

**MINISTRY OF HIGHER EDUCATION, SCIENCE AND
INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN**

**TASHKENT STATE TECHNICAL UNIVERSITY
NAMED AFTER ISLAM KARIMOV**

«CONFIRMED BY»



Rector

S.M.Turabdjano

«26» 08 2022 y.

STEEL PRODUCTION TECHNOLOGY

MODULE HANDBOOK

Field of knowledge: 600.000 – Engineering, machining and construction industries.

The field of education: 610.000 – Engineering work.

Field of study: 60712100 – Metallurgy.

MODULE REFERENCES

Module name:	Steel production technology
Code, if applicable	PICHT4810
Courses, if applicable	Course project
Semesters in which the module is taught	7, 8
Lecturer	Nuraliev Oybek Ulugbek ugli -Senior lecturer of the department 'Metallurgy' Rakhmataliev Shahrukh Ashur ugli – Assistant of "Metallurgy" department.
Language	Uzbek, Russian
Relation to curriculum	Compulsory
Type of teaching, contact hours	Lecture, practical
Workload	Total study load: 300 hours, Contact hours: - 104 hours; lecture - 64 hours; practical – 40 hours. Independent study: 196 hours.
Credit points	10
Recommended prerequisites	Heat and mass transfer in metallurgy, Direct extraction of iron from ore

<p>Module objectives / intended learning outcome</p>	<p>Using knowledge in the field students will be able to understand and explain the role of technological processes in order to improve the optimal technologies in steel melting machines, to improve the quality of steel processing, using the knowledge in the field of steel production technology. Students know the basic concepts of the field, specific features of the application of physico-chemical, heat and mass, and technological and economic laws in the process of steel production.</p> <p>Students will have the ability to make preliminary decisions on improving steel production technology, finding constructive solutions, analyzing existing problems in metallurgical processes, creating new technologies, and eliminating these problems.</p> <p>Able to understand and analyze the complex phenomena that occur in the production of iron and its alloys, in furnaces and ferrous metallurgy processes, using a broad and thorough basic knowledge of the metallurgical sciences.</p> <p>Able to calculate the parameters, characteristics, selection, digital automated systems of machines and auxiliary devices of ferrous metallurgy, as well as technological schemes of plants, and installation of equipment circuits in them.</p> <p>In practical training, students perform material and heat balance calculations using the laws of heat transfer and mass transfer in steel production.</p> <p>Students will have the ability to determine the optimal melting conditions by studying the selection of raw materials, calculations of energy sources, analysis of the composition of steel, slag and gases in oxygen converter furnaces, arc steel melting furnaces, and marten furnaces.</p> <p>Students apply the knowledge gained in the lectures and strengthen theoretical knowledge in practical ways when calculating problems.</p> <p>During independent work, students study scientific topics, get an idea of the latest technologies in steel production in foreign countries, types of raw materials, all stages of steel melting in different workshops, and their interrelationships; they study the optimal conditions for oxidation and recovery processes during steel melting; additional components to increase the quality of steel; importance of slag in steel melting; modern machines for melting steel; steel grades; current status and development prospects of ferrous metallurgy; skills of working with literature on the field; expands the horizons of future specialists, allows analysis of various relations between the raw material base and steel production enterprises.</p> <p>During the implementation of the course project, students learn scientific information, during the implementation of the project, the rational composition of the initial raw materials for the steel production industry, fuel consumption during steel melting, production efficiency of the used furnaces, they calculate the composition of waste gases and form practical skills in choosing a furnaces depending on the composition of raw materials.</p>
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Content	<ol style="list-style-type: none"> 1. Development of ferrous metallurgy in Uzbekistan. 2. Steel production in the CIS. 3. The metallized part of the charge material. 4. Non-metallic powdery materials, solid oxidizing materials, fluxes. 5. Main function and components of steel casting slag. 6. Physical and chemical properties of steel casting slag. 7. Fundamentals of carbon oxidation reactions. 8. Gases in steel and alloys. 9. Basics and objectives of the converter process. 10. Spraying mode of oxygen tuyeres. Formation of gases and slag in converter furnaces. 11. Heat and temperature mode. 12. Construction of converter furnace. Repair of furnace lining. 13. Steel production in Marten furnaces 14. Main classification of the Marten process 15. Marten scrap-ore process in liquid cast iron 16. Marten scrap process. Construction of Marten furnaces 17. Traction equipment of Marten furnaces 18. Cooling system for Marten furnaces 19. The main indicators of the heat operation of the Marten furnace 20. Two-bath steel melting aggregate 21. Steel production technology in electric furnaces 22. Steel production technology in electric arc furnaces 23. Electrodes of Arc furnace. 24. Technology of oxidation steel smelting in base arc furnaces. 25. The melting and oxidation period of the smelting process. 26. Recovery period of the melting process 27. Steel alloying during the melting process 28. Production of ferroalloys in electric furnaces/ 29. Deoxygenation and alloying of steels. 30. Cleaning the steel outside the furnace 31. Obtaining steel ingots 32. Continuous casting of steel. Casting quality
Study and examination requirements and forms of examination	It will be written, the theoretical part of the science and the calculation of the main processes in steel production will be included.
Assessment Requirements	Completion of science assignments and successful submission of current, intermediate, and final control forms.
Reading list	<ol style="list-style-type: none"> 1. Treatise On Process Metallurgy. Industrial Processes Editor-in-Chief SESHADRI SEETHARAMAN Copyright © 2014 Elsevier Ltd. All rights reserved. 2. Yusupxodjayev A.A., Aribjonova D., Beknazarova G., Karimjonov B. Po‘lat ishlab chiqarish texnologiyasi – T.: Shafoat Nur Fayz, 2020. -240 b. 3. Крамаров А.Д., Соколов А.Н. Электрометаллургия стали и ферросплавов - М.: Metallurgy, 1998. - 376 с. 4. Юсупходжаев А.А., Балгабаева Г.Т. Электрометаллургия стали и ферросплавов. - Т.: ТГТУ, 2005. -136 с.

