KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATPAYEV

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Management Board -
Rector of Kazatu named after K.Satpayev
M.M. Begentayev
2024

CURRICULUM
of Educational Program on enrollment for 2024-2025 academic year

Educational program 6B07109 - "Engineering Physics and Materials Science"
Group of educational programs B061 - "Materials Science and Technology"

Form of study: full-time | Duration of study: 4 years | Academic degree: Bachelor of Engineering and Technology

Discipline code	Name of disciplines	Cycle	Total amount in credits	ECTS credit	ABET credit	Total hours	classroom volume of lek/lab/p	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters							
										I course		II course		III course		IV course	
										1 semester	2 semester	3 semester	4 semester	5semester	6 semester	7 semester	8 semester
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																	
M-1. Module of language training																	
LNG 108	Foreign language	GED, UC	5	5	3	150	0/0/3	105	E	5							
LNG 108	Foreign language	GED, UC	5	5	3	150	0/0/3	105	E		5						
LNG 104	Kazakh (russian) language	GED, UC	5	5	3	150	0/0/3	105	E	5							
LNG 104	Kazakh (russian) language	GED, UC	5	5	3	150	0/0/3	105	E		5						
M-2. Module of physical training																	
KFK 101-104	Physical culture	GED, UC	8	8	8	240	0/0/8	120	Difcredit	2	2	2	2				
M-3. Module of information technology																	
CSE 677	Information and communication technologies	GED, UC	5	5	3	150	2/1/0	105	E				5				
M-4. Module of socio-cultural development																	
HUM 137	History of Kazakhstan	GED, UC	5	5	3	150	1/0/2	105	SE		5						
HUM 132	Philosophy	GED, UC	5	5	3	150	1/0/2	105	E				5				
HUM 120	Module of socio-political knowledge (sociology, political	GED, UC	3	3	2	90	1/0/1	60	E				3				
HUM 134	Module of socio-political knowledge (cultural studies,		5	5	3	150	2/0/1	150	E			5					
M-5. Module of anti-corruption culture, ecology and life safety base																	
HUM 136	Fundamentals of anti-corruption culture and law	GED, EC	5	5	3	150	2/0/1	150	E								
MNG 489	Fundamentals of economics and entrepreneurship																
MNG564	Basics of Financial Literacy																
HPP128	Fundamentals of scientific																
CHE 656	Ecology and life safety																
CYCLE OF BASIC DISCIPLINES (BD)																	
M-6. Module of physical and mathematical training																	
MAT 101	Mathematics I	BD, UC	5	5	3	150	1/0/2	105	E	5							
PHY 468	Physics	BD, UC	5	5	3	150	1/1/1	105	E	5							
MAT 102	Mathematics II	BD, UC	5	5	3	150	1/0/2	105	E		5						
M-7. Basic general technical training module																	
CHE495	Chemistry	BD, UC	5	5	3	150	1/1/1*	105	E			5					
M - 8. Materials Science Module																	
PHY533	Fundamentals of materials science	BD, UC	4	4	3	120	2/1/0*	75	E	4							
PHY501	Defects in the Crystal Structure of Materials	BD, UC	5	5	3	150	1/1/1*	105	E	5							
PHY435	Fundamentals of optics	BD, UC	5	5	3	150	2/1/0*	105	E		5						
PHY639	Measurement Theory and Application	PD, UC	5	5	3	150	2/1/0*	105	E				5				
PHY178	Computational Physics	BD, UC	5	5	3	150	1/0/2*	105	E				5				
PHY561	Mechanical properties of materials	BD, UC	6	6	4	180	2/1/1*	120	E			6					
PHY640	Fundamentals of modern physics: atomic and nuclear physics	BD, EC	5	5	3	150	2/0/1/	105	E								
MNG562	Legal regulation of intellectual property						2/0/1/					5					
PHY589	Microstructure of Organic Materials						1/1/1/										
PHY582	Alloy steels and alloys. Cast iron	BD, UC	5	5	3	150	2/1/0*	105	E					5			
PHY590	Corrosion and protection of metal structures	BD, EC	5	5	3	150	2/0/1/	105	E								
MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan						2/0/1/						5				
PHY591	Perspective glasses and glass materials						1/1/1/										
PHY538	Metallography	BD, UC	5	5	3	150	2/1/0*	105	E					5			
PHY641	Carbon and ceramic materials	BD, UC	4	4	3	150	1/0/2*	105	E					4			
PHY592	Structural materials	BD, EC	5	5	3	150	2/0/1/	105	E								
PHY593	Paints and varnishes materials						1/1/1/							5			
PHY495	Physics of Strength and Plasticity						1/1/1/										
PHY584	Chemical-thermal treatment of metals and alloys	PD, UC	5	5	3	150	1/1/1*	105	E							5	
PHY476	Mechanics of Materials	PD, UC	5	5	3	150	2/0/1*	105	E							5	
PHY482	Functional materials	PD, UC	6	6	4	180	2/1/1*	120	E							6	
PHY527	Methods for producing powder materials	PD, UC	5	5	3	150	1/1/1/	105	E							5	
PHY557	Scientific basis for material selection	PD, EC	5	5	3	150	1/1/1/	105	E								5
PHY558	Methods for calculating phase diagrams						1/1/1/										
M - 9. Module of engineering physics																	
PHY555	Probing methods on materials research	PD, UC	5	5	3	150	2/1/0*	105	E					5			

