Curriculum

Field of study: Metallurgical Engineering

Table of contents

General characteristics of the field of study

Basic information

Faculty name:	Faculty of Metals Engineering and Industrial Computer Science
Field of study:	Metallurgical Engineering
Level:	Second-cycle (engineer) programme
Profile:	General academic
Form:	Full-time studies
ISCED classification:	0715
Number of ECTS credits necessary to complete studies at a given level:	120
Professional title awarded to graduates:	magister inżynier
Cycle start date:	2024/2025, winter semester
Duration of studies (number of semesters):	4

Field of science to which the field of study is assigned:

Field engineering and technical sciences

Discipline of science to which the field of study is assigned:

Discipline	Percentage	ECTS
Material Engineering	100%	120

Relationship between the field of study and the AGH University development strategy and the AGH University mission

Metallurgical engineering creation as field of study in English, at the second degree of education (Msc), aims to prepare an extended educational offer developed at the Faculty of Metals Engineering and Industrial Computer Science, together with the Faculty of Non-Ferrous Metals and the Faculty of Foundry. The offer of such a course is especially directed to foreign students from Eastern Europe (Ukraine, Belarus) and Asia (India, Vietnam, Kazakhstan), who would have a chance to supplement and expand their specialist education at the second level of education (Msc). Recruitment of candidates for studies will take place in agreement with Universities from the above-mentioned regions.

The concept and program of the course being developed was consulted with ArcelorMittal Poland (AMP - a metallurgical company with branches all over the world) and received a positive opinion; AMP has declared support consisting in: giving selected lectures by AMP specialists, the possibility of carrying out diploma theses at AMP, funding scholarships for outstanding students. The above idea is in line with the AGH UST mission and strategy, which assume: improving the educational offer in foreign languages; also promoting and coordinating the cooperation of AGH UST Faculties with foreign universities, in particular: promotional activities aimed at recruiting foreign students, especially from Eastern Europe and Asia. The creation of a new field of study will also allow to aim ambitiousely even beyond the current top quality education level of AGH in close connection with the already high status of education in the field of ""metallurgical engineering"" (high positions in the Shanghai ranking of this discipline).

Information on taking into account the socio-economic demand while creating the curriculum and indication of the assumed learning outcomes matching the identified demand

The prepared study program meets the social and economic needs, both national and international. Currently, the education of engineering staff in the field of metallurgy at both domestic and foreign universities is very limited. In Poland, there is no major training program for metallurgists in the strict sense - despite the existence on the Polish market of several large metallurgical steel plants, a ferro-alloy steelworks and the world-class format of a copper-producing corporation and many smaller foundries. However, bearing in mind the need to carry out a comprehensive decarbonisation of the iron adn steelmaking and ferro-alloys industry and the need to introduce the related changes in the design of metallurgical equipment as well as the development and implementation of new hydrogen technologies and others, there is a need to educate engineers prepared for such a task. There is a laboratory base at AGH and there are specialists prepared to undertake such a task. A graduate of such studies, thanks to the subjects from the curriculum offer of the currently unique field of study called Metallurgical Engineering, will acquire skills related to advanced technologies for the production of metals solutions and products. Mastering the learning outcomes of the abovementioned skills will allow them to easily find employment in the domestic as well as European and global metallurgical industry. The insight into this labor market shows a huge demand for specialists with competences, the acquisition of which is offered by the prepared course. Educating engineers in this field, attention should be paid to ensuring continuity and a significant generational replacement of the engineering staff in existing industrial plants, which seems extremely important from the point of view of maintenance and technological development at an appropriate level.

Education paths – scope in Polish and in English

Not applicable

Graduation paths – scope in Polish and in English

Not applicable

The names of the majors in Polish and in English

Name [pl]	Name [en]

General information about the curriculum

Field of study: Metallurgical Engineering

General information related to the curriculum (general learning objectives and employment opportunities, typical jobs and opportunities for graduate continuing education)

In the first stage of education at the course (1 semester) the study program covers general engineering topics in the field of extractive metallurgy, casting, plastic processing and shaping the properties of manufactured metal products. The aim of this part of education is to equalize and consolidate basic knowledge for students. In the second stage of education, specialist subjects are proposed introducing specialist knowledge in the field of modern design solutions for metallurgical equipments and modern process technologies in the field of iron, steelmaking and non-ferrous metals production (e.g. hydrogen reduction processes, modernized electric arc furnace, processing of metallurgical waste in the context of closed-loop economy)) (semesters 2 and 3). In the last semester, only a diploma seminar and the preparation of a diploma thesis are planned, i.e. acquiring highly specialized knowledge in the selected diploma subject, including carrying out research for work, developing results and formulating conclusions. Study program is carried in English. The requirements for foreign language education will be verified on the basis of the learning outcomes in accordance with Appendix 5 to Resolution No. 14/2019 of the AGH Senate. The verification will take place during the classes and the exam in the subject "Additive Manufacturing Processes for Alloys", carried out during the 2nd semester of studies (2 ECTS points).

Graduates will have the opportunity to work in the metallurgical industry and related industries. Currently, there are over a dozen large and several dozen smaller companies of this type (only in Poland, employment about 100,000; approx. 10 million tons of steel are produced annually). In the world of this type of companies are over a dozen thousand, with aprox. 100 million employees, with an annual production of almost 2 billion tons of crude steel.