Reviewers	B.T. Berdiyarov – DSc associate professor Head of the Technological Metals and Clusters Department of the Ministry of Mining and Geology, (network enterprise); J.M. Bekpolatov - PhD, associate professor, associate professor of "Mining" department.
Confirmed place and time	Developed and approved by Tashkent State Technical University (Report № 1 26.08.2022)

Staff Handbook

Full name	<i>Nuraliev Oybek Ulugbek ugli</i>		
Teaching area	<i>Metallurgy (Heat and mass transfer in metallurgical processes)</i>		
Academic education	2017-2019 Heat and mass transfer in metallurgical processes	Tashkent State Technical University	Master's degree program. Master of Science: "Metallurgy of non-ferrous and noble metals"
	2013-2017	Tashkent State Technical University	Bachelor's degree program. Bachelor of Engineering: "Metallurgy"
Labor activity	2022-u.n.	Tashkent State Technical University	Senior lecturer of the department "Metallurgy"
	2019-2022	Tashkent State Technical University	Assistant of the department "Metallurgy"
Research and development over the past 5 years	<p>1."Analysis of the material composition of the secondary man-made products of "Almalik MMC" to determine the reserves of rare, scattered, rare, non-ferrous and ferrous metals" (2020-2021 y.y.) Total cost Uzs. 40.000 000.</p> <p>2.AL-592102410 « Investigations on the efficient conditioning technology and equipment for the mineral flotation based on the interfacial micro/nano bubble group» (2023-2024 y.y.) Total cost Uzs. 1000.000 000.</p>		
Intra-industry cooperation over the past 5 years	<p>1. «Investigations on the efficient conditioning technology and equipment for the mineral flotation based on the interfacial micro/nano bubble group», Wuhan University of Technology, China; prof, Dr. Siyan Yang. (2022-2023 y.y.)</p> <p>2. "Reductive leaching of zinc ferrite in sulfuric acid using hydrazine as a reductant" Firat University, Türkiye. Prof. Dr. Mehmet Deniz Turan. (2023 y.)</p>		
Patents and intellectual property			
Important publications in the last 5 years	<p style="text-align: center;">22 rticles and theses, 1 textbook</p> <p>1. Berdiyarov B.T Khojiev Sh.T. NuraliyevO.U. Mirsaotov B.U. Mirsaotov S.U. Osmanov Z. Quality Steel Production Research Based on the Introduction of Deoxidation Technology International Journal of Engineering and Information Systems (IJEAIS) ISSN: 2643-640X Vol. 5 Issue 12, December - 2021, Pages:91-101</p> <p>2. Berdiyarov B.T Khojiev Sh.T. NuraliyevO.U. Mirsaotov B.U. Mirsaotov S.U. Monitoring the oxygen removal process at the final stage of melting steel Intelligent Information Technology and Mathematical Modeling 2021december (IITMM 2021) doi:10.1088/1742-6596/2131/2/022071</p> <p>3. Shoir Mukhamedzhanova, Oybek Nuraliyev , Zhonibek Ismailov ,Bekzod Karimzhonov , and Qakhramon Ochildiev Improvement of the Technology of CopperProduction by Involving in the Processing of Industrial Waste JSC "Almalyk MMC" in</p>		

