DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

1. GENERAL INFORMATION ON THE STUDY PROGRAMME							
1.1. Name of the study programme	Geology						
1.2. Provider of the study programme	Faculty of Science						
1.3. Type of study programme	Vocational study programme ☐			University study programme **X**			
1.4. Level of study programme	Undergraduate **X**	Graduate ☐		Integrated ☐		Postgraduate specialist ☐	
1.5. Manner of implementation of the study programme	Classical **X**	Mixed (classical + online) ☐		Online in entirety ☐			
1.6. Academic/vocational title earned at completion of study	Bachelor of Science in Geology						
1.7. Total number of ECTS credits	Before the change	180		After the change	180		
1.8. Faculty Council decision on acceptance of changes and additions (enclose)							
1.9. Volume of changes and additions to the study programme	Number of ECTS credits of the unchanged part of the programme:	159					
	Number of ECTS credits of the changed part of the programme:	21					
1.10. Ordinal number of changes and additions to the study programme:		1.11. Estimate of the percentage of changes and additions to the study programme	Less than 20% **X** More than 20% and less than 40% ☐ More than 40% ☐				

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Table 1. Description of changes and additions to the study programme

What changes are made/What additions are made	Number of ECTS credits of the course being changes	Before the change	After the change	Explanation of the change
Compulsory course **Geological mapping** at 3rd year of Undergraduate study of Geology is discontinued in 2009.	-8	8	0	The course is substituted by two courses; Geological mapping I and Geological mapping II, which are being taught in winter and summer semester, respectively.
New compulsory course **Geological mapping I** is introduced in 2009 as a substitute of previous Geological Mapping course at the 3rd year of Undergraduate study of Geology.	+6	0	6	The course is being taught in winter semester.
New compulsory course **Geological mapping II** is introduced in 2009 as a substitute of previous Geological Mapping course at the 3rd year of Undergraduate study of Geology.	+3	0	3	The course is being taught in summer semester.
Compulsory course **Geology fieldwork III** at the 3rd year of Undergraduate study of Geology is discontinued in 2009.	-9	9	0	The course is divided into two to accommodate two lecturers and separate training fields, in External and Internal Dinarides, respectively.
New compulsory course **Geology fieldwork IIIA** is introduced in 2009.	+2	0	2	The course Geology fieldwork IIIA is introduced in 2009 as a substitute of previous Geology Fieldwork course at the 3rd year of Undergraduate study of Geology.
New compulsory course **Geology fieldwork IIIB** is introduced in 2009.	+7	0	7	The course Geology fieldwork IIIB is introduced in 2009 as a substitute of previous Geology Fieldwork course at the 3rd year of Undergraduate study of Geology.
Compulsory course **Basin analysis**, taught at 3rd year of Undergraduate study of Geology is discontinued in 2010.	-5	5	0	The course is partly substituted by the course Analysis and interpretation of facies.
New compulsory course **Analysis and interpretation of facies** at 3rd year of Undergraduate study of Geology is introduced in 2010.	+5	0	5	The course is introduced as partial substitute of Basin analysis, to accommodate students' needs for better understanding of facies.

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Compulsory course **Structural geology and tectonics**, taught at 3rd year of Undergraduate study of Geology has corrected ECTS credits in 2009	+1	4	5	Corrections in ECTS credits is made to balance the courses.
Compulsory course **Software in geology**, taught at 3rd year of Undergraduate study of Geology has corrected ECTS credits in 2009.	+1	4	5	Corrections in ECTS credits is made to balance the courses.
Compulsory course at 2nd year of Undergraduate study of Geology **Sistematic paleontology** is discontinued in 2012.	-7	7	0	Kolegij je zamijenjen kolegijima Paleontologija beskralježnjaka (ECTS 4) i Paleontologija kralježnjaka (ECTS 3)
New compulsory course **Invertebrate Paleontology** is introduced at 2nd year of Undergraduate study of Geology in 2012.	+4	0	+4	Kolegij djelomično zamjenjuje ukinuti kolegij Sistematska paleontologija.
New compulsory course **Vertebrate Paleontology** is introduced at 2nd year of Undergraduate study of Geology in 2012.	+3	0	+3	Kolegij djelomično zamjenjuje ukinuti kolegij Sistematska paleontologija.
Elective courses at the 3rd year of Undergraduate study of Geology has corrected ECTS credits in 2009.	-2	6	4	Corrections in ECTS credits is made to balance the courses.