The indicated scope of employment opportunities can be extended to companies dealing with the production of non-ferrous and ferroalloy metals. A graduate of this faculty (metallurgist) can also find employment as a technologist in the dynamically developing market of metallic powder atomization. Graduates will have the opportunity to continue their education at doctoral schools, at doctoral courses, as well as on others training courses, including obtaining various industry qualifications, required in some countries. Education in this field, among others Foreigners creates opportunities for the internationalization of the educational process. Foreign graduates educated in the field of study, can potentially constitute an opportunity to widen international inter-university network or built new industry contacts. Necessary payment.

Information on including the conclusions from the students and graduates careers monitoring in the curriculum

The created field of study is related to the "Metalurgy" field of education that has existed for many years. The analysis of the annual reports prepared by the AGH Career Center shows that 90% of the graduates of the "Metalurgy" faculty find employment, including 75% in line with their education.

Information on including the requirements and recommendations of the accreditation committees, in particular the Polish Accreditation Committee and industry accreditation committees in the curriculum

The field of study "Metallurgy" received a distinguishing mark from the Polish Accreditation Committee.

Information on including examples of good practice in the curriculum

The program has been prepared on the basis of the latest global education trends in the field of metal products manufacturing. The thematic scope of the schedule combines the issues of the basics of classical metallurgy with the issues of modern, future-oriented technical solutions related to environmental protection, based on the reduction of the carbon footprint, i.e. the use of hydrogen as a reducing agent instead of traditional carbon. Thanks to this, the Graduate will have the opportunity to obtain knowledge useful for work in companies both using traditional technologies for the production of

metal alloys and in companies planning to implement modern techniques taking into account environmental tasks in the future. The proposed subjects include both basic, theoretical and practical knowledge, which will enable the education of an excellent metallurgical engineer.

Information on cooperation in the preparation of the curriculum with external stakeholders, in particular associations, professional and social organizations

The preparation of the study program was consulted with ArcelorMittal Poland, a company that is a branch of a global steel consortium (several dozen branches on all continents with a production capacity of approximately 100 million tons of steel per year, employing over 100,000 employees).

Duration, rules and form of the practical placement

Only a diploma internship is foreseen. Diploma internships should be completed during the fourth semester at the latest, lasting 6 weeks. The diploma internship is credited by the thesis supervisor. Students receive a document from the Dean's Office to be confirmed by the supervisor of the diploma internship. The student submits to the Dean's Office the document supplemented by the supervisor along with other documents required for registration of the diploma thesis. Completing the diploma internship is a condition for the student to obtain the so-called discharge and take the diploma examination.

Admission criteria, rules and policies

Field of study: Metallurgical Engineering

Description of competences expected from the candidate applying for admission to studies

A candidate for admission to a second degree in Metallurgical Engineering must have a Bachelor's Degree or Undergraduate Bachelor's Degree in Engineering, respectively, and the competencies necessary to pursue a Second Degree in Metallurgical Engineering. The candidate should be prepared to acquire broadly understood technical knowledge. The candidate should have competences covering in particular: - knowledge of mathematics, physics and chemistry to understand the basics of metallurgy and to formulate and solve simple design tasks in the field of metallurgy; - knowledge and skills in the field of physical chemistry, mechanics and thermal technology, enabling measurement, analysis, simulation and design of simple processes in the area of metallurgy; - knowledge of extractive metallurgy enabling the analysis and design of selected technological lines of steel production; - the ability to use analytical, simulation and experimental methods to formulate and solve engineering tasks; - skills in the field of interpretation, presentation and documentation of the results of the experiment as well as the presentation and documentation of the results of a project task.

Recruitment conditions, including the winners and finalists of the central level high school scientific Olympics, as well as winners of international and national contests

The terms and conditions of recruitment are set out in the AGH UST Senate Resolution No. 67/2021 on the terms, procedure and date of commencement and completion of recruitment for the first year of first and second cycle studies in the academic year 2022/2023.

The expected limit of admissions to studies along with an indication of the minimum number of admitted candidates required to successfully launch a study cycle

Limit 20 Students, minimum 10 Students

Learning outcomes

Field of study : Metallurgical Engineering

Knowledge

KEU symbol	Learning outcomes prescribed to a field of study	CEU symbol
MEN2A_W01	Student has expanded theoretical knowledge in the field of ferrous and non-ferrous metals extractive metallurgy	P7S_WG_A
MEN2A_W02	Student has expanded theoretically founded knowledge in the field of ferrous, alloys and non-ferrous metals metallography and the research methods applied	P7S_WG_A
MEN2A_W03	Student has expanded and theoretical founded knowledge of materials and technologies used in additive manufacturing methods of metal products	P7S_WG_A
MEN2A_W04	Student has expanded and theoretical founded knowledge of materials and technologies used in foundry	P7S_WG_A
MEN2A_W05	Student has the knowledge necessary to understand the social, economic, legal and other non-technical determinants of engineering activities and knowledge of the most important development trends in metallurgy	P7S_WK_A
MEN2A_W06	Student has an systematized knowledge of the equipment included in the technological line of steel, cast iron and non-ferrous metals production	P7S_WG_A_Inz
MEN2A_W07	Student knows the general principles of creating and developing forms of individual entrepreneurship and has knowledge of management	P7S_WK_A_Inz

