials - 3 hours Students number - 75 чел.
Workload:	Total hours - 300, including: contact hours - 90, off-classes - 210; (tutorials - 45 hours, students' self-study - 165 hours)
Credit points:	10 ECTS
Module admission requirements	
Targeted learning outcomes:	to be aware of: -physico-chemical and technological bases of the processes of production of non-ferrous metals and alloys; production of ingots and continuously cast billets.to know: -methods of preparation of ores and other materials for metallurgical processing; -modern methods of production of non-ferrous metals and alloys (aluminum, copper, nickel, zinc, lead, precious and rare metals) and the design of the equipment for their production;

	-methods of production of ingots and continuously cast billets in steel mills and equipment's construction; - theoretical foundations of casting processes; -classification of cast billets defects, their causes and methods of its detection. to be able to: -select a flowsheet-ferrous metal production, dew to the characteristics of raw materials; - perform calculations on the production processes of nonferrous metals and alloys; -design the production technology of continuously cast billets; - make necessary technological calculations. acquire practical skills of: - performing separate technological operations of non-ferrous metals; -identify defects of continuously cast billets; -gathering, interpreting, presenting, discussing information and formulating arguments in solving the problems of non-ferrous metallurgy and continuous casting both with specialists and nonspecialists in these areas. to be competent: - in the implementation of certain manufacturing operations of nonferrous metals obtaining, billets manufacturing.
Lecture content	Theoretical bases of the production of metals process. Raw material for non-ferrous metals. Production of aluminum, copper, nickel, zinc, lead, precious and rare metals. Classification of methods of casting, advantages and disadvantages. Characteristics of methods of continuous casting. The design of the equipment and its exploitation.
Practical classes content	Zinc metallurgy. Calculation of rational composition of the concentrate. Calculation of composition and dust output. Calculation of composition and cinder output. Calculation of the required amount of air. Calculation of the exhaust gases. Drawing up the material and heat balance of roasting. The study of the design of continuous casting machine and its preparation for use. The study of technological modes of continuous casting to obtain billets of square section. The study of technological modes of continuous casting to obtain billets of circular section. Metrological provision of continuous casting processes and automation. The study of the quality of continuously cast billets.
Study/exam achievements	Exam
Forms of media	Power Point Presentation, slides, posters
Literature	1. Уткин Н.И. Производство цветных металлов. - 2-е изд. - М. : Интермет Инжиниринг, 2004. - 442 с. 2. Худайбергенов Т.Е. Металлургия легких металлов: Учебник - Алматы, 2001. - 235 с. 3. Воскобойников В.Г. Общая металлургия: Учебник для вузов. 6-е изд., перераб. и доп. / В.Г. Воскобойников, В.А. Кудрин, А.М. Якушев. - М. : ИКЦ «Академкнига», 2005. - 768 с. 4. Жукебаева Т.Ж. Металлургия: учебное пособие / Т.Ж. Жукебаева, М.К. Альжанов. - Караганда: КарГТУ, 2002. - 87 с. 5. Муканов Д. Металлургия Казахстана: состояние, инновационный потенциал, тренд развития. - Алматы, 2005. - 290

с.
6. Газалиев А. М. Технологические и физико-химические процессы литейного производства : учебник. - Алматы : Бшм, 2010. - 698 с.
7. Бровман М. Я. Непрерывная разливка металлов. - М. : Экомет, 2007. - 484 с.
8. Напалков В. И., Черепок Г. В., Махов С. В., Черновол Ю. М. Непрерывное литье алюминиевых сплавов: справочник. - М. : Интермет инжиниринг, 2005. - 512 с.
9. Разливка и кристаллизация : методические указания к практическим занятиям / сост. Быков П.О., Штиль И. Э. - Павлодар : ПГУ им. С. Торайгырова, 2007. - 57 с.

Elective module Optional component	
Module title:	**Foundry technology 4**
Abbreviation, if applicable:	
Sub-heading, if applicable:	---
Disciplines	Foundry of nonferrous metal alloys
Semester:	7
Module coordinator:	Bykov P.O.
Associate professor/lecturer	associate professor, candidate of technical science
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor's programme) Optional component
Teaching format / class hours per week during the semester:	Total hours - 45; including: Lectures - 15 hours; Practical classes - 30 hours; tutorials - 30 hours. Hours per week- 5; including: Lecture - 1 hour , practical classes - 2 hours, tutorials - 2 hours Students number - 75.
Workload:	Total hours - 150, including: contact hours - 45, off-class hours - 105; (tutorials - 30 hours, students' self-study - 75 hours)
Credit points:	5 ECTS
Module admission requirements	
Targeted learning outcomes:	to be aware of: -physico-chemical and technological bases of the processes of production of castings of non-ferrous alloys; -methods of the production of castings of non-ferrous metals and their scope; -theoretical foundations of nonferrous metals and alloys casting; -the stages of non-ferrous metals and alloys castings production, their essence, equipment and processes for their implementation. to be able to: - design the technology of non-ferrous alloys castings production;

	- carry out the necessary technological calculations. to acquire practical skills of: - making separate technological operations of castings production; - gathering, interpreting, presenting, discussing information and formulating arguments in solving the problems of foundry with both specialists and non-specialists in these areas. to be competent: -in the implementation of the individual process steps for making castings of non-ferrous alloys; - in the technology for making castings of non-ferrous alloys.
Lecture content	Classification of non-ferrous metals for the manufacture of castings. Classification of non-ferrous metals for the manufacture of castings. Features of designing of the technology for making castings of non- ferrous alloys. Smelting of nonferrous metals and alloys. Characteristic of methods for making castings of non-ferrous alloys. Casting of non- ferrous alloys in sand molds. Peculiarities of castings making technology using special casting methods.
Practical classes content	Analysis of the technological design of cast parts. Rationale for casting method manufacturing. The analysis of the variants of molding casting. The design of the pattern equipment. The design of the casting drawing. The selection of materials for mold making. Function and choice of technological regimes for mold making. The choice and rationale for the method of melting. The design and calculation of the pouring gate system and the regimes of castings. Calculation of the length and duration of the solidification of the casting in the form of extracts under cooling. Shakeout of flasks regimes assignment, rods removing, cleaning, thermal processing and quality control of castings.
Study/exam achievements	Exam
Forms of media	Power Point Presentation, slides, posters
Literature	1. Пикунов М.В. Плавка металлов, кристаллизация сплавов, затвердевание отливок. - М. : МИСиС, 2005. - 416 с. 2. Чернышев Е.А., Паньшин В.И. Литейные технологии. Основы проектирования в примерах и задачах. - М. : Машиностроение, 2011. 3. Быков П.О. Литейное производство. Методические указания к лабораторным занятиям. - Павлодар : ПГУ им. С. Торайгырова, 2005. - 34 с.

Elective module Optional component	
Module title:	**Design of Metallurgical Objects**
Abbreviation, if applicable:	---
Sub-heading, if applicable:	--
Disciplines	Bases of design of rolling and pipe workshops, Economics and production management
Semester:	7
Module coordinator:	Bogomolov A.V., Sembayev N.S.
Associate professor/lecturer	associate professor, candidate of technical science

Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor's programme) Optional component
Teaching format / class hours per week during the semester:	Total hours - 90; including: Lectures - 45 hours; Practical classes - 45 hours; tutorials - 45 hours. Hours per week - 9; including: Lectures - 3 hours, practical classes - 3 hours , tutorials - 3 hours Students' number - 75
Workload:	Total hours -300, including: contact hours - 90, off-classes - 210; (tutorials - 45 hours, students' self-study - 165 hours)
Credit points:	10 ECTS
Module admission requirements	
Targeted learning outcomes:	To be aware of: designing issues of rolling and pipe shops and economic justification of project decisions. to know: -classification of rolling and pipe shops; - principles for selecting of technological equipment for the specific production conditions. to be able to: -choose the technical equipment for specific conditions of production; - calculate the cost of pipe rolling shops production and; - perform layout drawings of rolling and pipe shops; to acquire practical skills of: -gathering, interpreting, presenting, discussing information and formulating arguments in solving the problems of design and economic substantiation of construction of rolling and pipe plants with both specialists and non-specialists in these areas. to be competent: -in the implementation of individual project operations and transactions of rolling and pipe shops; -perform rolling and pipe shops layout drawings using CAD.
Lecture content	Introduction. The equipment of shops on pressure metal treatment. The equipment of shops of special purpose. Units combined for etching and bands covering. Units combined for heat treating and improving the quality of hire. General information, technological fundamentals and design principles of metallurgical plants. The choice and calculation of the basic and auxiliary equipment and heating devices. The design decision of the cost of the construction project. The effectiveness of investment and economic assessment of the design decisions. Modern economic development peculiarities of metallurgical production. Mineral - raw materials and fuel - energy resources of metallurgy. Productive capital and economic efficiency of its use. Economic efficiency of different forms of production. The forms of social production organization. Industrial complexes. The organization of production processes at metallurgical enterprises. The organization and labor rate setting at metallurgical enterprises. The development of business - plan and intercompany planning. Estimatев charges. The

	analysis of industrial and economical activity of enterprise of nonferrous metallurgy. The basis of accounting of industrial and economical activity of the metallurgical industry. Business financial plan.
Practical classes content	Reading of modern metallurgical plants drawing. The productivity of the thermal processing equipment at metallurgical plants. Calculation of technical and economic parameters of the plant. Mineral raw and fuel and power resources of the metallurgical industry. Productive capital and economic efficiency of its use. The organization of production processes at metallurgical enterprises. The organization and labor rate setting at metallurgical enterprises.Estimatев charges.
Study/exam achievements	Exam + course paper
Forms of media	Power Point Presentation, slides, posters
Literature	1. Авдеев В.А. и др. Основы проектирования металлургических заводов: Справочное издание / В.А. Авдеев, В.М. Друян, Б.И. Кудрин. - М.: Интермет Инжиниринг, 2002. - 464 с. 2. Шокобаев Т.Д. Организация и планирование промышленных предприятий: Учебное пособие.- Алматы: КазНТУ, 2001г., 1-128 с. 3. Омарова Г. Т. Методические указания к выполнению курсовой работы по курсу «Организация и планирование производства» и дипломному проектированию для металлургических специальностей. - Павлодар: ПГУ им. С. Торайгырова, 2004. - 22 с.