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Table 2. Description of the new course or the course to which changes and additions are made

1. COURSE DECRIPTION – GENERAL INFORMATION			
1.1. Course teacher	Vladimir Tomić, senior lecturer	1.6. Year of study	3rd
1.2. Name of the course	Geological mapping I	1.7. Credit value (ECTS)	6
1.3. Associate teachers		1.8. Type of instruction (number of hours L+S+E+e-learning)	15+0+90+0
1.4. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.9. Expected enrolment in the course	30-35
1.5. Status of the course	Compulsory	1.10. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	

2. COURSE DESCRIPTION			
2.1. Course objectives	Learning how to use geologica maps and make new geological maps.		
2.2. Enrolment requirements and required entry competences for the course	Pass all exames of previous years of study		
2.3. Learning outcomes at the level of the study programme to which the course contributes	Educating students for spatial understanding of geological structures and their presentation on geological maps, providing skills for understanding of geological composition of individual territories as well as skills for interpretation of geological evolution of the territories. Skills for integration of all geological knowledge on studied areas.		
2.4. Expected learning outcomes at the level of the course (4-10 learning outcomes)	Mastering reading geological maps, competences for consstruction of geological sections and 3-D diagrams, writing explanatory books of geological maps, mastering field geological mapping.		
2.5. Course content broken down in detail by weekly class schedule (syllabus)	Introduction and history of geological mapping. Types of geological maps. Relations between rocks: structures,textures and tectonical movements, thickness of divided geological units. Recognotion of geological structures on the geological maps and on the field. Graphical presentation geological structures (profiles, diagrams). Preparations for geological mapping (fotogeology, remote sensing). Field work. Cabinet work (analysis of the rocks, geological colums and profiles, explanatory notes). Special maps.		
2.6. Type of instruction	x☐ lectures ☐ seminars and workshops x☐ exercises ☐ online in entirety x☐ mixed e-learning ☐ field work	x☐ independent study ☐ multimedia and the internet ☐ laboratory ☐ work with the mentor ☐ (other)	2.7. Comments:
2.8. Student responsibilities	Regular attending to lectures and successful passing all excersises		

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2.9. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)*:*	Class attendance	**1**	Research		Practical training	
	Experimental work		Report			
	Essay		Seminar essay		(Other--describe)	
	Tests	**2**	Oral exam		(Other—describe)	
	Written exam	3	Project		(Other—describe)	
2.1. Grading and evaluation of student work over the course of instruction and at a final exam	Successful passing exsercise and obligatory programs.					

2.2. Required literature (available at the library and via other media)	**Title**	**Number of copies at the library**	**Availability via other media**
	Bahun, S.: Geološko kartiranje. Školska knjiga, Zagreb,1993.		
	Barnes, J.W. & Lisle, R.J: Basic Geological Mapping (fourth edition). John Wiley & Sons, Ltd, England, 2004.		
	Bennison, G.M. & Moseley, K.A.: An Introduction to Geological Structures & Maps. Arnold, a member of the Hodder Headline Group, London, 1997.		
	Bolton, T. & Proudlove, P.: Geological Maps. Cambridge Univ. Press, 1989.		
	Butler,B:C:M. & Bell, J.D.:Interpretation of Geological Maps. Longman Scientific & Technical, 1988.		

2.12. Optional literature (at the time of the submission of the study programme proposal)	Dimitrijević, M.: Geološko kartiranje. ICS, Beograd, 1978. Powell, D.: Interpretation of Geological Structures Trough Maps (an introductory practical manual). Longman Scientific & Technical, Group UK Ltd., 1994.
2.13. Methods of monitoring quality that ensure acquisition of exit competences	Tests and written and oral exam

1. COURSE DECRIPTION – GENERAL INFORMATION			
1.3. Course teacher	Josip Halamić, associate professor	1.11. Year of study	3rd
1.4. Name of the course	Geological Mapping II	1.12. Credit value (ECTS)	3

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1.4. Associate teachers		1.13. Type of instruction (number of hours L+S+E+e-learning)	15+0+30+0
1.5. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.14. Expected enrolment in the course	25
1.6. Status of the course	Compulsory	1.15. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	1

