UNIVERSITY OF PETROŞANI
FACULTY OF MINES

CURRICULUM

(valid starting with the academic year **2026-2027**)

Field: **Mines, Oil and Gas**

Study programme: **Mining Construction Design Engineering**

Duration of studies: **4 semesters**

Form of education: **full-time (IF)**

I. Requirements for obtaining the diploma

120 credits, of which:

- credits for compulsory subjects: **100**
- credits for optional subjects: **20**

10 credits for passing the dissertation examination

II. Course of studies (in number of weeks)

Year	Teaching activities		Exam sessions			Holiday		
	Sem. I	Sem. II	I	V	R	Winter	Inter-semester	Summer
Year I	14	14	3	3	3	3	1	12
Year II	14	14	3	3	3	3	1	-

III. Number of hours per week

	Sem. I	Sem. II
Year I	26	26
Year II	26	26

IV. Dissertation examination

Period for the dissertation examination: June-July session, September session

Content of the dissertation examination:

- Presentation and defence of the dissertation - **10 credits**

V. Method of choosing the optional subjects

One subject is chosen from the package of optional subjects for each semester.

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Mission of the Mining Construction Design Engineering study programme

The mission of the master's study programme Mining Construction Design Engineering (IPCM) is to provide professional training of excellence, integrating the pillars of education, research and technological innovation in line with the requirements of modern education.
The programme is dedicated to training experts and technical leaders able to manage the design, execution, monitoring and protection of underground and surface structures throughout their life cycle — from site organisation and operation to the post-operational stage. By deepening knowledge of geomechanics, numerical modelling and risk assessment, the master's programme Mining Construction Design Engineering prepares specialists capable of making critical decisions under high standards of safety, ethics and sustainability, offering innovative solutions to the complex challenges of the mining and geotechnical sector.

Objectives of the Mining Construction Design Engineering study programme

1) ***Specialisation in design and technical documentation*** by developing the ability to independently prepare feasibility studies and complex technical designs for underground and surface mining construction, in compliance with international standards and the legislation in force.
2) ***Deepening numerical modelling and digitalisation*** through advanced use of simulation methods and computer-aided design software for the analysis of geomechanical behaviour and detailed visualisation of mining infrastructure**.**
3) ***Expertise in geomechanical and stability analysis*** by interpreting the field and laboratory investigations needed to assess rock masses and the stability of underground structures, with a view to proposing corrective and consolidation measures.
4) ***Risk management and implementation of monitoring systems*** by identifying and forecasting major geotechnical and mining risks correlated with the hydrological regime, ensuring the reliability tracking of structures through automated surveillance systems.
5) ***Developing research and innovation capacity*** by initiating development projects that apply advanced scientific methodologies to validate original engineering solutions and to write specialist papers at expert level.
6) ***Integrated project and sustainability management*** by optimising resources throughout the life cycle of the works, integrating occupational health and safety rules, environmental legislation and ethical principles in professional decision-making.

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No.	YEAR I	Subject	Subj.	Semester 1				Semester 2				Credit points		Ei, Ci, Vi		No. of teaching hours per subject			Total individual study hours	Total subject hours
crt.	Subject	code	type	C	S	L	P	C	S	L	P	Sem.1	Sem.2	Sem.1	Sem.2	Lect.*	Appl.**	Total		
1	Applied Geology	UPFMIPCM101	DF	3		2						6		E1		42	28	70	80	150
2	Optional subject OP 11	UPFMIPCM102	DF	3		3						7		E1		42	42	84	91	175
3	Rock Mass Investigation Techniques	UPFMIPCM103	DS	3	2							6		E1		42	28	70	80	150
4	Applied Geomechanics	UPFMIPCM104	DS	3		2						7		E1		42	28	70	105	175
5	Advances in the Use of Explosives in Underground Construction	UPFMIPCM105	DS	2	1	2						4		C1		28	42	70	30	100
6	Geotechnical Risks in Mining Construction	UPFMIPCM106	DS					3	1				5		E2	42	14	56	69	125
7	Stability of Underground Structures	UPFMIPCM107	DS					3	2				7		E2	42	28	70	105	175
8	Computer-Aided Design with Applications in Underground Construction	UPFMIPCM108	DS					2			2		6		E2	28	28	56	94	150
9	Modern Mining Machinery and Equipment	UPFMIPCM109	DS					2	1				4		C2	28	14	42	58	100
10	Professional internship	UPFMIPCM110	DS							10			8		C2	0	140	140	60	200
TOTAL YEAR I				14	3	9	0	10	4	10	2	30	30	7E + 3C		336	392	728	772	1500
												60								

