



UNIVERSITY OF MINING AND GEOLOGY "ST. IVAN RILSKI"

SOFIA

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FACULTY OF MINING TECHNOLOGY

## CURRICULUM

VOCATIONAL FIELD:	<b>5.7. Architecture, Construction, and Geodesy</b>
COURSE OF STUDY:	<b>Mine Surveying and Geodesy</b>
EDUCATIONAL AND QUALIFICATION DEGREE:	<b>Master</b>
VOCATIONAL QUALIFICATION:	<b>Regulated Profession of Engineer in Geodesy, Cartography, and Cadastre</b>
FORM OF STUDY:	<b>Full-time</b>
DURATION OF STUDY:	<b>Five years (Ten semesters)</b>

Adopted at a session of the Academic Council of the University of Mining and Geology "St. Ivan Rilski"

Minutes № 11 / 10.07. 2017

HEAD OF DEPARTMENT OF MINE SURVEYING AND GEODESY:

\_\_\_\_\_  
(Assoc. Prof. S. Topalov)

DEAN: \_\_\_\_\_

(Prof. Dr. I. Koprev)

**CURRICULUM**  
**EDUCATIONAL AND QUALIFICATION DEGREE: MASTER**  
**COURSE OF STUDY: MINE SURVEYING AND GEODESY**  
**VOCATIONAL FIELD: 5.7 ARCHITECTURE, CONSTRUCTION, AND GEODESY**