Elective module Optional component	
Module title:	**The rolling theory**
Abbreviation, if applicable:	–
Sub-heading, if applicable:	——
Disciplines	Crystallography and Mineralogy, the rolling theory
Semester:	5
Module coordinator:	Smajlova N.T., Tussupbekova M.Zh.
Associate professor/lecturer	Doctor of technical sciences, Senior lecturer
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor’s programme) Optional component
Teaching format / class hours per week during the semester:	Total contact hours - 105; including Lectures - 45 hours; Practical - 30 hours; practice - 30 hours;Laboratory classes -30 hours, Tutorial - 60 hours. C lasses per week- 11; including Lectures - 3 hours, practice - 2 hours, Laboratory classes-2 hours tutorials - 4 hours; Number of students - 75.
Workload:	Total contact hours - 360 Contact hours - 105, off-class hours - 255; (tutorial - 60 hours, students’ self-study - 195 hours)

Credit points:	12 ECTS
Module admission requirements	
Targeted learning outcomes:	To be aware of: -the classification of crystals, minerals and ores of basic metals; -methods of crystals, minerals and ores research; - the modern theory of the rolling, features of the stress-strain state of metal, methods for determining the contact stresses; to know: - basic methods of studying the structure and properties of crystals and minerals; -distinctive features of various crystals and minerals; - fundamental laws in the theory of rolling. to be able to: - distinguish crystals and minerals according to their properties and characteristics; - determine the stress-strain state of the metal, to use methods for determining the contact stresses; to conduct the necessary technological calculations. to acquire practical skills of: -implementing of elements of metallographic studies of minerals, metals and alloys; -gathering, interpreting, presenting, discussing information and formulating arguments in solving the problems of design and economic substantiation of construction of crystallography, mineralogy, theory rolling with both specialists and non-specialists in these areas. to be competent: -in crystallography and mineralogy matters; -in matters of theory rolling.
Lecture content	Fundamentals of Crystallography. Fundamentals of mineralogy. Methods of study of crystals and minerals. Fundamentals of descriptive mineralogy. Basics petrography. Industrial types of deposits, examples of ores and minerals used in metallurgy. Genesis of fossil fuels, oil and gas. Definition and classification of rolling processes. The geometry of the deformation zone. Stress-strain state. Friction. Rolling force. Torques, its work and power rolling. Complicated cases of rolling.
Practical classes content	Defining elements of symmetry crystal models, types of symmetry, category, symmetry, symmetry classes. Defining forms of crystalline polyhedra. Peculiarities in crystal morphology of minerals and their physical properties. Defining minerals by means of solder tube (dry analysis). Defining minerals by means of simple qualitative chemical reactions. Defining rocks by their external characteristics. Petrographic analysis of refractory materials. Defining the length of the deformation zone. Experimental defining of the timing. Theoretical defining of the timing. Defining the stress state of the strip by constructing the slip lines. Differential equation of equilibrium of longitudinal forces.
Study/exam achievements	Exam + course paper
Forms of media	Power Point Presentation, slides, posters
Literature	1. Батти Х., Принг А. Минералогия для студентов: Пер. с англ. - М.: Мир, 2001. - 429 с. 2. Кленов А.С. Занимательная минералогическая энциклопедия. -

М.: Педагогика-Пресс, 2000. - 224 с.: ил.
3. Грудев А.П. Теория прокатки. Изд. 2-е, перераб. и доп. - М.: Интермет Инжиниринг, 2001.-280 с.:ил.

Elective module Optional component	
Module title:	**Rolling production 1**
Abbreviation, if applicable:	---
Sub-heading, if applicable:	---
Disciplines	Rolling production technology, heat treatment of rolled pipes
Semester:	6
Module coordinator:	Bogomolov A.V., Zhakupov A.N.
Associate professor/lecturer	candidate of technical science, associate professor; senior lecturer
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor's programme) Optional component
Teaching format / class hours per week during the semester:	Total hours - 75; including Lectures –37,5 hours; Practical –37,5 hours; tutorial - 45 hours. Classes per week- 8; including Lectures –2,5 hours, practice – 2,5 hours , tutorials - 3 hours; Number of students - 75.
Workload:	Total hours - 240 Contact hours - 75, off-class hours - 165; (tutorial - 45 hours, students' self-study - 125 hours)
Credit points:	8 ECTS
Module admission requirements	
Targeted learning outcomes:	to be aware of: -theoretical foundations of rolling processes. -methods of long steel, flat products and pipes producing at the metallurgical plants and equipment design; - the ways of thermal treatment of mill products and pipes; - classification of mill products and pipes defects, their causes and methods of its detecting. to be able to: -choose technological scheme of rolled metal production; -choose technological scheme and modes of rolled products and pipes thermal treatment; - carry out the necessary technological calculations. to acquire practical skills of: - performing certain technological operations of pipes and thermal treatment manufacturing; - detecting defects of pipes; - gathering, interpreting, presenting, discussing information and formulating arguments in solving the problems of rolled metal production and thermal processing with both specialists and nonspecialists in these areas.

	to be competent: - in implementation of certain technological operations of pipe manufacturing.
Lecture content	Basics of the rolling process, and the main types of of rolled equipment production. Assortment of profiles, rolling material and scheme of production. Basic provisions of calibration of simple profiles roll. Technological process of simple rolled profiles production. Equipment and manufacturing process for the production of the semifinished steel. Production of lage, medium and bar steel rolled stock. Characteristics of mill products quality and its defects. Quality management and mill products shaping. Common questions of sheet steel production. The raw materials and their preparation for the hot mill of steel sheet. Technological processes of cold rolled steel sheet production. Production of pipes and specialized profiles.
Practical classes content	Analysis of characteristics of continuously cast billets for production of rolled products and their preparation for rolling. Analysis of the heating technology of continuous cast steel billets for rolling. Analysis of the long products (rebar, wire).production technology. Analysis of the specialized types of rolling (grinding balls) technology. The brief characteristic of seamless pipes production technology. Metrological provision of technological processes of rolling production and its automatization. Analysis of the quality of the long products.
Study/exam achievements	Exam + course paper
Forms of media:	Power Point Presentation, slides, posters
Literature	1. Данченко Н. С. Технология трубного производства - М. : Интермет Инжиниринг, 2005. - 478 с. 2. Шевакин Ю.Ф. Производство труб - М.: Интермет Инжиниринг, 2005. 3. Канаев А.Т., Токтанаева А.А., Примаков М.Е. Основы квалиметрии. Учебник. - Астана, 2007. - 308 с. 4. Мазур И.И. Управление качеством. Учеб. пособие. - М. : Омега- Л, 2008 - 399 с.

Elective module Optional component	
Module title:	**Rolling production 2**
Abbreviation, if applicable:	–
Subheading (if applicable)	----
Disciplines	Equipment of Metal forming
Semester:	6
Module coordinator:	Bogomolov A.V., Abcalyamova D.R
Associate professor/lecturer	candidate of technical science, associate professor; senior lecturer
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor's programme) Optional component
Teaching format / class hours per week	Total hours –37,5; including: Lectures –22,5 hours;

during the semester:	Practical classes - 15 hours; tutorial - 30 hours. lasses per week- 4,5; including Lectures – 1,5 hours, practice - 1 hour, tutorial - 2 hours. Number of students - 75.
Workload:	Total hours - 120 Contact hours –37,5, off-class hours – 82,5; (tutorial - 30 hours, students' self-study –52,5 hours)
Credit points:	4 ECTS
Module admission requirements	
Targeted learning outcomes:	to be aware of: - the design and operation of pipe rolling shops equipment; tendencies of the development of equipment construction of rental and tube shops; to know: modern methods of mechanization and automation of the production process of rolled pipes, operating principle, work processes, its design, calculation of the equipment and its components. to be able to: exploit the manufacturing equipment, to undertake specific tasks by choosing, improving and implementing of equipment including automatic equipment, to make technical assignments for rolling mills design. to acquire practical skills of: - performing certain technological calculations of pipe rolling equipment shops; - gathering, interpreting, presenting, discussing information and formulating arguments in solving the problems of construction of the equipment of rolling and pipe shops with both specialists and nonspecialists in these areas. to be competent: - in design and operation of the equipment of pipe and rolling shops; tendencies of construction development.
Lecture content	Classification of rolling mills and their working stands. Types and structure of the equipment of the main lines of the rolling mills. The main drive of the rolling mills. The equipment for rolling transportation. The equipment for supplying metal to roll stands of working rollers. The equipment for rolling cutting and straightening. The equipment of pipe shops. The piercing mill. The automatic mills. Continuous tube-rolling mills. Pilgrim mills. The rolling mills. Pressure reducing and sizing mill. Pressure reducing and sizing mills. Units for cold rolling, drawing and extrusion of pipes. Aggregates for the production of welded pipes. Rolling mills for special purposes. The equipment of drawing plants wire. Aggregates of etching, coating, heat treatment, packing and strapping of the hire. Prospects for the development of metal forming equipment.
Practical classes content	The equipment types and the main lines of the rolling mills. Working stands and its drive. Equipment for the transportation rolling. The equipment for metal supplying to the working roll stands. Machines for rolling cutting. Aggregates of heat treatment and accelerated cooling of rolling. Rolling mills and machines for the production of seamless pipes.
Study/exam achievements	Exam
Forms of media	Power Point Presentation, slides, posters

Literature	1. Машиностроение. Энциклопедия в 40 томах. Том IV-5 Машины и агрегаты металлургического производства. - М.: Машиностроение, 2004 - 912 с. 2. Технология трубного производства: Учебник для вузов/ Данченко В.Н., Коликов А.П.,. Романцев Б.А, Самусев С.В. - М.: Интермет Инжиниринг, 2002. - 640 с.