PHY534	Fundamentals of electricity and magnetism	BD, UC	5	5	3	150	2/1/0*	105	E						5		
PHY642	Methods for studying powder and composite materials	BD, EC	6	6	4	180	2/1/1/	120	E							6	
PHY553	Reactor Materials Science						2/1/1/										
PHY554	Physics of Low-Dimensional Systems						2/1/1/										
PHY585	Semiconductor materials	PD, UC	4	4	3	120	2/1/0*	75	E						4		
PHY638	Polymeric material	PD, EC	4	4	3	120	2/0/1/	75	E						4		
PHY549	Vacuum Technology						2/0/1/										
PHY594	Quality control of the materials	PD, UC	6	6	4	180	2/1/1/	120	E							6	
M - 10. Nanotechnology module																	
PHY586	Introduction to nanomaterials	BD, UC	5	5	3	150	1/1/1*	105	E					5			
PHY510	Physics and optics of photovoltaics	BD, EC	5	5	3	150	1/1/1/	105	E						5		
PHY503	Methods of forming the surface nanostructures						1/0/2/										
PHY505	Methods of obtaining and research of nanostructered materials						2/0/1/										
PHY596	Graphene and materials based on it	BD,EC	5	5	3	150	2/0/1/	105	E						5		
CSE831	Fundamentals of Artificial Intelligence						1/0/2/										
PHY511	Computer Modeling in Materials Science (thermocalc)						1/1/1/										
PHY597	Fundamentals of technological processes for the production of nanomaterials	PD, EC	5	5	3	150	1/1/1/	105	E						5		
PHY598	Nanomaterials in electronics						2/0/1/										
PHY431	Advanced materials						1/1/1/										
PHY480	Technologies of obtaining nanomaterials and nanosystems	PD, EC	5	5	3	150	1/1/1/	105	E								5
PHY587	Nanomaterials and nanotechnologies in construction	PD, UC	4	4	3	150	2/0/1*	105	E								
M - 11. R&D module																	
PHY599	Microstructure of Inorganic Materials	PD, EC	5	5	3	150	1/1/1/	105	E								5
PHY560	X-ray diffraction and electron microscopic analysis						1/1/1/										
M - 12. Practice-oriented module																	
AAP173	Training Practice	BD, UC	2	2	2						2						
AAP102	Production practice I	PD, UC	2	2	2								2				
AAP183	Production practice II	PD, UC	3	3	3										3		
M - 13. Module of final attestation																	
ECA109	Writing and defense of the thesis	FA	8	8	8												8
M - 14. Module of additional types of training																	
AAP500	Military affairs	ATT	0														
Total based on UNIVERSITY:				240	158					31	29	28	32	29	31	33	27
										60		60		60		60	