Skills

KEU symbol	Learning outcomes prescribed to a field of study	CEU symbol
MEN2A_U01	Student can solve complex problems in the field of metallurgy, based on expanded knowledge; Student is able to make a critical evaluation, synthesis and analysis of information through proper selection of information; Student is able to select the proper methods and tools to solve likewise unstandard problems and tasks	P7S_UW_A
MEN2A_U02	Student is able to communicate on specialist topics in the field of metallurgy with a diverse audience; Student can use a foreign language at the B2 + level of the European System for the Description of Languages and specialist and proper terminology	P7S_UK_A
MEN2A_U03	Student can work individually and in a team. Student is able to assess the time consumption of a task; Student is able to lead a small team in a way that ensures the completion of the task within the set deadline	P7S_UO_A
MEN2A_U04	Student is able to plan the path of further self-education based on the analysis of the state of knowledge in the field of metallurgy	P7S_UU_A
MEN2A_U05	Student is able to plan and implement experiments consisting in carrying out measurements and computer simulations in the field of metallurgy ; Student is able to interpret the obtained results and draw conclusions; is able to take into account non-technical aspects in the conducted analysis	P7S_UW_A_Inz_01
MEN2A_U06	Student is able to design metallic materials with the assumed properties and technological lines enabling their production; Student is able to select materials for defined purposes	P7S_UW_A_Inz_02

Social competence

KEU symbol	Learning outcomes prescribed to a field of study	CEU symbol
MEN2A_K01	Student can think and act in a creative and entrepreneurial way	P7S_KK_A
MEN2A_K02	Student understands the need for activities involving the social awareness of the role of metallurgy in the functioning of the local and global economy	P7S_KO_A
MEN2A_K03	Student understands the need to provide the society with knowledge about the professional role of an engineer, the rules of professional ethics and compliance with them	P7S_KR_A

Compliance table of engineering competence (Inz) with directional learning outcomes (KEU)

Major : Metallurgical Engineering

Knowledge

CEU symbol	Learning outcomes for qualifications including engineering competence	KEU references
P7S_WG_A_Inz	knowledge of basic processes taking place in the life cycle of technical devices, facilities and systems	MEN2A_W06
P7S_WK_A_Inz	knowledge of basic principles of creating and developing various forms of individual entrepreneurship	MEN2A_W07

Skills

CEU symbol	Learning outcomes for qualifications including engineering competence	KEU references
P7S_UW_A_Inz_01	ability to plan and carry out experiments, including measurements and computer simulations as well as to interpret the obtained results and draw conclusions out of them. When identifying and formulating the specification of engineering problems and solving them, being able to: - use analytical, simulation and experimental methods; - recognize their systemic and non-technical aspects, including ethical connotations; - conduct a preliminary economic assessment of the proposed solutions and planned engineering activities; - perform a critical analysis of the functioning of existing technical solutions to further evaluate them;	MEN2A_U05
P7S_UW_A_Inz_02	ability to design solutions in compliance with the given specification as well as being able to: create simple devices, facilities and systems typical for the study major or implement processes using skillfully chosen methods, techniques, tools and materials	MEN2A_U06

Field of study-prescribed outcomes coverage matrix

Field of study: Metallurgical Engineering

2024/2025/S/IIi/IMiIP/MEN/all

Course	Code	Semestr	MEN2A_W01	MEN2A_W02	MEN2A_W03	MEN2A_W04	MEN2A_W05	MEN2A_W06	MEN2A_W07	MEN2A_U01	MEN2A_U02	MEN2A_U03	MEN2A_U04	MEN2A_U05	MEN2A_U06	MEN2A_K01	MEN2A_K02	MEN2A_K03
Minimalism and other modern philosophies of life	MMENS.IIi1HS.61dd7b0600b2a.24	1s					x		x			x				x		
Physical Chemistry	MMENS.IIi1P.61dd7e3837561.24	1s	x	x						x						x		
Basics of production management	MMENS.IIi1HS.61dd7b06abb1b.24	1s						x	x	x					x		x	
Extractive Metallurgy of Ferrous Alloys	MMENS.IIi1P.61dd7b0356197.24	1s	x					x			x	x						
Extractive Metallurgy of Non-ferrous Alloys	MMENS.IIi1P.61dd7b03ecbfc.24	1s	x				x	x		x	x		x		x	x	x	
Metal Casting	MMENS.IIi1P.61dd7b04888d7.24	1s		x		x		x		x			x		x	x	x	x
Metal forming	MMENS.IIi1P.54403984bed30b570c3074d7b9945494.24	1s						x		x					x	x		
Transport engineering	MMENS.IIi1P.696cb6397aa7462d667881321912cec5.24	1s					x	x		x	x	x				x	x	x
Thermodynamics of Metals	MMENS.IIi1P.61dd7b053fbd7.24	1s		x		x		x		x		x		x		x		x
Management systems auditing - methodology and applications	MMENS.IIi2HS.60363c1591553.24	2s					x		x			x	x	x		x	x	
Data Processing	MMENS.IIi2K.61dd7b08a556a.24	2s	x			x				x						x		
Sustainable metallurgy in circular economy	MMENS.IIi2HS.61e1787138d9e.24	2s	x				x		x	x	x		x			x	x	x
Additive Manufacturing Processes for Alloys	MMENS.IIi2K.61dd7b093a3f7.24	2s		x	x					x	x				x		x	
Foundry Technologies	MMENS.IIi2K.61dd7b09cb691.24	2s			x	x				x	x	x	x		x	x	x	x