Elective module Optional component	
Module title:	**Rolling production 3**
Abbreviation, if applicable:	
Sub-heading, if applicable:	---
Disciplines	Pipe production technology, Quality of the product and qualimetry.
Semester:	7
Module coordinator:	Serzhanov R.I., Yksan Zh.M
Associate professor/lecturer	candidate of technical science, professor
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor's programme) Optional component
Teaching format / class hours per week during the semester:	Total hours - 90; including: Lectures - 60 hours; Practical - 30 hours; tutorials - 45 hours. Hours per week - 9; including Lectures - 4 hours, practice - 2 hours , tutorials - 3 hours Number of students - 75.
Workload:	Total hours - 300 Contact hours - 90, off-class hours - 210 hours; (tutorials - 45 hours, students' self-study - 165 hours)
Credit points:	10 ECTS
Module admission requirements	
Targeted learning outcomes:	to be aware of: theoretical foundations of rolling processes; methods of producing pipes in steel mills and construction of equipment; classification of pipes defects, their causes and methods of detection; methods of rolling pipes quality control; to be able to: choose the technological scheme of pipes production; choose the means of rolling pipes quality control; carry out the necessary technological calculations. to be able to: -perform separate processing operations of pipes production; - detect tubes defects; - gathering, interpreting, presenting, discussing information and formulating arguments in solving the problems of pipe production both with specialists and non-specialists in these areas. to be competent: - in the implementation of the individual technological operations of

	pipes manufacturing.
Lecture content	Seamless and welded pipes. The history of tubular products usage. Section One. Seamless pipe. Chapter 1. General issues of seamless steel tubes production. Pipe production technology in aggregates with automatic mill. Production of pipes in aggregates with continuous mill. Production of pipes in aggregates with pilgrim camp. Firmware of pipes and billets on the presses. Technology of welded steel pipes production. General questions of welded pipes. Technological preparation of production of welded pipes. Indicators of the quality of industrial products. Procedure for selection of consumer properties and quality indicators. Types of quality control. Assessment of the level of product quality. Key technologies of qualimetry. Quality assurance methods. Differential method for assessing the level of product quality. Assessment of the different conditions of the products. Assessment of the diverse products quality level. Determination of quality indices for different levels of industry management.
Practical classes content	The main technological parameters and methods for their determination. Calculations tables and rolling mills settings. Calibration of process tool. Method of the table of rolling and deformation modes calculation. Calculation of the instrument calibration and its rolling speeding. Manufacture of welded pipes. A continuous process of tubes and profiles forming. Options of radial, oval and double radial forming rolls calibration. Procedure for selection of consumer properties and quality indicators. Assessment of the level of quality expertise and differential methods. Assessment of the level of quality of diverse products. Defining quality indices of heterogeneous products.
Study/exam achievements	Exam
Forms of media	Power Point Presentation, slides, posters
Literature	1. Данченко Н. С. Технология трубного производства - М. : Интермет Инжиниринг, 2005. - 478 с. 2. Шевакин Ю.Ф. Производство труб - М.: Интермет Инжиниринг, 2005. 3. Канаев А.Т., Токтанаева А.А., Примаков М.Е. Основы квалиметрии. Учебник. - Астана, 2007. - 308 с. 4. Мазур И.И. Управление качеством. Учеб. пособие. - М. : Омега- Л, 2008 - 399 с.

Elective module Optional component	
Module title:	**Rolling production 4**
Abbreviation, if applicable:	–
Sub-heading, if applicable:	—
Disciplines	Corrosion and Protection of Metals
Semester:	7
Module coordinator:	Artamonov V.P., Sembayev N.S
Associate professor/lecturer	professor, candidate of technical science

Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor's programme) Optional component
Teaching format / class hours per week during the semester:	Total hours - 45; including Lectures - 15 hours; Practical - 30 hours; tutorials - 30 hours. Hours per week- 5; including Lecture - 1 hour , практика - 2 hours, tutorials - 2 hours Number of students - 75.
Workload:	Total hours hours- 150 Contact hours - 45, off-class hours - 105; (tutorials - 30 hours, students' self-study - 75 hours)
Credit points:	5 ECTS
Module admission requirements	
Targeted learning outcomes:	To be aware of: the basics of the theory of chemical and electrochemical processes of interaction of metals with a corrosive environment used in engineering methods of metals protection from corrosion. To know: basic terms and definitions in accordance with GOST 527268 "Corrosion of metals. The terms ", the reasons of metal fracture under the action of a corrosive environment, natural and artificial (industrial) corrosion protection, chemical and electrochemical processes of the interaction of metals with a corrosive environment, the theory and methods of protecting metals from corrosion. Be able to: classify corrosion processes in accordance with GOST 5272-68, conduct corrosion tests, including determining the corrosion resistance of metal in certain corrosive environments. To be able to: select and justify the various options for protecting metal products from corrosion. To be competent: in metal products corrosion protection.
Lecture content	General Terms. Chemical corrosion. Electrochemical corrosion. Electrochemical protection of metals against corrosion. Metal coatings as protection of metals against corrosion. Chemical reduction as a method of applying metallic coatings. Inorganic non-metallic coating. The paintwork. Polymer coatings. Ecological problems of technological processes of protective coatings. Helpful using of corrosion processes in non-ferrous metallurgy.
Practical classes content	Basic terms and definitions in accordance with GOST 5272-68 "Corrosion of metals. Terms." Measurement of electrochemical potentials of the compensation method. Galvanizing. Anodizing aluminum.
Study/exam achievements	Exam
Forms of media	Power Point Presentation, slides, posters
Literature	1. Никитин Г.М., Нурмаганбетов Ж.О., Абсадикова К.Ж. Коррозия и защита металлов. Учебное пособие. Актобе: РИО АУ им.К.Жубанова, 2000.-52с. 2. Никитин Г.М. Газовая коррозия. Учебное пособие. Актобе: РИО АУ им.К.Жубанова,2000.-82с.

Elective module Optional component	
Module title:	**Eduactional Internship**
Abbreviation, if applicable:	----
Sub-heading, if applicable:	--
Disciplines	Eduactional Internship
Semester:	2
Module coordinator:	Kenbeilova S.Zh
Associate professor/lecturer	Master of sciences, senior lecturer
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor's programme) Optional component
Teaching format / class hours per week during the semester:	Total hours hours - 60; Students number - 75 чел.
Workload:	Total hours - 60
Credit points:	2 ECTS
Module admission requirements	
Targeted learning outcomes:	Practical training is carried out in order to acquire skills of work by students with PC and computer applications in the field of metallurgy. Practice is held in computer rooms and laboratories of the department of metallurgy, etc. During the practice the student have to: - get acquainted with the technological processes of ferrous metallurgy, applied in the enterprise. - get acquainted with the implementation of technological process; - analyze the technology, taking into consideration the given products and tools material, the number of operating steps, the degree of mechanization and automation; - be aware of the ways of introducing new equipment and advanced technology to improve the technical and economic indicators of production; - to use technical documentation; - be able to use modern facilities of text and graphic documents design.
Lecture content	
Practical classes content	
Study/exam achievements	Report
Forms of media	Power Point Presentation, slides, posters
Literature	1. Э. Ахбердиев, Ш.М. Молдабеков. Химиялык технологияныц непзп процестері жэне аппараттары - Алматы. 2. Басов А.И. Механическое оборудование обогатительных фабрик заводов тяжелых цветных металлов. - М.: Металлургия.

Elective module Optional component	
Module title:	**Work experience internship**
Abbreviation, if applicable:	
Sub-heading, if applicable:	---
Disciplines	Work experience internship
Semester:	4, 6
Module coordinator:	Ibrayeva O.T.
Associate professor/lecturer	candidate of technical science, professor
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor's programme) Optional component
Teaching format / class hours per week during the semester:	Total hours - 300; Number of students - 75 чел.
Workload:	Total hours - 300
Credit points:	10 ECTS
Module admission requirements	
Targeted learning outcomes:	Work experience internship is conducted to obtain practical skills, study features of the technology of metallurgical processes, design documentation; venue of practice: metallurgical enterprises, scientific organizations, enterprises and universities laboratory. The main objectives of the practice are: - practical study of technological process of alumina, steel, rolled steel production and applicable technological equipment and materials, means of automation; - a detailed examination of the technological documentation used in alumina, steel, rolled production; - study of technical and economic parameters, organization and its management, issues of standardization and control; acquaintance with the structure of the company, its departments and the quality of products services; - gathering of materials needed to the course and the graduation project.
Lecture content	
Practical classes content	
Study/exam achievements	Report
Forms of media	Power Point Presentation, slides, posters
Literature	1. Э. Ахбердиев, Ш.М. Молдабеков. Химиялык технологияныц непзп процестері жэне аппараттары - Алматы. 2. Басов А.И. Механическое оборудование обогатительных фабрик

заводов тяжелых цветных металлов. - М.: Металлургия.

Elective module Optional component	
Module title:	**Pre-diploma internship**
Abbreviation, if applicable:	---
Sub-heading, if applicable:	--
Disciplines	Pre-diploma internship
Semester:	8
Module coordinator:	Ibrayeva O.T
Associate professor/lecturer	Candidate of technical science, associate professor
Language	Kazakh, Russian
Classification within the curriculum:	5B070900 - «Metallurgy» (Bachelor's programme) Optional component
Teaching format / class hours per week during the semester:	Total hours - 480; Number of students - 75 чел.
Workload:	Total hours - 480
Credit points:	16 ECTS
Module admission requirements	
Targeted learning outcomes:	Pre-diploma practice is to prepare students to the practical work as an engineer, as well as for the selection of the necessary materials and documents relating to the graduation project (work); the venue practice: metallurgical enterprises, scientific organizations, enterprises and universities laboratory. The main objectives of the practice are: - depth research and comprehensive analysis of the technologies for the production of steel products used by metallurgical facilities, means of mechanization and automation of its production and exploitation. - management system of the workshop study, planning of economy of production, organization of the continuous technological process of the enterprise. - technical services department study , organization of work on standardization of production processes and quality control study, organization of labor and the environment. -introduction into the research works in the field of steelmaking technology engaged into the enterprise, introduction with the achievements of science and technology, embedded and planned for implementation. Introduction to marketing and management system, organization of planning and economic department of the enterprise, the study of the basic technical and economic performance of the enterprise, gathering the necessary materials needed to graduation project in accordance with the assignment for diploma design.