FORM OF STUDY: FULL-TIME  
DURATION OF STUDY: 5 YEARS  
DURATION OF EACH SEMESTER: 15 WEEKS

Year	Semester	No	Course units		Form of control		Teaching hours (weekly)		Overall teaching hours				Individual work	Academic load and individual work	Credits acc. to ECTS		
			Code	Name of the course units (course projects, practical trainings)	exam	CA	L	S	Lectures	Type of seminars						L+S	
										S	Lab	P					
FIRST	First	1	252101	Introduction to Geodesy and Mine Surveying	1	0	3	1	45	15	0	0	60	60	120	4	
		2	361101	Higher Mathematics, Part I (Linear Algebra and Analytical Geometry)	1	0	2	2	30	30	0	0	60	60	120	4	
		3	252102	General Topography	1	0	2	2	30	10	0	20	60	60	120	4	
		4	371102	Introduction to Computer Technologies	1	0	1	2	15	0	30	0	45	45	90	3	
		5	252105	CAD Systems for Topographic and Mine Surveying Modelling	1	0	1	2	15	2	28	0	45	45	90	3	
		6	361105	Descriptive Geometry	1	0	2	2	30	30	0	0	60	60	120	4	
		7	421100	Foreign Language - Optional	0	1	0	2	0	30	0	0	30	30	60	2	
		8	431100	Physical Education and Sports	0	0	0	2	0	0	0	30	30	0	30		
	<b>First semester:</b>					<b>6</b>	<b>1</b>	<b>11</b>	<b>15</b>	<b>165</b>	<b>117</b>	<b>58</b>	<b>50</b>	<b>390</b>	<b>360</b>	<b>750</b>	<b>24</b>
	Second	9	361102	Higher Mathematics, Part II (Mathematical Analysis of the Function of One Variable)	1	0	2	2	30	30	0	0	60	60	120	4	
		10	252103	General Geodesy	1	0	5	3	75	6	0	39	120	120	240	8	
		11	181102	Physics, Part I	1	0	2	2	30	0	30	0	60	60	120	4	
		12	131134	Geology, Mineralogy, and Petrography	1	0	3	1	45	15	0	0	60	60	120	4	
		13	371138	Informatics - Database Management (DBM)	1	0	1	2	15	0	30	0	45	45	90	3	
		14	421100	Foreign Language - Optional	0	1	0	2	0	30	0	0	30	30	60	2	
15		431100	Physical Education and Sports	0	1	0	2	0	0	0	30	30	0	30	2		
<b>Second semester:</b>					<b>5</b>	<b>2</b>	<b>13</b>	<b>14</b>	<b>195</b>	<b>81</b>	<b>60</b>	<b>69</b>	<b>405</b>	<b>375</b>	<b>780</b>	<b>27</b>	
<b>Overall for the first year:</b>					<b>11</b>	<b>3</b>	<b>24</b>	<b>29</b>	<b>360</b>	<b>198</b>	<b>118</b>	<b>119</b>	<b>795</b>	<b>735</b>	<b>1530</b>	<b>51</b>	
	16	371143	Practical Training: CAD Systems	0	1								30	30	60	2	
	17	252104	Practical Training: Geodesy	0	1								72	72	144	5	