Course	Code	Semestr	MEN2A_W01	MEN2A_W02	MEN2A_W03	MEN2A_W04	MEN2A_W05	MEN2A_W06	MEN2A_W07	MEN2A_U01	MEN2A_U02	MEN2A_U03	MEN2A_U04	MEN2A_U05	MEN2A_U06	MEN2A_K01	MEN2A_K02	MEN2A_K03
Logistics in Metallurgy	MMENS.IIi2K.61dd7b0a61ba3.24	2s	x			x	x	x	x	x	x		x			x	x	
Electrometallurgy	MMENS.IIi2K.61dd7b0aebc14.24	2s	x	x						x			x		x	x		x
Non-ferrous Processing Metallurgy	MMENS.IIi2K.61dd7b0b91593.24	2s	x	x	x					x				x		x	x	
Hydrogen and Green Metallurgy	MMENS.IIi2K.61dd7b0c4cdf9.24	2s	x				x	x						x			x	
Fundamentals of Metal Science	MMENS.IIi2K.61dd7b0cd8085.24	2s		x		x		x		x				x		x	x	
Primary Metallurgy	MMENS.IIi2K.61dd7b0da5c10.24	2s	x											x				
Theory of Metallurgical Processes	MMENS.IIi2K.61dd7b0ec0ebc.24	2s	x				x	x		x	x	x	x			x	x	x
Computer Modeling of Casting Processes	MMENS.IIi4K.61dd7b11760c5.24	3s	x		x					x					x	x		
Molding and core sands in ecological aspect	MMENS.IIi4K.602ce6f41a84f.24	3s			x	x					x	x	x			x	x	x
Environmental Protection in Foundry Process	MMENS.IIi4K.61dd7b121e935.24	3s				x	x			x		x	x	x		x	x	x
Hydrometallurgy	MMENS.IIi4K.61dd7b12aaef2.24	3s	x				x			x		x	x	x		x		
Modeling of metallurgical processes	MMENS.IIi4K.61dd7b1342dfd.24	3s	x					x		x				x				
Thermo-chemical treatment of metals	MMENS.IIi4K.61dd7b13ce542.24	3s	x	x	x		x	x	x	x	x	x	x	x		x	x	x
Secondary metallurgy and ferroalloys production	MMENS.IIi4K.61dd7b146489b.24	3s	x	x			x		x	x		x	x	x	x	x	x	x
Continuous and Semi-solid Casting Processes	MMENS.IIi8K.61dd7b1687c23.24	4s	x		x	x				x				x	x	x		
Diploma Seminar	MMENS.IIi8K.113e607328fe3b1feac36d5c37a13bcd.24	4s	x	x	x	x				x			x	x		x	x	x
Metal additive manufacturing, characterization and modeling	MMENS.IIi8K.61dd7b1726481.24	4s			x									x	x			x

Course	Code	Semestr	MEN2A_W01	MEN2A_W02	MEN2A_W03	MEN2A_W04	MEN2A_W05	MEN2A_W06	MEN2A_W07	MEN2A_U01	MEN2A_U02	MEN2A_U03	MEN2A_U04	MEN2A_U05	MEN2A_U06	MEN2A_K01	MEN2A_K02	MEN2A_K03
Diploma Thesis	MMENS.lli8K.e53bc1ffec52171870fc55d1cec2fa6a.24	4s	x	x	x	x	x	x	x	x				x	x	x		
Sum (obligatory):			12	9	5	8	6	11	2	16	7	5	7	7	7	15	11	7
Sum (elective):			7	2	5	3	7	3	6	9	3	7	7	8	5	10	7	6
Sum:			19	11	10	11	13	14	8	25	10	12	14	15	12	25	18	13

Characteristics matrix of learning outcomes in relation to modules

Major: Metallurgical Engineering

2024/2025/S/IIi/IMiIP/MEN/all

Course	Code	Semestr	P7S_WG_A	P7S_WK_A	P7S_WG_A_Inz	P7S_WK_A_Inz	P7S_UW_A	P7S_UK_A	P7S_UO_A	P7S_UU_A	P7S_UW_A_Inz_01	P7S_UW_A_Inz_02	P7S_KK_A	P7S_KO_A	P7S_KR_A
Minimalism and other modern philosophies of life	MMENS.IIi1HS.61dd7b0600b2a.24	1s		x		x			x				x		
Physical Chemistry	MMENS.IIi1P.61dd7e3837561.24	1s	x				x						x		
Basics of production management	MMENS.IIi1HS.61dd7b06abb1b.24	1s			x	x	x					x		x	
Extractive Metallurgy of Ferrous Alloys	MMENS.IIi1P.61dd7b0356197.24	1s	x		x			x	x						
Extractive Metallurgy of Non-ferrous Alloys	MMENS.IIi1P.61dd7b03ecbfc.24	1s	x	x	x		x	x		x		x	x	x	
Metal Casting	MMENS.IIi1P.61dd7b04888d7.24	1s	x		x		x			x		x	x	x	x
Metal forming	MMENS.IIi1P.54403984bed30b570c3074d7b9945494.24	1s			x		x					x	x		
Transport engineering	MMENS.IIi1P.696cb6397aa7462d667881321912cec5.24	1s		x	x		x	x	x				x	x	x
Thermodynamics of Metals	MMENS.IIi1P.61dd7b053fbd7.24	1s	x		x		x		x		x		x		x
Management systems auditing - methodology and applications	MMENS.IIi2HS.60363c1591553.24	2s		x		x			x	x	x		x	x	
Data Processing	MMENS.IIi2K.61dd7b08a556a.24	2s	x				x						x		
Sustainable metallurgy in circular economy	MMENS.IIi2HS.61e1787138d9e.24	2s	x	x		x	x	x		x			x	x	x
Additive Manufacturing Processes for Alloys	MMENS.IIi2K.61dd7b093a3f7.24	2s	x				x	x				x		x	