City University of Hong Kong SAR, Hong Kong, People's Republic of China

GE1401	University English	Electives	3								3								
MA1200/MA1300	Calculus and Basic Linear Algebra I/ Enhanced Calculus and Linear Algebra I	Core Courses	3								3								
PHY1201	General Physics I	Core Courses	3								3								
MSE2102	Introduction to Materials Science and Engineering	Core Courses	3								3								
MSE2109	Bonding and Structure of Materials	Core Courses	3								3								
GE2410	English for Engineering[1]	Electives	3									3							
MA1201/MA1301	Calculus and Basic Linear Algebra II/ Enhanced Calculus and Linear Algebra II	Core Courses	3									3							
GE1501	Chinese Civilization – History & Philosophy[1]	Electives	3									3							
PHY1202	General Physics II	Core Courses	3									3							
CHEM1300	Principles of General Chemistry	Electives	3										3						
MSE2104	Mechanical Behaviour of Materials	Core Courses	3										3						
PHY1203	General Physics III	Core Courses	3										3						
GE 1355	Sustainable Energy and Environmental Engineering	Electives	3										3						
GE2105	Popular Culture	Electives	3										3						
MA2172	Applied Statistics for Sciences and Engineering	Electives	3											3					
MSE2107	Measurement Theory and Application	Core Courses	3											3					
MSE4170	Corrosion and Protection of Materials	Electives	3											3					
CS1302	Introduction to Computer Programming	Electives	3											3					
GE 2106	Philosophy and Life: A Dialogue	Electives	3											3					
GE2138	Introduction to Ethics and Public Policy	Electives	3											3					
MSE3244	Design Laboratory	Core Courses	3											3					
MSE3190	Thermodynamics of Materials	Core Courses	3												3				
MSE3195	Kinetics and Phase Transformations	Electives	3												3				
MSE3111	Ceramic Materials	Electives	3												3				
MSE3110	Deformation and Fracture	Core Courses	3												3				
MSE3171	Materials Characterization	Core Courses	3												3				
MSE2106	Quantum Properties of Materials	Core Courses	3												3				
MSE3172	Electronic Properties of Solids	Core Courses	3													3			
MSE4121	Thin Films	Electives	3													3			

MSE4119	Advanced Computational Methods for Materials Science and Engineers	Electives	3													3		
MSE4178	Nanostructures & Nanotechnology	Electives	3													3		
MSE3113	Soft Materials	Core Courses	3													3		
MSE4176	Energy Materials for the Current Century	Electives	3													3		
MSE 2243	Workshop Practice	Core Courses	3													3		
MSE 4714	Special Topics in Materials Science and Engineering I	Electives	3														3	
MSE3169	Materials Testing Techniques	Electives	3														3	
MSE4177	Smart and Functional Materials: Selection and Application	Electives	3														3	
MSE2108	Materials Chemistry	Core Courses	3														3	
MSE4118	Composite	Electives	3														3	
MSE4715	Special Topics in Materials Science and Engineering II	Electives	3														3	
MSE4179	Advanced Materials Characterization	Electives	3															3
MSE3114	Computational Methods for Physicists and Materials Engineers	Core Courses	3															3
MSE5301	Instrumentation for Materials Characterization	Electives	3															3
MSE 4307	Building Materials	Electives	3															3
MSE4116	Dissertation	Core Courses	6															6
										15	12	15	21	18	21	18	18	

Number of credits for the entire period of study									
Cycle code	Cycles of disciplines	Credits							
		required component (RC)			university component (UC)	component of choice (CCH)	Total		
GED	Cycle of general education disciplines	51				5	56		
BD	Cycle of basic disciplines				76	31	176		
PD	Cycle of profile disciplines				34	35			
	Total for theoretical training:	*51*			*110*	*71*	*232*		
FA	Final attestation	8					8		
	TOTAL:						240		

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № 12 " 22 " 04 20 24 y.

Decision of the Educational and Methodological Council of Kaznu named after K.Satpayev. Protocol № 6 " 19 " 04 20 24 y.

Decision of the Academic Council of the Institute M&M. Protocol№ 7 " 27 " 03 20 24 y.

Vice-Rector for Academic Affairs — Uskenbayeva R.K

Director of M&M Institute — Rysbekov K.B.

Head of the MN&EP Department — Kudaibergenov K.K.

Specialty Council representative from — Idrisova T.K.