Lecture content	
Practical classes content	
Study/exam achievements	Report
Forms of media	Power Point Presentation, slides, posters
Literature	1. Экономика и организация производства в дипломном проектировании: Учебное пособие для вузов / Юзов О. В., Ф. И. Шепилов, А. Г. Шлеев. - М.: Металлургия.

PAVLODAR STATE UNIVERSITY NAMED AFTER S. TORAIGHYROV

MODULE HANDBOOK

of specialty 6M070900 Metallurgy

ASIIN’e.V.

Akkreditierungsagentur fur Studiengangeder Ingenie
urwissenschaften, der Informatik, der Naturwissensch
aften und der Mathematik e.V.

Pavlodar, 2017 78

List «Modules Reference»

Basic disciplines Compulsory componeni	**t, elective component**
Module title:	Theory and practice of scientific research 1
Abbreviation, if applicable:	---
Sub-heading, if applicable:	---
Disciplines	Foreign Language (professional), History and Philosophy of Science, Business Kazakh language
Semester:	1,2, 3
Module coordinator:	Bykov P.O., Nevmerzhitski S.V.
Associate professor/lecturer	professor, candidate of technical science
Language	Russian, Kazakh, English
Classification within the curriculum:	6M070900 - «Metallurgy» (Master's programme) Compulsory component
Teaching format / class hours per week during the semester:	Total hours –112,5; including Lectures - 15 hours; Practical –97,5 hours; Magisters' self-study - 90 hours. Hours per week- 13,5; including: Lecture - 1 hour , practice –6,5 hours, magisters' self-study - 6 hours Number of students - 4.
Workload:	Total hours - 360 Contact hours –112,5, off-class hours –247,5 (tutorials - 60 hours, magisters' self-study – 187,5 hours)
Credit points:	12 ECTS
Module admission requirements	
Targeted learning outcomes:	To be aware of: contradictions and socio-economic impacts of globalization; the role of science and education in public life; modern trends in the development of scientific knowledge; the current methodological and philosophical problems of science. To know: the methodology of scientific cognition; principles and structure of the scientific organization activity. To be able to: use this knowledge to the development and application of original ideas in the context of scientific research; critically analyze existing concepts, theories and approaches of processes and phenomena analysis; integrate the knowledge which was gained in the framework of different disciplines to solve research problems in the new unfamiliar conditions; through the integration of knowledge we make judgments and decisions based on incomplete or limited information; fluency in a foreign and Kazakh language at a professional level, which will allow to carry out research and implement teaching of special subjects in universities. To be competent in: professional communication and intercultural communication; oratory skills, correct and logical design of their thoughts orally and in writing.
Lecture content	Education concept and its philosophical status. Ideological and

	methodological foundations of philosophy of education. The ideology of education. The main ideas of education in the history of philosophy. Ontology of education. Axiology of education. The logic of education. Methodology of education. Ethics education. Policy in the sphere of education. Aesthetic education.
Practical classes content	Philosophy of education as a practical philosophy; General reflection; presentation of pedagogical consciousness; revived scientific pedagogy; interdisciplinary and integrative science. Object, subject, structure and functions of education philosophy. Ideas of enlightenment and education for human philosophy in the modern times. Postmodern education strategy. Russian tradition of philosophy in education. Philosophy and pedagogy of education and upbringing. It has holistic view of education. The concept, nature, essence, functions of education. Education is as a value, system, process, activity, result. Identity in culture. Civilized and uncivilized (primitive, primary) education system. Eastern and Western educational systems. Basic educational strategies are idealism and realism (materialism), pragmatism, existentialism, humanistic (non-legislative) paradigm. The spiritual search and spiritual crisis of soul disease: neurosis, alcoholism, drug abuse, and education. Education and the Church. Education and gender. Classical, non-classical and post non-classical stages as structural evolution of science: basic concepts and principles. Parent school is a experience of the “initial” period and principle of continuity and a healthy society (E. Fromm, K. Horney, A. Maslow, J. Ledloff). The logic of education by S.I. Gessen. The logic of science- based education BS Gershunski. Deductive and inductive logic of the education. Alienation and cooperation (co-authorship) in education. The social role of the teacher. An aesthete, a moralist, a thinker in the educational space. Information, informative-creative and creative model of education. Verbal and nonverbal communication. Communication barriers. The art of listening. Individual approach to students, interaction with different personality types. Explanation and understanding. Science understood. Three world understanding (A. A Brudnyi). Truth and lies in communication. Educational policy of the Government. The educational system tasks of the RK. Educational programs and terms of education in the Republic of Kazakhstan. The Lisbon Convention of 1997. National education is a main thing in the context of globalization and internationalization. The role of education in the formation of world culture. Man as “symbolic animal” (E. Cassirer, S. Langer). Man as “symbolic animal” (E. Cassirer, S. Langer). Discursive and presentational symbolism. Ergonomics in education. Teaching skills: teacher as a director, an actor, a designer, a psychologist of pedagogical process. Business etiquette, image, fashion in the field of the education. Dynamics of culture: oral, book and screen. The international contacts are important part for younger specialist’s professional life. Meetings, arrangements, telephone conversation. Negotiations, professional debates, presentations and conferences. Business correspondence (resume, cover letter, letter of recommendation; complaints, requests, request for information, a letter-confirmation, orders, contracts, etc.). International programs and projects. The University's international cooperation. Metallurgy and

	basic scientific directions in metallurgy. Basic concepts and definitions in the scientific field. General information about construction materials and Metallurgical science in Kazakhstan and abroad: history, modern condition and prospects. Scientific researches in the field of equipment and technology of production of cast iron, steel, aluminum, ferroalloy, foundry production and their processes and rolled tubes.
Study/exam achievements	Exam
Forms of media	Power Point Presentation, slides, posters
Literature	1. Мессер, А. Введение в теорию познания.- Изд. 2-е, стер..- М.:КомКнига. - 2007.-184 с. 2. Бердяев, Н. Самопознание.- М.:ЭКСМО. Самопознание.-2008.- 639 с..- (Антология мысли) 3. Тарасов, Ю. Н.Философские проблемы социальногуманитарных наук:учеб. пособие для аспирантов.- Воронеж:[б.и.]. Философские проблемы социально-гуманитарных наук.-2008.-208 с. 4. Раисова А.Б., Муканова Л.Ж., Немецкий язык. Методическое пособие для студентов специальностей «Физика», «Математика», «Информатика», ПГУ им. С. Торайгырова: 2006. 5. Русско-англо-немецко-французский металлургический словарь. Основные термины. Ок. 5000 слов. - 2-е издание, стереотип. - М. : РУССО, 2006. - 360 с. 6. The 300 t EAF meltshop at the new Iskenderun minim / MPT International, № 2, 2008. - P. 52 - 58. 7. Sprachkurs Deutsch 2. Verlag Moritz Diesterweg Gmbh. Stutgartt: 2001 8. Dialog in Beruf. Max Hueber Verlag. Munchen: 2009. 9. Themen 2. Kursbuch. Lehrwerk fur Deutsch als Fremdsprache. Max Hueber Verlag. Munchen: 2001.

Basic disciplines Compulsory componeni	**t, elective component**
Module title:	Foundations of higher education
Abbreviation, if applicable:	---
Sub-heading, if applicable:	---
Disciplines	Psychology, Pedagogy
Semester:	1
Module coordinator:	Burdina Ye.I.
Associate professor/lecturer	Professor., doctor of pedagogical sciences
Language	Russian, Kazakh
Classification within the curriculum:	6M070900 - «Metallurgy» (Master's programme) Compulsory component
Teaching format / class hours per week during the semester:	Total hours - 75; including Lectures - 45 hours; Practical - 30 hours; Tutorials - 60 hours. Hours per week- 9; including

	Lecture - 3 hour s, practice - 2 hour , tutorials - 4 hours number of students - 4
Workload:	Total hours - 240 Contact hours - 75, off-class hours - 165; (tutorials - 60 hours, students' self-study - 105 hours)
Credit points:	8 ECTS
Module admission requirements	
Targeted learning outcomes:	To be aware of: professional competence of a high school teacher. To know: students' psychology of cognitive activity in the learning process; psychological methods and means to improve the efficiency and quality of learning. Be able to: apply knowledge of pedagogy and psychology of higher education in its educational activities; use interactive teaching methods. To be able to: implement educational and pedagogical activity on credit technology of training. To be competent: in the field of scientific and scientific-pedagogical work in higher educational institutions; in questions of modern educational technologies.
Lecture content	There are theoretical, methodological and historical bases of pedagogics. The development of higher education in the modern world. The theory of learning in higher education (didactics). Modern approaches to the content of higher education. Forms and methods of training in the higher school. Educational work in higher school. Psychological counseling to students and teachers. The subject of psychology goal, objectives. Psyche and consciousness. The concept of personality. The structure of personality. The modern theory of personality. The concept of activity. The communication. Sensation and perception. The memory. Thinking and speaking. Attention. The imagination. Feelings and emotions. The will. Temperament. The character. Ability. Subject and objectives of age psychology. The problem of age. Socio - psychological characteristics of large social groups.
Practical classes content	Methodology of science. The historic nature of pedagogy. Pedagogy of higher school, its connection with andragogy. The main tendencies of education development in the conditions of globalization of economy. The crisis of education in the modern world. Paradigms of education pedagogical and andragogical, acmeological and other methodological basis of training process in the higher school. Pedagogical process as a system characteristic element of pedagogical system. The nature, structure and main components of the training process in the higher school. The basic theory of the formation of the content of education (material, formal and the like) theory of modern education content (V. V. Kraevsky, I. A. Lerner, and M. N. Skatkin). Contents education and their characteristics. Traditional and innovative forms of education. Classification of methods. Methods of teaching in higher school. The method of complete knowledge is the basis of education. The graduate school as a social institution. Educational work in higher school, as the process of professional socialization of the future specialists. The main directions of curator's systematic work.