	<p>Uzbekistan XV International Scientific Conference "INTERAGROMASH 2022" Global Precision Ag Innovation 2022, Volume 2 Pages:2193-2200 https://doi.org/10.1007/978-3-031-21219-2</p> <p>4. Matkarimov S.T., Nosirkho'zhaev S.Q. Ochildiyev Q.T., Karimjonov B.R., Nuraliyev O.U. (2019) Technological Processes of Receiving Metals in The Conditions of Moderate Temperatures International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8, Issue-12, October 2019 India. P.1826-1828</p> <p>5. Yusupkhodjayev A.A., Matkarimov S.T., Khudoyarov S.R., Valiyev X.R., Nuraliyev O.U. (2019) Use of Secondary Technogenic Formations of Ferrous Metallurgy for Production of Steel, International Journal of Advanced Research in Science, Engineering and Technology Vol. 6, Issue 1, January 2019 India. P. 7751-7755</p>		
<p>Activities in specialized bodies over the past 5 years</p>	<p>Student scientific coterie "Young metallurgist" of the faculty "Metallurgy" of the Tashkent State Technical University.</p>	<p>member</p>	<p>2019- u.n.</p>

Staff Handbook

Full name	<i>Rakhmataliev Shahrukh Ashur ugli</i>		
Teaching area	<i>Metallurgy (Heat and mass transfer in metallurgical processes. Projection of metallurgical plants. Metal recycling)</i>		
Academic education	2020-2022	Tashkent State Technical University	Master's degree program. Master of Science: "Metallurgy of non-ferrous and noble metals"
	2016-2020	Tashkent State Technical University	Bachelor's degree program. Bachelor of Engineering: "Metallurgy"
Labor activity	2022-u.n.	Tashkent State Technical University	Assistant of the department "Metallurgy"
Research and development over the past 5 years	1. "Obtaining a new composition against absorption in solutions in uranium mining" No.-1/2022. (2022-2023 y.y.) Total cost Uzs. 500,000,000		
Intra-industry cooperation over the past 5 years	1. «Investigations on the efficient conditioning technology and equipment for the mineral flotation based on the interfacial micro/nano bubble group», Wuhan University of Technology, China; prof, Dr. Siyan Yang. (2022-2023 y.y.) 2. "Reductive leaching of zinc ferrite in sulfuric acid using hydrazine as a reductant" Firat University, Türkiye. Prof. Dr. Mehmet Deniz Turan. (2023 y.) 3. "Surface treatments on steels to enhance dissolution resistance in metal melts while maintaining good wettability" Мишколц (Miskolc) Университети. Венгрия Prof. Marton Banke		
Patents and intellectual property			
Important publications in the last 5 years	50 rticles and theses		
	1.Rakhmataliev Sh., Sulonov Kh., Khojiev Sh., Abdukholiqov A. Modern Technologies of Gold Production // IJEAIS, 5(5), 2021. P. 121-131.		
	2. Mukhametdjanova Sh., Khojiev Sh., Rakhmataliev Sh., Avibakirov I., Mamatov M. Modern Technologies of Copper Production // IJEAIS, 5(5), 2021. P. 106-120.		
	3. Berdiyarov B., Khojiev Sh., Rakhmataliev Sh., Suyunova M., Rasulova N. Modern Technologies of Aluminum Production // IJEAIS, 5(5), 2021. P. 100-105.		
	4. Rakhmataliev Sh.A., Berdiyarov B.T., Kadirov N.A., Khojiev Sh.T. Recycling technology using battery waste and other lead savings of secondary raw materials // Education and science in the XXI century, 2021, 12(3). C. 867-880.		
Activities in specialized bodies over the past 5 years	Student scientific coterie "Young metallurgist" of the faculty "Metallurgy" of the Tashkent State Technical University.	member	2022- u.n.