<b>Overall for the first year + practical trainings:</b>					<b>11</b>	<b>5</b>							<b>897</b>	<b>837</b>	<b>1734</b>	<b>58</b>	
SECOND	Third	18	361104	Higher Mathematics, Part III (Multivariate Analysis, Differential Equations, and Mathematical Statistics)	1	0	3	2	45	30	0	0	75	75	150	5	
		19	211118	Underground Mining of Mineral Deposits	1	0	2	2	30	30	0	0	60	60	120	4	
		20	181103	Physics, Part II	1	0	2	1	30	0	15	0	45	45	90	3	
		21	151112	Hydrogeology and Engineering Geology	1	0	2	2	30	12	18	0	60	60	120	4	
		22	252106	Engineering Geodesy	1	0	2	2	30	0	10	20	60	60	120	4	
		23	281104	Engineering Mechanics	1	0	2	2	30	30	0	0	60	60	120	4	
		24	421100	Foreign Language - Optional	0	1	0	2	0	30	0	0	30	30	60	2	
		25	431143	Physical Education and Sports	0	0	0	2	0	0	0	30	30		30		
			411300	Philosophical Cycle -optional	0	1*	2*	1*	30*	15*	0*	0*	45*	45*	90*	3*	
	<b>Third semester:</b>					<b>6</b>	<b>1</b>	<b>13</b>	<b>15</b>	<b>195</b>	<b>132</b>	<b>43</b>	<b>50</b>	<b>420</b>	<b>390</b>	<b>810</b>	<b>26</b>
	Fourth	26	252107	Remote Sensing Methods for Geodetic and Mine Surveying Measurements	1	0	2	2	30	0	0	30	60	60	120	4	
		27	111118	Mineral Deposits	1	0	2	1	30	0	15	0	45	45	90	3	
		28	252108	Mine Surveying in Underground Mining of Deposits	1	0	4	2	60	20	0	10	90	90	180	6	
		29	252110	Mathematical Processing of Geodetic and Mine Surveying Measurements, Part I	1	0	3	2	45	0	0	30	75	75	150	5	
		30	252111	Geographic Information Systems (GIS), Part I	1	0	2	2	30	0	30	0	60	60	120	4	
31		341103	Electrical Engineering and Electronics	1	0	2	1	30	0	15	0	45	45	90	3		
32		431100	Physical Education and Sports	0	1	0	2	0	0	0	30	30	0	30	2		
<b>Fourth semester:</b>					<b>6</b>	<b>1</b>	<b>15</b>	<b>12</b>	<b>225</b>	<b>20</b>	<b>60</b>	<b>100</b>	<b>405</b>	<b>375</b>	<b>780</b>	<b>27</b>	
<b>Overall for the second year:</b>					<b>12</b>	<b>2</b>	<b>28</b>	<b>27</b>	<b>420</b>	<b>152</b>	<b>103</b>	<b>150</b>	<b>825</b>	<b>765</b>	<b>1590</b>	<b>53</b>	
	33	252109	Practical training: Mine Surveying in Underground Mining of Deposits	0	1								102	102	204	7	
<b>Overall for the second year + practical trainings:</b>					<b>12</b>	<b>3</b>							<b>927</b>	<b>867</b>	<b>1794</b>	<b>60</b>	