	Implementation of the credit system of study abroad (problems and benefits). The introduction of the credit system in the Republic of Kazakhstan. Preparation of teaching materials in conditions of the credit system. The subject of psychology goal, objectives. Psyche and consciousness. The concept of personality. The structure of personality. The concept of activity. The communication. Feelings and emotions. Socio - psychological characteristics of large social groups.
Study/exam achievements	Exam
Forms of media	Power Point Presentation, slides, posters
Literature	1. Бодалев А. А. Личность и общение. - М., 2000. 2. Выготский Л.С. Собрание сочинений в б томах -М., 1986. 3. Выготский Л.С. Психология - М., 2002. 4. Васильев И. А., Тихомиров О. К. Эмоции и мышление. -М., 1980. 5. Ванханский, О.С., Наумов, А.И. Менеджмент,- М.: Фирма Гардарини, 2004. 6. Бабышев С.Я. Блочно-модульное обучение. М., 1997. 7. Безрукова В.С. Педагогика. - Екатеринбург, 1994. Бердяев Н.А. Самопознание. М., 1990.

Basic and majors disciplines Elective component	
Module title:	Theory and practice of scientific research 2
Abbreviation, if applicable:	---
Sub-heading, if applicable:	---
Disciplines	Teaching Methods of Metallurgical Processes Theory, Diagnosis of technical objects
Semester:	1, 2
Module coordinator	Smailova N.T., Artamonov V.P.
Associate professor/lecturer	Professor, doctor of technical sciences
Language	Russian, Kazakh
Classification within the curriculum:	6M070900 - «Metallurgy» (Master's programme) Compulsory component
Teaching format / class hours per week during the semester:	Total hours -75; including Lectures - 37,5 hours; Practical –37,5 hours; Tutorials - 60 hours. Hours per week- 8; including Lectures - 2,5 hours, practice - 2,5 hours, tutorials - 4 hours Number of students - 4.
Workload:	Total hours - 240 Contact hours - 75, off-class hours - 165; (tutorials - 60 hours, students' self-study - 105 hours) -
Credit points:	8 ECTS
Module admission requirements	

Targeted learning outcomes:	To be aware of: research methods and diagnosis of metals and alloys, also their use in research activities; methods of teaching special subjects. To know: methods for the determination of hardness, strength, plastics and performance properties of metals and alloys; methods of metallographic studies of metals and alloys; methods and means of improving the efficiency and quality of education in special disciplines. To be able to: apply the methods of investigation and diagnostics of metals and alloys in research activities; to apply interactive methods of teaching and view presentations on special disciplines and scientific activity. To be able to: implement their own research using the methods of determining the hardness, strength, plasticity, operational properties and metallographic analysis of metals and alloys; implementation of educational and pedagogical activity on credit technology of training. To be competent: in the research field, namely structure and properties of metals and alloys; methods of teaching special disciplines.
Lecture content	Classification of study methods of structure and properties of metals and alloys. Determination methods of mechanical and service properties of metals. Metallographic techniques of metals and alloys. Diagnostics service failures pipes for various purposes. General information about nondestructive control of microstructure of metal. There are metallographic methods of nondestructive testing microstructure through portable microscopes. Moreover there are metallographic methods of nondestructive testing microstructure by replicas. Modern approaches of higher education metallurgical direction.
Practical classes content	It consist study of determination methods of hardness, strength and plastic properties of metal. In addition, there are In addition, there are studies of methods for determining the operational properties of metals and alloy, NDT methods microstructure through portable microscopes. They learn metallographic study of NDT methods microstructure of metals and alloys by replicas. Development of educational material for specialty disciplines “Metallurgy”, interactive training material for specific topics lectures, practical classes, study techniques conducting laboratory classes on methods to determine mechanical performance properties of metals, metallographic studies of metals and alloys.
Study/exam achievements	Exam
Forms of media	Power Point Presentation, slides, posters
Literature	1. Артамонов В. П. Диагностирование технических объектов по структуре металла : монография. - Павлодар : Кереку, 2013. - 224 с. 2. Артамонов В.В., Артамонов В.П. Оптимизация контроля и технической диагностики теплоэнергетического оборудования. - СПб.: Наука,2009.- 191 с.

Majors Compulsory componeni	**t, an elective component**
Module name:	**Fundamentals of scientific activities in metallurgy**
Abbreviation, if	–

applicable	
Sub-heading, if applicable	---
Training activities / training courses disciplines, if applicable	Current and future technologies of processing of raw materials in ferrous and non-ferrous metallurgy, Mathematic modeling of the metallurgical processes, Special chapters in the theory of metallurgical processes.
Semester:	1, 2
Module coordinator:	Ibraev I.K
Associate professor / Lecturer:	Professor, Doctor of Technical Sciences
Language:	Russian, Kazakh
Classification within the curriculum:	Master's specialty 6M070900 - «Metallurgy» Compulsory component, an elective component
Teaching format / class hours per week during the semester:	Total contact hours –127,5; including: Lectures - 82,5 hours; Practical classes - 45 hours; Tutorials - 120 hours. Hours in a week - 16; including: lectures - 5,5 hours, practice - 3 hours, tutorials - 8 hours Number of students - 4
Workload:	Total hours - 420 including contact hours -127,5, off-class hours –292,5 (office tutorials - 120 hours, MSS –172,5 hours)
Credit points:	14 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To have an understanding of the theory of metallurgical processes; stages of research; planning of the experiment and the treatment of the results; promising areas of research in the field of metallurgy. To know: theoretical foundations of metallurgical processes, procedures for research, planning methods and processing of experimental results in metallurgy, main promising areas of research in metallurgy. To be able to: apply acquired knowledge in conducting own research in improving processes in metallurgy. To have the skills to: carry out own research in metallurgy, using scheduling techniques and processing the results of experiments. To be competent: in the field of theoretical and experimental studies of metallurgical processes.
Content of lectures	Theoretical Foundations of metallurgy. Classification of metals, ores, metallurgical processes. Melting and crystallization. Theoretical Foundations of evaporation and condensation processes. Structure and properties of oxide melts. Basics of redox processes. Theoretical bases of processing sulfides. Thermodynamics and kinetics of leaching. Fundamentals of the theory of separation of liquid and solid phases. Basics of extraction processes. Electrolysis of molten salts. Stages of research. Theoretical and experimental studies and their characteristics. Simulation in research. General methodological issues of mathematical modeling. Similarity as a theoretical basis for modeling. Mathematical description of the physical laws. Experimental

	and statistical methods of mathematical description. Hardware and practical modeling techniques. Promising research directions in the various sectors of metallurgy. Development of the theory and practice of producing pig iron, steel, ferroalloys, non-ferrous metals and alloys. Advanced production technology of metal with high value added.
Content of practical classes	Calculation of the equilibrium composition of the gas phase in the carbon - oxygen and assessment of its redox properties. Calculation of thermodynamic properties (standard free energy, activity, equilibrium constants of redox processes). Chart analysis of melting slag systems. Calculation of chemical equilibria metallurgical systems. Calculation of kinetic parameters of the reaction. Calculation of reaction order. Planning univariate and multivariate experiment. Processing the results of experiments. Regression analysis, etc.
Study / exam achievements:	Exam
Forms of media:	Presentations of Power Point, slides, posters
Literature	1. Шамельханова Н.А. Основы планирования эксперимента. - Алматы : КазНТУ им. К. Сатпаева, 2002. - 182 с. 2. Кисиленко Л.Е. Машины и технология литейного производства. КНИР: учебно-методическое пособие - М. : МГИУ, 2008 - 60 с. 3. Муканов Д. Металлургия Казахстана: состояние, инновационный потенциал, тренд развития. - Алматы, 2005. - 290 с. 4. Диаграммы состояния двойных металлических систем: справочник в 3-х томах. Т.1. Под ред. Лякишева Н.П. М. : Машиностроение, 2006. - 991 с. 5. Диаграммы состояния двойных металлических систем: справочник в 3-х томах. Т.2. Под ред. Лякишева Н.П. М. : Машиностроение, 2006. - 1023 с. 6. Диаграммы состояния двойных металлических систем: справочник в 3-х томах. Т.3. Книга 1. Под ред. Лякишева Н.П. М. : Машиностроение, 2006. - 872 с. 7. Диаграммы состояния двойных металлических систем: справочник в 3-х томах. Т.3. Книга 2. Под ред. Лякишева Н.П. М. : Машиностроение, 2006. - 448 с. 8. Ибраев И.К., Акбердин А.А. Теоретические, технологические и экологические особенности производства низкоуглеродистой стали для листового проката. Научно-учебное пособие. - Алматы: НИЦ «Еылым», 2008 - 386 с. 9. Тлеугабулов С.М. Теория металлургических процессов. Учебное пособие для вузов. - Алматы: издание РИК по учебной и методической литературе, 2007. - 351 с.