* - Delivery mode: 50% Face to face (FF) and 50% Synchronous online (OS)
** - Delivery mode: 65% Face to face (FF) and 35% Synchronous online (OS)

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No. crt.	YEAR II Subject	Subject code	Subj. type	Semester 3 C	S	L	P	Semester 4 C	S	L	P	Credit points Sem.1	Sem.2	Ei, Ci, Vi Sem.1	Sem.2	No. of teaching hours per subject Lect.*	Appl.**	Total	Total individual study hours	Total subject hours
11	Design of Special Underground Works	UPFMIPCM211	DS	3	2		3					8		E3		42	70	112	88	200
12	Mining Construction Project Management and Economic Evaluation	UPFMIPCM212	DF	3	1		2					8		E3		42	42	84	116	200
13	Reliability Monitoring of Mining Structures	UPFMIPCM213	DF	3		3						7		E3		42	42	84	91	175
14	Optional subject OP 21	UPFMIPCM214	DS	3		3						7		E3		42	42	84	91	175
15	Optional subject OP 22	UPFMIPCM215	DF					1	2				6		E4	14	28	42	108	150
16	Ethics and Academic Integrity	UPFMIPCM216	DC					1	2				4		C4	14	28	42	58	100
17	Internship for dissertation preparation	UPFMIPCM217	DS							12			10		C4	0	168	168	82	250
18	Preparation of the dissertation thesis	UPFMIPCM218	DS							8			10		C4		112	112	138	250
TOTAL year II				12	3	6	5	2	4	20	0	30	30	5E + 3C		196	532	728	772	1500
												60								
Elective subjects																				
19	Environmental Management	UPFMIPCM219	DFA	2		2						3		C3		28	28	56	19	75
20	Assessment and Prevention of Worker Exposure to Specific Risks	UPFMIPCM220	DFA					2		2			3	C4		28	28	56	19	75

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DISTRIBUTION OF HOURS BY SUBJECT GROUPS						
Total lecture hours :			**532**			
Total application hours :			**504**			
Total hours :			**1456**			
Total lecture hours / Total hours (%) :	532	/	1456	x 100		36.54
Total application hours / Total hours (%) :	504	/	1456	x 100		34.62
Total lecture hours / Total application hours (%) :	532	/	504			1.06

SUBJECT GROUPS	No. hours	No. hours/Total hours (%)
Fundamental subjects DF	**364**	**25.00**
Specialisation subjects DS	**1050**	**72.12**
Complementary subjects DC	**42**	**2.88**
Optional subjects DOP	**210**	**14.42**
Elective subjects DFA	**112**	**7.69**

REMARKS : For one credit point, 25 teaching and individual study hours are allocated

LEGEND :

DF – fundamental subject, DS - specialisation subject, DC - complementary subject, DFA - elective subject

C - lecture, S - seminar, L - laboratory, P - project, Apl - application hours

Ei, Ci, Vi - exam, colloquium, verification respectively in semester i, i =1 ÷ 4

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OPTIONAL SUBJECTS				
No.	**Subject code**	**Year of study**	**Subject names**	
2	OP 11	I	Rock Rheology with Applications in Underground Construction	Elasticity and Plasticity in Mining Construction
13	OP 21	II	Risk Assessment in the Execution and Operation of Mining Structures	Mining Risk Assessment and Management
14	OP22	II	Mining Legislation	Legislative and Methodological Foundations of Occupational Safety and Health

Basic group from COR/ISCO-08/ESCO representative of the study programme Mining Construction Design Engineering

2146 Mining engineers, metallurgists and related professionals

Target occupations from the representative COR/ESCO basic group for graduates of the master's programme Mining Construction Design Engineering