Year	Semester	No	Course units		Form of control		Teaching hours (weekly)		Overall teaching hours				Individual work	Academic load and individual work	Credits acc. to ECTS		
			Code	Name of the course units (course projects, practical trainings)	exam	CA	L	S	Lectures	Type of seminars						L+S	
										S	Lab	P					
THIRD	Fifth	34	252112	Higher Geodesy, Part I	1	0	3	3	45	6	0	39	90	90	180	6	
		35	231121	Construction of Underground Facilities	1	0	2	1	30	15	0	0	45	45	90	3	
		36	252113	Numerical Methods for Image Processing	1	0	2	2	30	0	30	0	60	60	120	4	
		37	252114	Fundamentals of Remote Sensing	1	0	2	2	30	0	30	0	60	60	120	4	
		38	221116	Opensact Mining of Minerals	1	0	2	2	30	30	0	0	60	60	120	4	
		39	252115	Geographic Information Systems (GIS), Part II	1	0	2	2	30	0	30	0	60	60	120	4	
		40	252116	Practical training: Mine Surveying in Underground Mining of Deposits	0	1	0	2	0	30	0	0	30	30	60	2	
	<b>Fifth semester:</b>					<b>6</b>	<b>1</b>	<b>13</b>	<b>14</b>	<b>195</b>	<b>81</b>	<b>90</b>	<b>39</b>	<b>405</b>	<b>405</b>	<b>810</b>	<b>27</b>
	Sixth	41	252117	Mine Surveying in Mine Construction	0	1	1	1	15	10	0	5	30	30	60	2	
		42	252118	Higher Geodesy, Part II	1	0	3	3	45	6	0	39	90	90	180	6	
		43	252119	Fundamentals of Photogrammetry	1	0	2	2	30	0	30	0	60	60	120	4	
		44	252120	Applications of Interpretative Remote Sensing Measurements	1	0	2	2	30	0	30	0	60	60	120	4	
		45	252121	Global Navigational Satellite Systems (GNSS), Part I	1	0	2	2	30	0	0	30	60	60	120	4	
		46	252122	Cartography	1	0	2	2	30	0	0	30	60	60	120	4	
47		261101	Mining Aerology	1	0	2	1	30	10	5	0	45	45	90	3		
<b>Sixth semester:</b>					<b>6</b>	<b>1</b>	<b>14</b>	<b>13</b>	<b>210</b>	<b>26</b>	<b>65</b>	<b>104</b>	<b>405</b>	<b>405</b>	<b>810</b>	<b>27</b>	
<b>Overall for the third year:</b>					<b>12</b>	<b>2</b>	<b>27</b>	<b>27</b>	<b>405</b>	<b>107</b>	<b>155</b>	<b>143</b>	<b>810</b>	<b>810</b>	<b>1620</b>	<b>54</b>	
	48	252123	Practical training: Survey Grids, Geodetic Networks, and Global Navigational Satellite Systems	0	1								72	72	144	5	
	49	252124	Practical training: Photogrammetry, Part I	0	1								30	30	60	2	
<b>Overall for the third year + practical training:</b>					<b>12</b>	<b>4</b>							<b>912</b>	<b>912</b>	<b>1824</b>	<b>61</b>	
FOURTH	Seventh	50	252125	Analytical and Digital Photogrammetry	1	0	2	2	30	0	30	0	60	60	120	4	
		51	252126	Global Navigational Satellite Systems (GNSS), Part II	1	0	2	2	30	0	0	30	60	60	120	4	
		52	252127	Cadastre	1	0	3	3	45	0	45	0	90	90	180	6	
		53	252128	Development Planning	1	0	2	2	30	0	30	0	60	60	120	4	
		54	252129	Practical training: Mine Surveying in Opensact Mining of Minerals	1	0	4	2	60	30	0	0	90	90	180	6	
		55	252131	Geometry (Cartography) of Mineral Deposits	1	0	3	2	45	30	0	0	75	75	150	5	
		56	271113	Economics and Management	1	0	3	1	45	15	0	0	60	60	120	4	
	<b>Seventh semester:</b>					<b>7</b>	<b>0</b>	<b>19</b>	<b>14</b>	<b>285</b>	<b>75</b>	<b>105</b>	<b>30</b>	<b>495</b>	<b>495</b>	<b>990</b>	<b>33</b>
<b>ACADEMIC LOAD FROM THE FIRST TO THE SEVENTH SEMESTER:</b>					<b>42</b>	<b>7</b>	<b>98</b>	<b>97</b>	<b>1470</b>	<b>532</b>	<b>481</b>	<b>442</b>	<b>2925</b>	<b>2805</b>	<b>5730</b>	<b>191</b>	
<b>PRACTICAL TRAININGS FROM THE FIRST TO THE SEVENTH SEMESTER:</b>					<b>0</b>	<b>5</b>							<b>306</b>	<b>306</b>	<b>612</b>	<b>21</b>	
<b>OVERALL TEACHING HOURS FROM THE FIRST TO THE SEVENTH SEMESTER:</b>					<b>42</b>	<b>12</b>							<b>3231</b>	<b>3111</b>	<b>6342</b>	<b>212</b>	