Majors Compulsory componeni	**t, an elective component**
Module name:	Perspective methods of foundry
Abbreviation, if applicable	---
Sub-heading, if applicable	---
Training activities /	Perspective methods of foundry

training courses disciplines, if applicable	
Semester:	3
Module coordinator:	Suyundikov M. M., Bykov P. O.
Associate professor / Lecturer:	Professor, candidate of technical sciences; associate professor, candidate of technical sciences
Language:	Russian, Kazakh
Classification within the curriculum:	Master's specialty 6M070900 - «Metallurgy» Compulsory component, an elective component
Teaching format / class hours per week during the semester:	Total contact hours - 60; including: Lectures - 30 hours; Practical classes - 15 hours; Laboratory classes -15 hours Tutorials - 15 hours; Hours in per week - 14; including: lectures - 3 hours, practice - 1 hour,Laboratory classes -1 hour, tutorials - 1 hour, tutorials - 5 hours
Workload:	Total hours - 210 including contact hours - 60, off-class hours - 150 (office tutorials - 75 hours, MSS - 75 hours)
Credit points:	7 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To have an understanding the status and trends of technology foundry processes. To know: theoretical basis, the stages of research, planning and processing methods of experimental research in the field of technology of casting processes. To be able to: apply knowledge gained in conducting its own research on the improvement of technological processes of foundry and casting of metals and alloys. To have the skills to implementation and execution of the results of our research in the field of technology of casting processes. To be competent: research on the technology of casting processes.
Content of lectures	Classification of casting techniques. Feature castings, ingots and billets. Demands placed upon them in modern conditions. Classification and characterization methods research process foundry. Scientific schools in this area. Examples of research in the field of improvement of technological processes foundry.
Content of practical classes	Study of the structure and properties of metals and alloys produced by different casting techniques. Planning research to improve the process for making castings, ingots and billets. Conducting experiments. Processing the results of research, evaluation measurement uncertainty. Drawing up the final report on the conduct of scientific research.
Study / exam achievements:	Exam
Forms of media:	Presentations of Power Point, slides, posters
Literature	1. Суюндиков М.М. Определение площади пенокерамических фильтров, установленных в литниковой системе/ Литейщик России, - 2011, №6.

2. Bykov P. O., Kanaev A. T., Bogomolov A. V., Reshotkina E. N. Reducing the Central Porosity of Continuous-Cast Billet by Modification of the Solidification Process. // Steel in Translation. - 2012. - №. 8. - Vol. 42 - P. 643-645.
3. Суюндиков М.М. Ресурс работы пенокерамических фильтров для литья алюминиевых сплавов/Инновации в материаловедении и металлургии: материалы 1-й Международной интерактивной научно-практической конференции. - Екатеринбург: УРФУ им. Первого Президента РФ Б.Н.Ельцина, 2012.

Majors Compulsory componeni	**t, an elective component**
Module name	**Modern state and ways of development of ferrous metallurgy**
Abbreviation (if applicable)	---
Sub-heading (if applicable)	---
Training / courses of academic disciplines (if applicable)	Modern state and ways of development of ferrous metallurgy
Semester:	3
Module coordinator	Ibrayev I.K.
Associate professor/ lecturer	Professor, doctor of technical sciences
Language	Russian, Kazakh
Classification within the curriculum	Magistracy of specialty 6M070900 - «Metallurgy» Component selection
Teaching format / class hours per week during the semester:	Total contact hours - 60; including: Lectures - 30 hours; Practical classes - 30 hours; Tutorials - 75 hours. Hours per week - 10; including: lectures - 2 hours, practice - 2 hours, tutorials - 5 hours Number of students - 4.
Workload:	Total hours - 210 including contact hours - 60, off-class hours - 150 (office tutorials - 75 hours, MSS - 75 hours)
Credit points:	7 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To have an understanding of the theory of metallurgical processes; stages of research; planning of the experiment and the treatment of the results; promising areas of research in the field of metallurgy. To know: theoretical foundations of metallurgical processes, procedures for research, planning methods and processing of experimental results in metallurgy, main promising areas of research in metallurgy. To be able to: apply acquired knowledge in conducting own research in improving processes in metallurgy. To have the skills to: carry out own research in metallurgy, using

	scheduling techniques and processing the results of experiments. To be competent: in the field of theoretical and experimental studies of metallurgical processes.
Content of lectures:	Theoretical Foundations of metallurgy. Classification of metals, ores, metallurgical processes. Melting and crystallization. Theoretical Foundations of evaporation and condensation processes. Structure and properties of oxide melts. Basics of redox processes. Theoretical bases of processing sulfides. Thermodynamics and kinetics of leaching Fundamentals of the theory of separation of liquid and solid phases. Basics of extraction processes. Electrolysis of molten salts. Stages of research. Theoretical and experimental studies and their characteristics. Simulation in research. General methodological issues of mathematical modeling. Similarity as a theoretical basis for modeling. Mathematical description of the physical laws. Experimental and statistical methods of mathematical description. Hardware and practical modeling techniques. Promising research directions in the various sectors of metallurgy. Development of the theory and practice of producing pig iron, steel, ferroalloys, non-ferrous metals and alloys. Advanced production technology of metal with high value added.
Content of practical classes:	Calculation of the equilibrium composition of the gas phase in the carbon - oxygen and assessment of its redox properties. Calculation of thermodynamic properties (standard free energy, activity, equilibrium constants of redox processes). Chart analysis of melting slag systems. Calculation of chemical equilibria metallurgical systems. Calculation of kinetic parameters of the reaction. Calculation of reaction order. Planning univariate and multivariate experiment. Processing the results of experiments. Regression analysis, etc.
Study / exam achievements:	Exam
Forms of media:	Presentations of Power Point, slides, posters
Literature	1. Муканов Д. Металлургия Казахстана: состояние, инновационный потенциал, тренд развития. - Алматы, 2005. - 290 с. 2. Ибраев И.К., Акбердин А.А. Теоретические, технологические и экологические особенности производства низкоуглеродистой стали для листового проката. Научно-учебное пособие. - Алматы: НИЦ «Еылым», 2008. - 386 с. 3. Быков П.О., Шабенов К.К. Суюндиков М.М. Государственная программа по форсированному индустриально-инновационному развитию Республики Казахстан и ее реализация в горнометаллургической отрасли Павлодарского региона. - Материалы международной научно-практической конференции «Металлургия Прииртышья в реализации программы форсированного индустриально-инновационного развития «Казахстан - 2020» (27 апреля 2011 года). - Павлодар : Павлодарский государственный университет им. С. Торайгырова, 2011. - с. 317 - 320.

Majors Compulsory componeni	**t, an elective component**
Module name:	**Research practice**
Module level, if	–

applicable:	
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Research practice
Semester:	2, 4
Module coordinator:	Ibraev. I. K.
Lecturer:	Professor, doctor of technical sciences
Language:	Russian, Kazakh
Classification within the curriculum:	Magistracy on specialty 6M070900 - «Metallurgy» Obligatory component
Teaching format / class hours per week during the semester:	Total classroom hours - 450 from them: Number of students - 4 pers.
Workload:	Total hours - 450
Credit points:	15 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	The ability to choose appropriate research methods (modify existing ones to develop new methods), based on the objectives of a particular research (master's thesis on the subject, or performing tasks of the supervisor in the master's program); ability to apply modern information technology for scientific research; ability to handle the results, analyze and present them in the form of completed research and development (report on the research work, abstracts, scientific articles, coursework, master's thesis); the ability to issue the results of its work in accordance with the requirements established by regulatory documents using modern means of editing and printing;
Content of lectures:	
Content of practical classes:	
Study / exam achievements:	Report
Forms of media:	Powerpoint Presentations, slides, posters
Literature:	1. Bykov P.O, K.K Shabenov, Suyundikov M.M. The State Program on Forced Industrial-Innovative Development of the Republic of Kazakhstan and its realization in the mining industry of Pavlodar region. - Materials of the international scientific-practical conference "Metallurgy of Priirtyshye in implementing the program of forced industrial-innovative development of the" Kazakhstan - 2020 "(April 27, 2011). - Pavlodar: Pavlodar State University. S.Toraigyrov 2011. - P. 317 - 320.

Majors Compulsory componeni	**t, an elective component**
Module name:	**Pedagogic practice**
Abbreviation, if applicable	---
Sub-heading, if applicable	---
Training activities / training courses disciplines, if applicable	Pedagogic practice
Semester:	1, 2, 3
Module coordinator:	Bogomolov A. B.
Associate professor / Lecturer:	Professor, Doctor of Technical Sciences
Language:	Russian, Kazakh
Classification within the curriculum:	Master's specialty 6M070900 - «Metallurgy» Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours - 90; including: Number of students - 4
Workload:	Total hours - 90
Credit points:	3 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	Knowledge of the specific nature of teaching and educational work and a high school teacher, teaching methods, organizational methods and educational work of the department faculty; application of knowledge and skills for the teaching of disciplines and specializations psycho- pedagogical disciplines in practice; formation in the course of professional practice of personal qualities, scientific and pedagogical culture of thinking, professional and pedagogical skills of creative activity.
Content of lectures	
Content of practical classes	
Study / exam achievements:	Report
Forms of media:	Presentations of Power Point, slides, posters
Literature	1. Бодалев А. А. Личность и общение. - М., 2000. 2. Выготский Л.С. Собрание сочинений в б томах -М., 1986. 3. Выготский Л.С. Психология - М., 2002. 4. Васильев И. А., Тихомиров О. К. Эмоции и мышление. -М., 1980. 5. Ванханский, О.С., Наумов, А.И. Менеджмент,- М.: Фирма Гардарини, 2004. 6. Бабышев С.Я. Блочно-модульное обучение. М., 1997. 7. Безрукова В.С. Педагогика. - Екатеринбург, 1994. Бердяев Н.А. Самопознание. М., 1990.

Majors Compulsory componeni	**t, an elective component**
Module name:	**Scientific and research work**
Abbreviation, if applicable:	---
Sub-heading, if applicable:	---
Training activities / training courses disciplines, if applicable	Scientific and research work
Semester:	2, 3, 4
Module coordinator	Bogomolov A. V.
Lecturer:	Associate professor, Candidate of Technical Sciences
Language:	Russian, Kazakh
Classification within the curriculum:	Master's specialty 6M070900 - «Metallurgy» Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours - 900; Number of students - 4
Workload:	Total contact hours - 900
Credit points:	30 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	Acquisition of skills to perform scientific-research work within the formulation and solution of problems in specialty.
Content of lectures:	
Content of practical classes:	
Study / exam achievements:	Report
Forms of media:	Presentations of Power Point, slides, posters
Literature	1. Быков П.О., Шабенов К.К. Суюндиков М.М. Государственная программа по форсированному индустриально-инновационному развитию Республики Казахстан и ее реализация в горнометаллургической отрасли Павлодарского региона. - Материалы международной научно-практической конференции «Металлургия Прииртышья в реализации программы форсированного индустриально-инновационного развития «Казахстан - 2020» (27 апреля 2011 года). - Павлодар : Павлодарский государственный университет им. С. Торайгырова, 2011. - с. 317 - 320.