Course	Code	Semestr	P7S_WG_A	P7S_WK_A	P7S_WG_A_Inz	P7S_WK_A_Inz	P7S_UW_A	P7S_UK_A	P7S_UO_A	P7S_UU_A	P7S_UW_A_Inz_01	P7S_UW_A_Inz_02	P7S_KK_A	P7S_KO_A	P7S_KR_A
Foundry Technologies	MMENS.IIi2K.61dd7b09cb691.24	2s	x				x	x	x	x		x	x	x	x
Logistics in Metallurgy	MMENS.IIi2K.61dd7b0a61ba3.24	2s	x	x	x	x	x	x		x			x	x	
Electrometallurgy	MMENS.IIi2K.61dd7b0aebc14.24	2s	x				x			x		x	x		x
Non-ferrous Processing Metallurgy	MMENS.IIi2K.61dd7b0b91593.24	2s	x				x				x		x	x	
Hydrogen and Green Metallurgy	MMENS.IIi2K.61dd7b0c4cdf9.24	2s	x	x	x						x			x	
Fundamentals of Metal Science	MMENS.IIi2K.61dd7b0cd8085.24	2s	x		x		x				x		x	x	
Primary Metallurgy	MMENS.IIi2K.61dd7b0da5c10.24	2s	x								x				
Theory of Metallurgical Processes	MMENS.IIi2K.61dd7b0ec0ebc.24	2s	x	x	x		x	x	x	x			x	x	x
Computer Modeling of Casting Processes	MMENS.IIi4K.61dd7b11760c5.24	3s	x				x					x	x		
Molding and core sands in ecological aspect	MMENS.IIi4K.602ce6f41a84f.24	3s	x					x	x	x			x	x	x
Environmental Protection in Foundry Process	MMENS.IIi4K.61dd7b121e935.24	3s	x	x			x		x	x	x		x	x	x
Hydrometallurgy	MMENS.IIi4K.61dd7b12aaef2.24	3s	x	x			x		x	x	x		x		
Modeling of metallurgical processes	MMENS.IIi4K.61dd7b1342dfd.24	3s	x		x		x				x				
Thermo-chemical treatment of metals	MMENS.IIi4K.61dd7b13ce542.24	3s	x	x	x	x	x	x	x	x	x		x	x	x
Secondary metallurgy and ferroalloys production	MMENS.IIi4K.61dd7b146489b.24	3s	x	x		x	x		x	x	x	x	x	x	x
Continuous and Semi-solid Casting Processes	MMENS.IIi8K.61dd7b1687c23.24	4s	x				x				x	x	x		
Diploma Seminar	MMENS.IIi8K.113e607328fe3b1feac36d5c37a13bcd.24	4s	x				x			x	x		x	x	x

Course	Code	Semestr	P7S_WG_A	P7S_WK_A	P7S_WG_A_Inz	P7S_WK_A_Inz	P7S_UW_A	P7S_UK_A	P7S_UO_A	P7S_UU_A	P7S_UW_A_Inz_01	P7S_UW_A_Inz_02	P7S_KK_A	P7S_KO_A	P7S_KR_A
Metal additive manufacturing, characterization and modeling	MMENS.IIi8K.61dd7b1726481.24	4s	x								x	x			x
Diploma Thesis	MMENS.IIi8K.e53bc1ffec52171870fc55d1cec2fa6a.24	4s	x	x	x	x	x				x	x	x		
Sum (obligatory):			17	6	11	2	16	7	5	7	7	7	15	11	7
Sum (elective):			10	7	3	6	9	3	7	7	8	5	10	7	6
Sum:			27	13	14	8	25	10	12	14	15	12	25	18	13

Matrix of learning outcomes prescribed to a field of study with related forms of classes and the method of testing