## Specialisation: Mine Surveying

Year	Semester	№	Course units		Form of control		Teaching hours (weekly)		Overall teaching hours				Individual work	Academic load and individual	Credits acc. to ECTS		
			Code	Name of the course units (course projects, practical trainings)	exam	CA	L	S	Lectures	Type of seminars						L+S	
										S	Lab	P					
FOURTH	Eighth	57	252132	Rock Movement	1	0	3	2	45	30	0	0	75	75	150	5	
		58	252133	Close-Range Photogrammetry for Special-Purpose Applications	1	0	2	2	30	0	30	0	60	60	120	4	
		59	252134	Vertical Planning	1	0	2	2	30	0	30	0	60	60	120	4	
		60	261121	Technical Safety	1	0	2	2	30	6	24	0	60	60	120	4	
		61	261105	Ecology and Environmental Protection	1	0	2	2	30	14	16	0	60	60	120	4	
		62	252137	Course project: Development Planning	0	1	0	4	0	0	0	60	60	60	120	4	
		63	252138	Course project: Rock Movement	0	1	0	3	0	0	45	0	45	45	90	3	
<b>Eighth semester:</b>					<b>5</b>	<b>2</b>	<b>11</b>	<b>17</b>	<b>165</b>	<b>50</b>	<b>145</b>	<b>60</b>	<b>420</b>	<b>420</b>	<b>840</b>	<b>28</b>	
<b>Overall for the fourth year:</b>					<b>12</b>	<b>2</b>	<b>30</b>	<b>31</b>	<b>450</b>	<b>125</b>	<b>250</b>	<b>90</b>	<b>915</b>	<b>915</b>	<b>1830</b>	<b>61</b>	
		64	252139	Practical training: Photogrammetry, Part II and	0	1						72	72	144	5		
		65	252130	Practical training: Mine Surveying in Opensact Mining of Minerals	0	1						30	30	60	2		
<b>Overall for the fourth year + practical trainings:</b>					<b>12</b>	<b>4</b>							<b>1017</b>	<b>1017</b>	<b>2034</b>	<b>68</b>	
FIFTH	Ninth	66	252140	Specialised Cadaster in Geodesy and Mine Surveying	1	0	2	2	30	0	0	30	60	60	120	4	
		67	252141	Geo-Cybernetics	1	0	2	3	30	0	0	45	75	75	150	5	
		68	252135	Gyroscopic Survey	1	0	2	2	30	0	0	30	60	60	120	4	
		69		Optional module 1	1	0	2	2	30	0	30	0	60	60	120	4	
			212212	Rock Mechanics													
			252236	Mine Geometry and Reserve Management													
		70		Optional module 2	1	0	2	2	30	0	30	0	60	60	120	4	
			252242	Rock Movement, Part II													
			282210	Basin Mechanics													
		71	252143	Course project: Vertical Planning	0	1	0	4	0	0	0	60	60	60	120	4	
	72	252144	Course project: Geometry (Cartography) of Mineral Deposits	0	1	0	2	0	30	0	0	30	30	60	2		
	73	252145	Course project: Topographic Mapping	0	1	0	3	0	0	0	45	45	45	90	3		
	<b>Ninth semester:</b>					<b>5</b>	<b>3</b>	<b>10</b>	<b>20</b>	<b>150</b>	<b>30</b>	<b>60</b>	<b>210</b>	<b>450</b>	<b>450</b>	<b>900</b>	<b>30</b>
	Tenth	74	252146	Pre-diploma production practice	0	1						120	120	240	8		
		75		Diploma thesis preparation and defence											15		
<b>Tenth semester:</b>					<b>0</b>	<b>1</b>						<b>120</b>	<b>120</b>	<b>240</b>	<b>23</b>		
<b>Overall for the fifth year:</b>					<b>5</b>	<b>4</b>	<b>10</b>	<b>20</b>	<b>150</b>	<b>30</b>	<b>60</b>	<b>210</b>	<b>570</b>	<b>570</b>	<b>1140</b>	<b>53</b>	
<b>ACADEMIC LOAD FOR THE FULL COURSE OF STUDY:</b>					<b>52</b>	<b>12</b>	<b>119</b>	<b>134</b>	<b>1785</b>	<b>612</b>	<b>686</b>	<b>712</b>	<b>3795</b>	<b>3675</b>	<b>7470</b>	<b>249</b>	
<b>PRACTICAL TRAININGS FOR THE FULL COURSE OF STUDY:</b>					<b>0</b>	<b>3</b>						<b>528</b>	<b>528</b>	<b>1056</b>	<b>36</b>		
<b>OVERALL FOR THE FULL COURSE OF STUDY:</b>					<b>52</b>	<b>15</b>						<b>4323</b>	<b>4203</b>	<b>8526</b>	<b>300</b>		