PAVLODAR STATE UNIVERSITY NAMED AFTER S. TORAIGHYROV

MODULE HANDBOOK

of specialty 6M070900 Metallurgy

Akkreditierungsagentur fur Studiengangeder Ingenie
urwissenschaften, der Informatik, der Naturwissensch
aften und der Mathematik e.V.

Pavlodar, 2017

List «Modules Reference»

Basic disciplines Compulsory component	**t, an elective component**
Module name:	Management
Module level, if applicable:	---
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Management, Psychology, Business Kazakh language
Semester:	1, 2
Module coordinator:	Erzhanov T.N., Burdina E.I., Bykov P.O.
Lecturer:	associate professor; d.p.s., professor, к/t.s., associate professor
Language:	Russian, Kazakh
Classification within the curriculum:	Master's specialty 6M070900 - "Metallurgy" compulsory component;
Teaching format / class hours per week during the semester:	Total contact hours –97,5; including: Lectures - 30 hours; Practical classes –67,5 hours; Tutorials - 75 hours. Hours per week - 6; including: Lectures –2 hours, practical classes –4,5 hours, tutorials - 5 hours Number of students - 4 pers.
Workload:	Total hours - 280 including contact hours –97,5, off-class hours –182,5 (office tutorials - 75 hours, MSS –107,5 hours)
Credit points:	10 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To have an understanding of the functions and use of management, psychology, Kazakh and foreign languages in professional activities. To know: - the evolution of theories, especially Kazakh management; - the organization as a system of governance, the principles of personnel management, - forms of power samomendzhment and leadership; - basic psychological concepts and their definitions; - professional terms in Kazakh and foreign languages. To be able to: - perform the functions and use of management practices; - make decisions; manage conflict, stress, changes in the organization and evaluate the effectiveness of management; - use Kazakh and foreign language in professional activities. To have the skills to: - perform basic management functions and other activities , practical application of skills and knowledge acquired in accordance with international requirements for the chosen activity. - used to compile and analyze the information, set goals and find ways to achieve them in the conditions of formation and development of information society in Kazakh, Russian and foreign languages; used to

	compile and analyze the information, set goals and find ways to achieve them in the conditions of formation and development of the information society. To be competent: in management, psychology, Kazakh and foreign languages.
Content of lectures:	Management. Ways to control. Management functions. Management style. Organizational management structure. Management decisions. Evaluating the effectiveness of management. The subject of psychology purpose, objectives. Psyche and consciousness. The concept of personality. Personality structure. Modern theories of personality. The concept of activity. Communication. Sensation and perception. Memory. Thinking and speech. Attention. Imagination. Feelings and emotions. Will. Temperament. Character. Ability. Subject and tasks of psychology. The problem of age. Socio - psychological characteristics of large social groups.
Content of practical classes:	The subject of psychology purpose, objectives. Psyche and consciousness. The concept of personality. Personality structure. The concept of activity. Communication. Feelings and emotions. Socio - psychological characteristics of large social groups. International contacts and their role in modern specialist. Meeting arrangements, telephone conversation. Negotiations, professional debates, presentations and conferences. Business correspondence (resume, cover letter, letter of recommendation; complaints, requests, request for information, a letter - confirmation, orders, contracts, etc.). International programs and projects. International cooperation of the university. Metallurgy and the main research areas in metallurgy. Basic concepts and definitions in the scientific field. Understanding structural materials Metallurgical science in Kazakhstan and abroad: history, current state and prospects. Research in the field of technology and equipment for producing pig iron, steel, aluminum, ferroalloys, foundry, production processes and rolled tubes.
Study / exam achievements:	Exam
Forms of media:	Presentations of Power Point, slides, posters
Literature	1. Бодалев А. А. Личность и общение. - М., 2000. 2. Выготский Л.С. Собрание сочинений в 6 томах -М., 1986. 3. Выготский Л.С. Психология - М., 2002. 4. Васильев И. А., Тихомиров О. К. Эмоции и мышление. -М., 1980. 5. Ванханский, О.С., Наумов, А.И. Менеджмент,- М.: Фирма Гардарини, 2004. 6. Русско-англо-немецко-французский металлургический словарь. Основные термины. Ок. 5000 слов. - 2-е издание, стереотип. - М. : РУССО, 2006. - 360 с. 7. The 300 t EAF meltshop at the new Iskenderun minim / MPT International, № 2, 2008. - P. 52 - 58. 8. Sprachkurs Deutsch 2. Verlag Moritz Diesterweg Gmbh. Stutgartt: 2001 9. Dialog in Beruf. Max Hueber Verlag. Munchen: 2009. 10. Асылханова Л.Е., Жумабекова Б.К. и др. Учебно-методическое

	пособие для студентов неязыковых специальностей. Павлодар: 2008.

Majors Compulsory componeni	**t, an elective component**
Module name:	**Current and future technologies of processing of raw materials in ferrous and non-ferrous metallurgy**
Module level, if applicable:	---
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Current and future technologies of processing of raw materials in ferrous and non-ferrous metallurgy
Semester:	2
Module coordinator:	Ibrayev I.K
Lecturer:	professor, Doctor of Technical Sciences
Language:	Russian, Kazakh
Classification within the curriculum:	Masters majoring 6M070900 - «Metallurgy» compulsory component
Teaching format / class hours per week during the semester:	Total contact hours - 60; including: Lectures - 30 hours; Practical classes - 30 hours; Tutorials - 75 hours. Hours per week - 10; including: lectures - 2 hours, practice - 2 hours, tutorials - 5 hours Number of students - 4.
Workload:	Total hours - 210 including contact hours - 60, off-class hours - 150 (office tutorials - 75 hours, MSS - 75 hours)
Credit points:	7 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	Have an idea: about the theory of metallurgical processes; research methods and diagnosis of metals and alloys and their use in research activities; promising areas of research in the field of metallurgy and technology of casting processes. Know: the theoretical basis of metallurgical processes, methods of investigation and diagnosis of metals and alloys and their use in research activities, the main promising areas of research in metallurgy and technology of casting processes. Be able to: apply knowledge gained in conducting its own research on the improvement of technological processes in metallurgy. Have skills: implementation of their own research in the field of metallurgy using the methods of planning and processing of experimental results. To be competent: in the field of theoretical and experimental studies of metallurgical processes.
Content of lectures:	Theoretical Foundations of metallurgy. Promising research directions in the various sectors of metallurgy. The theory and practice of

	producing pig iron, steel, ferroalloys, non-ferrous metals and alloys. Classification of methods of investigation of the structure and properties of metals and alloys. Methods for determination of mechanical and performance properties of metals. Methods metallographic studies of metals and alloys. Diagnostics service failures pipes for various purposes. General information on nondestructive testing of metal microstructure. Metallographic methods of nondestructive testing microstructure through portable microscopes. Metallographic methods of nondestructive testing microstructure by replicas. Classification of casting techniques. Characteristics of castings, ingots and billets. Demands placed upon them in modern conditions. Classification and methods of characteristics of research process foundry. Scientific schools in this area. Examples of research in the field of improvement of technological processes foundry.
Study / exam achievements:	Calculation of the equilibrium composition of the gas phase in the carbon - oxygen and evaluation of its redox properties. Calculation of thermodynamic properties (standard free energy, activity, equilibrium constants of redox processes). Chart Analysis melting slag systems. Calculation of chemical equilibria metallurgical systems. Calculation of kinetic parameters of the reaction. Calculation of the reaction order. Study of methods for determining hardness. Study of methods for determining the strength and plastic properties of metals. Study of methods for determining the operational properties of metals and alloys. Study of NDT methods microstructure through portable microscopes. Metallographic study of NDT methods microstructure of metals and alloys by replicas. Study of the structure and properties of metals and alloys produced by different casting techniques. Planning research to improve the process for making castings, ingots and billets. Conducting experiments. Processing the results of research, evaluation of measurement error. Drawing up the final report on the conduct of scientific research.
Study / exam achievements:	Exam
Forms of media:	Presentation Power Point, slides, posters
Literature	1. Шамельханова Н.А. Основы планирования эксперимента. - Алматы : КазНТУ им. К. Сатпаева, 2002. - 182 с. 2. Кисиленко Л.Е. Машины и технология литейного производства. КНИР: учебно-методическое пособие - М. : МГИУ, 2008 - 60 с. 3. Муканов Д. Металлургия Казахстана: состояние, инновационный потенциал, тренд развития. - Алматы, 2005. - 290 с. 4. Ибраев И.К., Акбердин А.А. Теоретические, технологические и экологические особенности производства низкоуглеродистой стали для листового проката. Научно-учебное пособие. - Алматы: НИЦ «Еылым», 2008 - 386 с. 5. Тлеугабулов С.М. Теория металлургических процессов. Учебное пособие для вузов. - Алматы: издание РИК по учебной и методической литературе, 2007. - 351 с. 6. Артамонов В. П. Диагностирование технических объектов по структуре металла : монография. - Павлодар : Кереку, 2013. - 224

7. Артамонов В.В., Артамонов В.П. Оптимизация контроля и технической диагностики теплоэнергетического оборудования. - СПб.: Наука,2009.- 191 с.
8. Суюндиков М.М. Определение площади пенокерамических фильтров, установленных в литниковой системе/ Литейщик России, - 2011, №6.
9. Bykov P. O., Kanaev A. T., Bogomolov A. V., Reshotkina E. N. Reducing the Central Porosity of Continuous-Cast Billet by Modification of the Solidification Process. // Steel in Translation. - 2012. - №. 8. - Vol. 42 - P. 643-645.