Occupation title (COR)	COR code	Similar occupation title (ESCO)	ESCO code	Qualification level
Mining engineering expert	214611	Mine development engineer	2146.6	EQF Level 7 (Master)
Mining design engineer	214624	Mine planning engineer	2146.8	EQF Level 7 (Master)
Specialist inspector, mining engineer	214612	Mining operations engineer	2146.8	EQF Level 7 (Master)
Specialist officer, mining engineer	214613	Mining operations engineer	2146.8	EQF Level 7 (Master)

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Competences for the master's study programme Mining Construction Design Engineering

Professional competences

CP1. Approaches problems critically
CP2. Ensures compliance with safety legislation
CP3. Develops alternative mining methods
CP4. Evaluates mining development projects
CP5 Deals with exceptional circumstances in the mining sector
CP6. Copes with pressure arising from unexpected circumstances
CP7. Generates reconciliation reports
CP8. Manages waste rock
CP9. Manages staff
CP10. Makes independent operational decisions
CP11. Identifies solutions for optimising mining processes
CP12. Maintains mine site plans
CP13. Monitors mining production
CP14. Advises on mining equipment

CP15. Plans mining production
CP16. Prepares scientific reports
CP17. Prepares work reports
CP18. Presents reports
CP19. Supervises mine planning activities
CP20. Supervises mine construction operations
CP21. Supervises staff
CP22. Uses mine planning software

CP23. Applies numerical modelling to rock masses
CP24. Designs complex support structures
CP25. Uses advanced tools in mine design
CP26. performs advanced geomechanical analyses
CP27. assesses the stability of mining works
CP28. Designs works in difficult geological environments
CP29. Interprets data from in situ investigations
CP30. Manages collapse and suffusion risks
CP31. Implements geotechnical monitoring systems
CP32. Builds 3D models of mining infrastructure
CP33. Prepares complex feasibility studies
CP34. Applies consolidation techniques for unstable rock masses
CP35. Monitors environmental factors and the hydrological regime
CP36. Coordinates research and development teams
CP37. Validates technical solutions through computer simulations
CP38. Evaluates the economic efficiency of investments
CP39. applies European standards in mining construction
CP40. Proposes corrective and preventive measures for the identified risks

Transversal competences

CT1. Thinks critically and analyses complex information
CT2. Takes responsibility under conditions of uncertainty
CT3. Respects professional ethics and integrity
CT4. Communicates effectively in specialised technical language
CT5. Presents and argues expert reports

CT6. Works in multidisciplinary and international teams
CT7. Coordinates and negotiates tasks within the team
CT8. Manages own continuous professional development
CT9. Quickly adapts knowledge to new technologies
CT10. Optimises the use of time and material resources
CT11. Solves engineering problems through creative approaches

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CT12. Uses advanced digital collaboration tools
CT13. Shows initiative in identifying project opportunities
CT14. Demonstrates entrepreneurial spirit in the mining sector
CT15. Manages conflict situations and professional stress
CT16. Critically evaluates own performance and training needs
CT17. Writes rigorous technical and scientific documentation
CT18. makes autonomous decisions based on ethical principles
CT19. Promotes a culture of occupational safety and health
CT20. Integrates sustainable development principles into the proposed solutions

Learning outcomes for the master's study programme Mining Construction Design Engineering
Knowledge generated by the learning outcomes for the master's study programme Mining Construction Design Engineering

C1. The student/graduate synthesises and critically integrates advanced theories of geomechanics, rock mechanics and structural engineering needed to analyse rock mass behaviour and substantiate the design of mining structures.
C2. The student/graduate explains and applies the principles of numerical modelling methods and the use of specialised software to simulate the interaction between the rock mass and support structures.
C3. The student/graduate knows and applies national and European legislation, international design standards (Eurocodes) and mining-specific regulations, ensuring compliance with occupational health and safety (OHS) requirements.
C4. The student/graduate forecasts and classifies risks, demonstrating an in-depth understanding of geotechnical and mining risk mechanisms, instability phenomena and the standardised technical terminology used in expert assessments.
C5. The student/graduate defines and interprets the strength and deformability parameters of rock masses, using data from in situ geotechnical investigations and laboratory tests to substantiate technical solutions.
C6. The student/graduate understands and correlates the influence of the hydrological regime and groundwater on the stability of mining works, identifying appropriate drainage and waterproofing measures in complex geological environments.
C7. The student/graduate explains geotechnical and structural monitoring processes, knowing the operating principles of automated data acquisition systems for tracking structural behaviour in real time.
C8. The student/graduate knows and evaluates modern technological solutions for executing excavations and special consolidation works, adapted to the specific conditions of depth and high mining pressures.
C9. The student/graduate identifies and analyses project life cycle management methods, including economic evaluation, resource planning and strategies for minimising environmental impact.
C10. The student/graduate deepens the methodology of applied scientific research, needed to validate innovative engineering solutions and to prepare specialist papers based on rigour and professional ethics.