Abbreviations:

CA - continuous assessment; L - lectures; Lab - laboratory seminars; S - seminars; P - practical seminars

### Parameters of the Curriculum

Overall teaching hours for the full course of study: 4323 teach. hrs.  
 Academic load:: 3795 teach. hrs.  
 lectures: 1785 teach. hrs.  
 seminars: 2010 teach. hrs.  
 Extracurricular load (practical training: 528 teach. hrs.  
 Individual work 4203  
 Number of exams per course of study: 52  
 Items of continuous assessment: 20  
 Credit accumulated: 300

## Specialisation: Geodetic Surveillance of the Earth

Year	Semester	№	Course units		Form of control		Teaching hours (weekly)		Overall teaching hours				Individual work	Academic load and individual	Credits acc. to ECTS		
			Code	Name of the course units (course projects, practical trainings)	exam	CA	L	S	Lectures	Type of seminars						L+S	
										S	Lab	P					
FOURTH	Eighth	57	252147	Mathematical Processing of Geodetic and Mine Surveying Measurements, Part II	1	0	2	2	30	6	24	0	60	60	120	4	
		58	252133	Close-Range Photogrammetry for Special-Purpose Applications	1	0	2	2	30	0	30	0	60	60	120	4	
		59	252134	Vertical Planning	1	0	2	2	30	0	30	0	60	60	120	4	
		60	0	Geodetic Astronomy and Space Geodesy	0	0	2	2	30	0	30	0	60	60	120	4	
		61	142142	General Geophysics	1	0	2	2	30	0	30	0	60	60	120	4	
		62	142143	Experimental Methods in Geophysics, Part I	1	0	2	2	30	0	30	0	60	60	120	4	
		63	252137	Course project: Development Planning	0	1	0	4	0	0	0	60	60	60	120	4	
		64		Optional module	0	1	0	3	0	0	30	0	30	30	60	2	
				252249	Course project: Time Series Analysis												
				252253	Course project: Deformation Analysis												
		252254	Course project: Geoid Determination														
<b>Eighth semester:</b>					<b>5</b>	<b>2</b>	<b>12</b>	<b>19</b>	<b>180</b>	<b>6</b>	<b>204</b>	<b>60</b>	<b>450</b>	<b>450</b>	<b>900</b>	<b>30</b>	
<b>Overall for the fourth year:</b>					<b>5</b>	<b>2</b>	<b>12</b>	<b>19</b>	<b>180</b>	<b>6</b>	<b>204</b>	<b>60</b>	<b>450</b>	<b>450</b>	<b>900</b>	<b>30</b>	
		65	252139	Practical training: Photogrammetry, Part II and Remote Sensing Research	0	1						72	72	144	5		
		66	252130	Practical training: Mine Surveying in Opensact Mining of Minerals	0	1						30	30	60	2		
<b>Overall for the fourth year + practical trainings:</b>					<b>5</b>	<b>4</b>						<b>1047</b>	<b>1047</b>	<b>2094</b>	<b>70</b>		
FIFTH	Ninth	67	252140	Specialised Cadaster in Geodesy and Mine Surveying	1	0	2	2	30	0	0	30	60	60	120	4	
		68	252150	Radiometric Methods for Remote Sensing	1	0	2	2	30	0	30	0	60	60	120	4	
		69	252158	Geo-Dynamics	1	0	2	2	30	0	30	0	60	60	120	4	
		70	142144	Experimental Methods in Geophysics, Part II	1	0	2	2	30	0	30	0	60	60	120	4	
		71		Optional module	1	0	2	2	30	0	30	0	60	60	120	4	
				252251	The Earth's Gravitational Field and Geodetic Reference Systems												
				252252	Geoid Determination and Time Series of the Earth's Gravitational Field												
		72	252143	Course project: Vertical Planning	0	1	0	4	0	0	0	60	60	60	120	4	
		73	252144	Course project: Geometry (Cartography) of Mineral Deposits	0	1	0	2	0	30	0	0	30	30	60	2	
		74	0	Course project: Topographic Mapping	0	1	0	3	0	0	0	45	45	45	90	3	
<b>Ninth semester:</b>					<b>5</b>	<b>3</b>	<b>10</b>	<b>19</b>	<b>150</b>	<b>30</b>	<b>120</b>	<b>135</b>	<b>435</b>	<b>435</b>	<b>870</b>	<b>29</b>	
	Tenth	75	252146	Pre-diploma production practice	0	1						120	120	240	8		
		76		Diploma thesis preparation and defence											15		
<b>Tenth semester:</b>					<b>0</b>	<b>1</b>						<b>120</b>	<b>120</b>	<b>240</b>	<b>23</b>		
<b>Overall for the fifth year:</b>					<b>5</b>	<b>4</b>	<b>10</b>	<b>19</b>	<b>150</b>	<b>30</b>	<b>120</b>	<b>135</b>	<b>555</b>	<b>555</b>	<b>1110</b>	<b>52</b>	
<b>ACADEMIC LOAD FOR THE FULL COURSE OF STUDY</b>					<b>53</b>	<b>12</b>	<b>120</b>	<b>134</b>	<b>1800</b>	<b>568</b>	<b>805</b>	<b>637</b>	<b>3810</b>	<b>3690</b>	<b>7500</b>	<b>250</b>	
<b>PRACTICAL TRAININGS FOR THE FULL COURSE OF STUDY:</b>					<b>0</b>	<b>8</b>						<b>528</b>	<b>528</b>	<b>1056</b>	<b>36</b>		
<b>OVERALL FOR THE FULL COURSE OF STUDY:</b>					<b>53</b>	<b>20</b>						<b>4338</b>	<b>4218</b>	<b>8556</b>	<b>301</b>		

### Parameters of the Curriculum

Overall teaching hours for the full course of study:	4338 teach. hrs.
Academic load::	3810 teach. hrs.
lectures:	1800 teach. hrs.
seminars:	2010 teach. hrs.
Extracurricular load (practical training:	528 teach. hrs.
Individual work	4218
Number of exams per course of study:	53
Items of continuous assessment:	20
Credit accumulated:	301