Majors Compulsory componeni	**t, an Elective component**
Module name:	**Fundamentals of scientific activities in metallurgy**
Module level, if applicable:	---
Sub-heading, if applicable:	---
Training activities / training courses disciplines, if applicable	Mathematic modeling of the metallurgical processes, Theory of Mass and Heat Exchange in Metallurgical Processes
Semester:	1, 2
Module coordinator:	Ibrayev I.K, Serzhanov R.I.
Associate professor / Lecturer:	Professor, Doctor of Technical Sciences; Professor, Ph.D
Language:	Russian, Kazakh
Classification within the curriculum:	Master's specialty 6M070900 - «Metallurgy» Compulsory component, an elective component
Teaching format / class hours per week during the semester:	Total contact hours - 105; including: Lectures - 75 hours; Practical classes - 30 hours; Tutorials - 120 hours. Hours in a week - 16; including: lectures - 5 hours, practice - 2 hours, tutorials - 8 hours Number of students - 4
Workload:	Total hours - 360 including contact hours - 105, off-class hours - 255 (office tutorials - 75 hours, MSS - 180 hours)
Credit points:	12 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To have an understanding of the theory of metallurgical processes; stages of research; planning of the experiment and the treatment of the results; promising areas of research in the field of metallurgy. To know: theoretical foundations of metallurgical processes, procedures for research, planning methods and processing of experimental results in metallurgy, main promising areas of research in metallurgy. To be able to: apply acquired knowledge in conducting own research in

	improving processes in metallurgy. To have the skills to: carry out own research in metallurgy, using scheduling techniques and processing the results of experiments. To be competent: in the field of theoretical and experimental studies of metallurgical processes
Content of lectures:	Thermodynamics of gases and vapors. Heat and mass transfer processes. Fuel and combustion fundamentals. Yielding. Fundamentals of heat and stoves. Stages of research. Theoretical and experimental studies and their characteristics. Simulation in research. General methodological issues of mathematical modeling. Similarity as a theoretical modeling framework. Using a mathematical description of the physical laws. Experimental and statistical methods of mathematical description. Hardware and practical modeling techniques.
Content of practical classes	Planning unvariate and multivariate experiment. Processing the results of experiments. Regression analysis, etc. Calculation of heat and mass transfer processes of metallurgical processes.
Study / exam achievements:	Exam.
Forms of media:	Presentations of Power Point, slides, posters
Literature:	1. Шамельханова Н.А. Основы планирования эксперимента. - Алматы : КазНТУ им. К. Сатпаева, 2002. - 182 с. 2. Кисиленко Л.Е. Машины и технология литейного производства. КНИР: учебно-методическое пособие - М. : МГИУ, 2008 - 60 с. 3. Ибраев И.К., Акбердин А.А. Теоретические, технологические и экологические особенности производства низкоуглеродистой стали для листового проката. Научно-учебное пособие. - Алматы: НИЦ «Еылым», 2008 - 386 с. 4. Гусовский В.А. Теплотехника: Тепловой расчет печей непрерывного действия / Под ред. Кривандина В.А. - М.: МИСиС, 2012. - 84 с. 5. Гусовский В.А. Теплотехника: Тепловой расчет печей периодического действия / Под ред. Кривандина В.А. - М.: МИСиС, 2012. - 71 с.

Majors Compulsory componeni	**t, an Elective component**
Module name:	**Modern state and ways of development of ferrous metallurgy**
Module level, if applicable:	---
Sub-heading, if applicable:	---
Training activities / training courses disciplines, if applicable	Modern state and ways of development of ferrous metallurgy, Diagnosis of technical objects, Perspective technologies of metals and alloys pouring
Semester:	1, 2, 3
Module coordinator:	Ibrayev I.K
Associate professor / Lecturer:	Professor, Doctor of Technical Sciences

Language:	Russian, Kazakh
Classification within the curriculum:	Master's specialty 6M070900 - «Metallurgy» Compulsory component, an elective component
Teaching format / class hours per week during the semester:	Total contact hours - 165; including: Lectures - 120 hours; Practical classes - 45 hours; Tutorials - 45 hours Hours in a week - 15; including lectures –8 hours, practice - 3 hour, tutorials - 3 hours Number of students - 4
Workload:	Total hours - 570 including contact - 165, off-class hours - 405 (office tutorials - 45 hours, MSS - 360 hours)
Credit points:	19 ECTS credits
Requirements under the examination regulations:	
Targeted learning outcomes:	To have an understanding of the theory of metallurgical processes; stages of research; planning of the experiment and the treatment of the results; promising areas of research in the field of metallurgy. To know: theoretical foundations of metallurgical processes, procedures for research, planning methods and processing of experimental results in metallurgy, main promising areas of research in metallurgy. To be able to: apply acquired knowledge in conducting own research in improving processes in metallurgy. To have the skills to: carry out own research in metallurgy, using scheduling techniques and processing the results of experiments. To be competent: in the field of theoretical and experimental studies of metallurgical processes
Content of lectures:	Modern state of metallurgy. Metallurgy of Kazakhstan at the present stage: state and problems. Raw materials and fuel base metallurgy in Kazakhstan, refractories. Their place in the world. Trends in the development of metallurgy subsectors : iron and steel , ferroalloy production, electric furnace steelmaking , production of non-ferrous metals , metal forming , new and innovative projects in metallurgy of Kazakhstan and the world in general . World resources of information on mineral raw materials, metals, materials, and processes for their preparation.
Content of practical classes:	Studying the main deposits of iron, manganese and chromite ore in Kazakhstan. Mapping the major deposits of iron, manganese and chromite ore in Kazakhstan. Study of the main directions of development of the ferroalloy industry in Kazakhstan. Types of ferroalloys produced in Kazakhstan. Study of the technology of integrated ferroalloys. Casting of metals and alloys. Studying trends of development of continuous casting. Metal Forming. Technology
Study / exam achievements:	Exam
Forms of media:	Presentations of Power Point, slides, posters
Literature:	1. Муканов Д. Металлургия Казахстана: состояние, инновационный потенциал, тренд развития. - Алматы, 2005. - 290 с.

2. Ибраев И.К., Акбердин А.А. Теоретические, технологические и экологические особенности производства низкоуглеродистой стали для листового проката. Научно-учебное пособие. - Алматы: НИЦ «Еылым», 2008. - 386 с.
3. Быков П.О., Шабенов К.К. Суюндиков М.М. Государственная программа по форсированному индустриально-инновационному развитию Республики Казахстан и ее реализация в горно-металлургической отрасли Павлодарского региона. - Материалы международной научно-практической конференции «Металлургия Прииртышья в реализации программы форсированного индустриально-инновационного развития «Казахстан - 2020» (27 апреля 2011 года). - Павлодар: Павлодарский государственный университет им. С. Торайгырова, 2011. - с. 317 - 320.

Specialized discipline Compulsory componeni	**t, an elective component**
Module name:	**Industrial Practice**
Module level, if applicable:	---
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Industrial Practice
Semester:	2
Module coordinator:	Ibrayev I.K.
Associate professor:	professor, doctor of Technical Sciences
Language:	Russian, Kazakh
Classification within the curriculum:	Master's specialty 6M070900- "Metallurgy" Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours - 270; of them: Number of students - 4 pers.
Workload:	Total hours - 270
Credit points:	9 ECTS
Requirements under the examination regulations:	
Targeted learning outcomes:	The ability to choose appropriate research methods (to modify existing and develop new methods) based on the objectives of a particular study (master's thesis on the subject , or performing tasks of the supervisor in the master's program); ability to apply modern information technology for scientific research ; ability to handle the results , analyze and present them in the form of completed research and development (report on research work , abstracts, scientific articles, coursework, master's thesis) ; the ability to issue the results of its work in accordance with the requirements established by regulatory documents using modern means of editing and printing ;
Content of lectures:	
Content of practical classes:	
Study / exam achievements:	Report

Forms of media:	Power Point Presentations, slides, posters
Literature:	1. Быков П.О., Шабенов К.К. Суюндиков М.М. Государственная программа по форсированному индустриально-инновационному развитию Республики Казахстан и ее реализация в горнометаллургической отрасли Павлодарского региона. - Материалы международной научно-практической конференции «Металлургия Прииртышья в реализации программы форсированного индустриально-инновационного развития «Казахстан - 2020» (27 апреля 2011 года). - Павлодар : Павлодарский государственный университет им. С. Торайгырова, 2011. - с. 317 - 320.

Specialized discipline Compulsory componeni	**t, an elective component**
Module name:	**Experimental research**
Module level, if applicable:	---
Abbreviation, if applicable:	---
Sub-heading, if applicable:	Experimental research, Foreign language professional)
Semester:	1, 2, 3
Module coordinator:	Bogomolova A.V.
Associate professor:	professor, doctor of Technical Sciences
Language:	Russian, Kazakh
Classification within the curriculum:	Master's specialty 6M070900- "Metallurgy" Compulsory component
Teaching format / class hours per week during the semester:	Total contact hours - 390; of them: Number of students - 4 pers.
Workload:	Total hours - 390
Credit points:	13 ECTS
Requirements under the examination regulations:	
Targeted learning outcomes:	Acquisition of skills to perform research within formulating and solving problems in their specialty.
Content of lectures:	
Content of practical classes:	
Study / exam achievements:	Report
Forms of media:	Power Point Presentations, slides, posters
Literature:	1. Быков П.О., Шабенов К.К. Суюндиков М.М. Государственная программа по форсированному индустриально-инновационному развитию Республики Казахстан и ее реализация в горнометаллургической отрасли Павлодарского региона. - Материалы международной научно-практической конференции «Металлургия Прииртышья в реализации программы форсированного индустриально-инновационного развития «Казахстан - 2020» (27 апреля 2011 года). - Павлодар : Павлодарский государственный университет им. С. Торайгырова, 2011. - с. 317 - 320.