Major: Metallurgical Engineering

2024/2025/S/IIi/IMiIP/MEN/all

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Minimalism and other modern philosophies of life	Lectures	Activity during classes, Test	MEN2A_W07, MEN2A_W05, MEN2A_U03, MEN2A_K01
Physical Chemistry	Lectures, Auditorium classes, Laboratory classes	Examination, Activity during classes, Test, Oral answer, Execution of laboratory classes, Report	MEN2A_W01, MEN2A_W02, MEN2A_U01, MEN2A_K01
Basics of production management	Lectures	Activity during classes, Test	MEN2A_W06, MEN2A_W07, MEN2A_U06, MEN2A_U01, MEN2A_K02
Extractive Metallurgy of Ferrous Alloys	Lectures, Seminars	Test, Participation in a discussion, Presentation	MEN2A_W01, MEN2A_W06, MEN2A_U03, MEN2A_U02
Extractive Metallurgy of Non-ferrous Alloys	Lectures, Seminars	Test, Activity during classes, Participation in a discussion, Essay, Presentation	MEN2A_W01, MEN2A_W05, MEN2A_W06, MEN2A_U01, MEN2A_U02, MEN2A_U04, MEN2A_U06, MEN2A_K01, MEN2A_K02
Metal Casting	Lectures, Seminars	Test, Participation in a discussion, Presentation	MEN2A_W02, MEN2A_W04, MEN2A_W06, MEN2A_U01, MEN2A_U04, MEN2A_U06, MEN2A_K01, MEN2A_K02, MEN2A_K03
Metal forming	Lectures, Auditorium classes, Laboratory classes	Examination, Activity during classes, Execution of laboratory classes	MEN2A_W06, MEN2A_U01, MEN2A_U06, MEN2A_K01
Transport engineering	Lectures, Seminars	Test, Activity during classes, Report, Presentation	MEN2A_W05, MEN2A_W06, MEN2A_U01, MEN2A_U02, MEN2A_U03, MEN2A_K01, MEN2A_K02, MEN2A_K03
Thermodynamics of Metals	Lectures, Auditorium classes, Laboratory classes	Examination, Activity during classes, Execution of exercises, Activity during classes, Participation in a discussion, Execution of laboratory classes	MEN2A_W02, MEN2A_W04, MEN2A_W06, MEN2A_U01, MEN2A_U03, MEN2A_U05, MEN2A_K01, MEN2A_K03

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Management systems auditing - methodology and applications	Workshop classes	Activity during classes, Scientific paper, Case study	MEN2A_W05, MEN2A_W07, MEN2A_U03, MEN2A_U04, MEN2A_U05, MEN2A_K01, MEN2A_K02
Data Processing	Lectures, Laboratory classes	Activity during classes, Test, Test, Report, Oral answer, Completion of laboratory classes	MEN2A_W01, MEN2A_W04, MEN2A_U01, MEN2A_K01
Sustainable metallurgy in circular economy	Lectures	Test	MEN2A_W05, MEN2A_W07, MEN2A_W01, MEN2A_U01, MEN2A_U02, MEN2A_U04, MEN2A_K01, MEN2A_K02, MEN2A_K03
Additive Manufacturing Processes for Alloys	Lectures, Laboratory classes	Activity during classes, Participation in a discussion, Examination, Execution of laboratory classes, Report, Oral answer	MEN2A_W03, MEN2A_W02, MEN2A_U01, MEN2A_U06, MEN2A_U02, MEN2A_K02
Foundry Technologies	Lectures, Laboratory classes	Examination, Execution of laboratory classes, Report	MEN2A_W03, MEN2A_W04, MEN2A_U01, MEN2A_U06, MEN2A_U04, MEN2A_U02, MEN2A_U03, MEN2A_K02, MEN2A_K03, MEN2A_K01
Logistics in Metallurgy	Lectures, Laboratory classes	Test, Activity during classes, Execution of laboratory classes, Report	MEN2A_W01, MEN2A_W04, MEN2A_W05, MEN2A_W06, MEN2A_W07, MEN2A_U01, MEN2A_U02, MEN2A_U04, MEN2A_K01, MEN2A_K02
Electrometallurgy	Lectures, Laboratory classes	Examination, Activity during classes, Execution of laboratory classes	MEN2A_W01, MEN2A_W02, MEN2A_U01, MEN2A_U06, MEN2A_U04, MEN2A_K01, MEN2A_K03
Non-ferrous Processing Metallurgy	Lectures, Laboratory classes	Examination, Execution of laboratory classes	MEN2A_W01, MEN2A_W03, MEN2A_W02, MEN2A_U01, MEN2A_U05, MEN2A_K01, MEN2A_K02
Hydrogen and Green Metallurgy	Lectures, Laboratory classes	Test, Execution of laboratory classes, Report	MEN2A_W01, MEN2A_W05, MEN2A_W06, MEN2A_U05, MEN2A_K02
Fundamentals of Metal Science	Lectures, Laboratory classes	Test, Completion of laboratory classes	MEN2A_W02, MEN2A_W06, MEN2A_W04, MEN2A_U01, MEN2A_U05, MEN2A_K01, MEN2A_K02
Primary Metallurgy	Lectures, Laboratory classes	Test, Execution of laboratory classes, Report	MEN2A_W01, MEN2A_U05