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Skills generated by the learning outcomes for the master's study programme Mining Construction Design Engineering

A1. The student/graduate prepares feasibility studies and complete technical design documentation for underground and surface mining works, using advanced numerical modelling and choosing optimal support and consolidation solutions.
A2. The student/graduate applies risk analysis techniques and geomechanical expertise to assess the stability of rock masses and mining structures, proposing innovative risk mitigation solutions and real-time monitoring systems.
A3. The student/graduate leads and coordinates investment projects in the mining construction sector, including detailed economic evaluation and the application of modern strategies for managing and optimising execution processes.
A4. The student/graduate carries out research and development activities by applying an advanced scientific methodology, being able to formulate hypotheses, validate complex engineering solutions and write specialist papers or expert reports.
A5. The student/graduate integrates and uses in design the international technical standards and execution rules (Eurocodes relevant to underground construction and geotechnics) to ensure the interoperability, safety and quality of mining works.
A6. The student/graduate makes advanced use of platforms for 3D modelling and detailed visualisation of mining infrastructure, facilitating multidisciplinary collaboration and the detection of design errors through digital simulations.
A7. The student/graduate designs and optimises support systems based on the results of complex geomechanical analyses, adapting technical solutions to the variability of rock properties and to specific mining pressures.
A8. The student/graduate designs and implements automated monitoring networks for the behaviour of rock masses and mining structures, interpreting the data provided by geotechnical instruments to ensure the reliability of structures throughout their life cycle.
A9. The student/graduate prepares mining waste management plans and site rehabilitation strategies, applying waste rock stabilisation techniques and ensuring compliance with environmental legislation and the principles of sustainable development.
A10. The student/graduate performs computer simulations of technological and hydrological flows, using data from in situ investigations to validate the efficiency of drainage systems and excavation methods in difficult geological environments.

Responsibilities generated by the learning outcomes for the master's study programme Mining Construction Design Engineering

RA1. The student/graduate demonstrates learning autonomy on complex issues specific to mining engineering, identifying and accessing relevant bibliographic resources from the international scientific flow in order to keep up to date with technological innovations.
RA2. The student/graduate critically selects and uses bibliographic sources and technical databases specific to underground construction for the theoretical and practical substantiation of technical projects, expert reports and specialist studies.
RA3. The student/graduate takes decision-making responsibility in complex and unpredictable professional contexts, based on a critical evaluation of geomechanical data and rigorous compliance with ethical and legal rules and integrity standards in engineering decision-making.
RA4. The student/graduate ethically evaluates the social and environmental impact of mining projects and makes autonomous decisions under conditions of geotechnical risk and

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uncertainty, while initiating research and development activities to find sustainable technical solutions.
RA5. The student/graduate takes on the role of technical project coordinator, strategically managing the allocated human and financial resources and being directly responsible for technical quality, the safety of the designed structures and compliance with the established execution deadlines.
RA6. The student/graduate initiates continuous learning and applied scientific research, demonstrating the ability to communicate effectively the results of his/her own projects and research through logical and technical argumentation of solutions before experts, authorities and the general public.
RA7. The student/graduate exercises the role of expert in multidisciplinary teams, facilitating collaboration between specialists from related fields and taking responsibility for the coherent integration of technical solutions in complex projects.
RA8. The student/graduate monitors and evaluates the compliance of design and execution activities with occupational safety and health rules, assuming the authority to intervene and propose immediate corrective measures to prevent technical or human accidents.
RA9. The student/graduate manages the ethical and professional risks associated with mining operations in difficult conditions, demonstrating the ability to act independently to protect staff and the environment through scientifically substantiated technical solutions.
RA10. The student/graduate shows entrepreneurial initiative in identifying new development opportunities in the mining construction sector, taking responsibility for developing innovative strategies that increase the competitiveness and efficiency of the coordinated projects.

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