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Theory of Metallurgical Processes	Lectures, Auditorium classes	Activity during classes, Examination, Oral answer, Activity during classes, Test, Presentation, Oral answer	MEN2A_W01, MEN2A_W05, MEN2A_W06, MEN2A_U01, MEN2A_U02, MEN2A_U03, MEN2A_U04, MEN2A_K01, MEN2A_K02, MEN2A_K03
Computer Modeling of Casting Processes	Lectures, Auditorium classes, Laboratory classes	Examination, Activity during classes, Test, Oral answer, Activity during classes, Execution of exercises	MEN2A_W01, MEN2A_W03, MEN2A_U01, MEN2A_U06, MEN2A_K01
Molding and core sands in ecological aspect	Lectures, Auditorium classes, Laboratory classes	Activity during classes, Examination, Activity during classes, Involvement in teamwork, Presentation, Activity during classes, Execution of laboratory classes, Test, Report, Involvement in teamwork	MEN2A_W04, MEN2A_W03, MEN2A_U03, MEN2A_U04, MEN2A_U02, MEN2A_K01, MEN2A_K03, MEN2A_K02
Environmental Protection in Foundry Process	Lectures, Auditorium classes, Laboratory classes	Examination, Execution of exercises, Test results, Execution of laboratory classes, Report, Completion of laboratory classes	MEN2A_W04, MEN2A_W05, MEN2A_U03, MEN2A_U04, MEN2A_U05, MEN2A_U01, MEN2A_K02, MEN2A_K01, MEN2A_K03
Hydrometallurgy	Lectures, Auditorium classes, Laboratory classes	Examination, Activity during classes, Test results, Execution of laboratory classes, Report	MEN2A_W01, MEN2A_W05, MEN2A_U01, MEN2A_U03, MEN2A_U04, MEN2A_U05, MEN2A_K01
Modeling of metallurgical processes	Lectures, Auditorium classes, Laboratory classes	Examination, Execution of exercises, Completion of laboratory classes	MEN2A_W01, MEN2A_W06, MEN2A_U01, MEN2A_U05
Thermo-chemical treatment of metals	Lectures, Auditorium classes, Laboratory classes	Examination, Participation in a discussion, Presentation, Execution of laboratory classes, Report, Involvement in teamwork	MEN2A_W01, MEN2A_W02, MEN2A_W03, MEN2A_W06, MEN2A_W07, MEN2A_W05, MEN2A_U01, MEN2A_U04, MEN2A_U02, MEN2A_U03, MEN2A_U05, MEN2A_K01, MEN2A_K02, MEN2A_K03
Secondary metallurgy and ferroalloys production	Lectures, Auditorium classes, Laboratory classes	Examination, Participation in a discussion, Presentation, Execution of laboratory classes, Report	MEN2A_W01, MEN2A_W02, MEN2A_W05, MEN2A_W07, MEN2A_U01, MEN2A_U03, MEN2A_U05, MEN2A_U06, MEN2A_U04, MEN2A_K01, MEN2A_K02, MEN2A_K03
Continuous and Semi-solid Casting Processes	Lectures, Auditorium classes, Laboratory classes	Examination, Activity during classes, Test, Report, Completion of laboratory classes	MEN2A_W01, MEN2A_W03, MEN2A_W04, MEN2A_U01, MEN2A_U05, MEN2A_U06, MEN2A_K01
Diploma Seminar	Seminars	Participation in a discussion, Presentation	MEN2A_W01, MEN2A_W02, MEN2A_W03, MEN2A_W04, MEN2A_U04, MEN2A_U05, MEN2A_U01, MEN2A_K01, MEN2A_K02, MEN2A_K03

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Metal additive manufacturing, characterization and modeling	Lectures, Seminars, Laboratory classes	Examination, Activity during classes, Participation in a discussion, Presentation, Execution of laboratory classes, Report, Involvement in teamwork	MEN2A_W03, MEN2A_U06, MEN2A_U05, MEN2A_K03
Diploma Thesis	Diploma Thesis	Diploma thesis, Diploma thesis preparation, Presentation	MEN2A_W01, MEN2A_W02, MEN2A_W03, MEN2A_W04, MEN2A_W05, MEN2A_W06, MEN2A_W07, MEN2A_U01, MEN2A_U06, MEN2A_U05, MEN2A_K01

Detailed rules of the implementation of the curriculum estabilished by the Dean of the Faculty (the so-called Study Rules)

Field of study: Metallurgical Engineering

Enrollment rules for the next semester

1. Obtaining credits for all obligatory modules of classes included in the plan of a given semester of study.
2. Student obtaining a certain number of ECTS points.

Enrollment rules for the next semester as a part of the so-called ECTS credits debt ceiling

The student is registered for the next semester if he or she does not exceed the acceptable deficit of points, which is 10 ECTS.

ECTS credits debt ceiling

10

Organization of classes within the so-called blocks of classes (i.e. such organization of subjects or individual forms of classes that creates exceptions to the cyclical nature of classes in particular weeks of a given semester of studies)

Not applicable (there are no exceptions to the cyclical nature of classes).

Monitoring semesters

3

Study rules in case of the individual organization of studies approved for a specific student

The principles of pursuing an individual study plan are described in the AGH Study Regulations, § 9.

Possibility of studying according to the individual organization of studies (IOS) applies to students who meet the conditions set out in the Study Regulations, including students who excel in science, disabled students, in difficult life situation, participating in sports competitions, studying in more than one field of study or elected to the collegiate body of the University.

The possibility of studying according to IOS concerns in particular:

• individual selection of course modules, methods and forms of education;

• modification of the number of ECTS credits required to complete a semester of study;

• modification of the weekly schedule of classes, if possible, by selecting the class group and / or hours of classes in a way that allows the implementation of the current study program, adapting to the student's time possibilities.

The consent for IOS is issued by the Vice-Dean for Education upon the student's written request with justification, submitted immediately after the occurrence of the reason constituting the basis for granting it, but not later than by the end of the semester preceding the proposed changes to the study program. The application should be accompanied by the consent of the academic tutor and the individual study program agreed with him. Pursuing studies according to an individual program may not lead to a change in the field of directional learning outcomes and modules of classes recognized as compulsory in the study program for a given field of study, level and profile, or to an extension of the date of graduation.

Implementation of practical placements including monitoring system and completion rules

Not applicable

Rules of elective modules taking

The rules of eligibility are described in the study program in front of each group or block of elective modules.

Rules of education paths, graduation paths, major choice/eligibility

Not applicable

Rules related to the preparation of diploma projects and theses as well as the implementation of the degree granting

The terms and conditions and requirements of the diploma program are contained in § 25 and § 26 of the AGH Study Regulations and on the Faculty website: https://www.metal.agh.edu.pl/page/studia-stacjonarne-informacje-dla-dyplomantow.

1. The subject of the diploma dissertation should be undertaken by the student no later than one year before the scheduled date of graduation. The list of available topics for theses is available for students in the thesis catalog in the USOS system (module APD - Archive of Diploma Theses). The supervisor of the diploma thesis may be an academic teacher with the academic title of professor or the degree of habilitated doctor. With the consent of the Dean of the Faculty, the tutor may also be a person with a doctoral degree, who has competences and experience allowing for the proper implementation of the work.

2. The master's thesis should confirm the ability to use the knowledge required from a graduate of a given field of study and the acquisition of specific professional skills. It should constitute an independent development of a specific scientific, artistic or practical issue, presenting general knowledge and skills of independent analysis and reasoning. In justified cases, it is allowed to perform work in teams of two, provided that the participation of each of its contractors is specified in detail. The diploma thesis (or part of it) is prepared by the student personally and independently, which is confirmed by an appropriate declaration.

3. The thesis supervisor, selected and agreed with the student, shall be submitted for approval in the USOS system by filling in an appropriate application. The application is approved electronically in the USOS system by a three-person Commission, consisting of the Head of the Department, to which the thesis supervisor belongs, and two Vice-Deans for Education. After the thesis subject is approved by the Committee, the promoter determines the mode and schedule for the implementation of the diploma thesis enabling its timely completion.

4. By the end of November, the Dean of the Faculty sets the dates for the defense of diploma theses for the entire next calendar year. These dates are announced to students on the Faculty's website.

5. After completing the diploma thesis according to the guidelines and instructions of the tutor, the student uploads the thesis to the APD module, which results in the automatic sending of the thesis to the Unified Anti-plagiarism System (JSA). After the anti-plagiarism report is verified and the work is approved by the tutor, the tutor and the reviewer successively evaluate the work in the USOS system. The review by the reviewer is the moment of its registration in the IT system.

6. The diploma thesis is considered to be completed on time if the thesis will be registered in the USOS system by the end of September. In special cases, the Dean of the Faculty, at the student's request submitted before the deadline referred to above, may consent to the extension of the deadline for submitting the master's thesis, but not more than by two months.

7. The defense of the diploma thesis is understood as its presentation to the Diploma Examination Board, discussion on the diploma thesis and checking the level of knowledge and skills in the field of study being studied. The final grade for completing the studies is calculated in accordance with § 27 it. 3, 4 and 5 of the AGH Study Regulations:

• 0.6 for the average grade from studies,

• 0.2 for the diploma thesis grade,

• 0.2 for the grade for the diploma examination.

Principles for determining the overall evaluation of graduation (the final grade)

The result of completing higher education entered in the diploma and the supplement is determined as the weighted average the following ratings:

1. average grade from the studies, determined in accordance with § 14 of the AGH Study Regulations (weight 0.6);
2. the final grade for the diploma dissertation, determined in accordance with § 26 it. 17 of the AGH Study Regulations (weight 0.2);
3. the grade for the diploma examination, determined by the Commission in accordance with § 23 it. 19 of the AGH Study Regulations (weight 0.2).

Other requirements related to the implementation of the curriculum resulting from the AGH University Study Regulations or other regulations in force at the University

Not applicable

Metallurgical engineering program is prepared to offer specialized education in the field of modern extractive metallurgy. It covers broad content in the field of metal production from the preparation of raw materials, through the production of metal alloys, to obtaining an ingot. It focuses on the construction and principles of operation of the devices used in production, as well as on the techniques of the ongoing processes. It enables to gain the theoretical knowledge in the field of physical phenomena taking place during extraction processes and high-temperature chemical reactions, including their thermodynamics and kinetics.

In the first stage of education (1 semester) the study program covers general engineering issues in the field of extractive metallurgy, casting, plastic processing and shaping the properties of manufactured metal products. The aim of this part of education is to explain and summarize basic knowledge for students with different undergraduate expertise. In the second stage of education, specialized subjects are proposed introducing specialist knowledge in the field of modern design solutions for metallurgical equipments and modern process technologies in the field of iron, steelmaking and non-ferrous metals production (e.g. hydrogen reduction processes, modernized electric arc furnace, processing of metallurgical waste in the context of closed-loop economy) (semesters 2 and 3). In the final semester, only a one specialistic subject, diploma seminar and the preparation of a diploma thesis are planned, i.e. acquiring highly specialized knowledge in the selected diploma subject, including carrying out research work, performing experiments and analyzing the results that leads to formulating conclusions.

Graduates will gain necessary knowledge and experience required in modern metallurgical industry and related industries.

Mentor of the field of study: prof. dr hab. inż. Mirosław Karbowniczek

View full description of the field of study

Study programme determined by Resolution No. 14/2022 of the AGH UST Senate of 2 March 2022