2. COURSE DESCRIPTION			
2.10. Course objectives	Adopting of competences of interpretation and construction of geological maps		
2.11. Enrolment requirements and required entry competences for the course	Completed all courses in geology on 1st and 2nd years of study and Geological mapping I (attended).		
2.12. Learning outcomes at the level of the study programme to which the course contributes	Learn how to use geological maps and make new geological maps.		
2.13. Expected learning outcomes at the level of the course (4-10 learning outcomes)	1. Programming of geological mapping 2. Interpretation of geological maps 3. Construction and making of the geological maps 4. Construction and making of the geological profiles		
2.14. Course content broken down in detail by weekly class schedule (syllabus)	1. Examination of general geological knowledge 2. Topographic maps 3. – 7. Interpretation of geological maps 8. Spatial distribution of geological units 9. Lithostratigraphic nomenclaturethe 10. Guidelines for Geological map of Croatia 1:50 000 11. Identification of geological structures – construction of geological profiles 12. GIS technology as a tool for construction of geological maps 13. Geological databases 14. Preparing for the fieldwork		
2.15. Type of instruction	x☐ lectures x☐ seminars and workshops x☐ exercises ☐ online in entirety ☐ mixed e-learning x☐ field work	x☐ independent study ☐ multimedia and the internet ☐ laboratory ☐ work with the mentor ☐ (other)	2.16. Comments:
2.17. Student responsibilities	Preparing of field geological map on the basis of field exercises		

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2.18. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)*:*	Class attendance	0,2	Research		Practical training	1,5
	Experimental work		Report			
	Essay		Seminar essay	0,3	(Other--describe)	
	Tests		Oral exam	0,5	(Other—describe)	
	Written exam	0,5	Project		(Other—describe)	
2.3. Grading and evaluation of student work over the course of instruction and at a final exam	Evaluation through the practical work and final exam.					

2.4. Required literature (available at the library and via other media)	**Title**	**Number of copies at the library**	**Availability via other media**
	Bahun, S. (1993): Geološko kartiranje	10	
	Dimitrijević, M. (1978): Geološko kartiranje	2	
	Freeman, T. (2005): Procedures in field geology.- Blackwell.	1	
	Compton, R.R. (1985): Geology in the field.- John Wiley & Sons.	1	

2.14. Optional literature (at the time of the submission of the study programme proposal)	
2.15. Methods of monitoring quality that ensure acquisition of exit competences	Monitoring student's performances during exercises and completing obligatory programs.

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1. COURSE DECRIPTION – GENERAL INFORMATION			
1.5. Course teacher	Vladimir Tomić, senior lecturer	1.16. Year of study	3rd
1.6. Name of the course	Field course in Geology IIIA	1.17. Credit value (ECTS)	2
1.5. Associate teachers	Bruno Tomljenović, associate professor, Andrea Bačani, professor	1.18. Type of instruction (number of hours L+S+E+e-learning)	0+0+30+0
1.6. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.19. Expected enrolment in the course	30-35
1.7. Status of the course	Compulsory	1.20. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	

2. COURSE DESCRIPTION			
2.19. Course objectives	Learn students how to use geological maps, hydrogeological and structural data.		
2.20. Enrolment requirements and required entry competences for the course	Involvement in courses Geological mapping I, Hydrogeology and Structural geology and tectonics		
2.21. Learning outcomes at the level of the study programme to which the course contributes	Mastering the use of geological maps. Getting knowledge to solve practical problems important for watersupply. Analysis and interpretation of structural/tectonic history of the region based on collected data together with data presented on published geological maps.		
2.22. Expected learning outcomes at the level of the course (4-10 learning outcomes)	1. Spatial orientation in the field 2. Reading of the topographic maps in the filed 3. Independently leading of the fieldbook 4. Teamwork 5. Construction of the geological map in the field		
2.23. Course content broken down in detail by weekly class schedule (syllabus)	1. Field introduction 2. Individual work in field and camp 3. Recognition and descriptive analysis of deformational structures in regions composed of crystalline basement (metamorphic and igneous) and in sedimentary rocks. 4. Analysis and interpretation of structural/tectonic history of the region 5. Solving practical problems important for watersupply		
2.24. Type of	☐ lectures	☐ independent study	2.25. Comments:

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instruction	☐ seminars and workshops ☐ exercises ☐ online in entirety ☐ mixed e-learning x☐ field work	☐ multimedia and the internet ☐ laboratory ☐ work with the mentor ☐ (other)	

2.26. Student responsibilities	Independent work on geological map of specific area, fieldbook preparation					
2.27. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)*:*	Class attendance		Research		Practical training	7
	Experimental work		Report			
	Essay		Seminar essay		(Other--describe)	
	Tests		Oral exam		(Other—describe)	
	Written exam		Project		(Other—describe)	

2.5. Grading and evaluation of student work over the course of instruction and at a final exam			
2.6. Required literature (available at the library and via other media)	**Title**	**Number of copies at the library**	**Availability via other media**
	Bahun, S. (1993): Geološko kartiranje	10	
	Dimitrijević, M. (1978): Geološko kartiranje	2	
	Freeman, T. (2005): Procedures in field geology.- Blackwell.	1	
	Compton, R.R. (1985): Geology in the field.- John Wiley & Sons.	1	
2.16. Optional literature (at the time of the submission of the study programme proposal)	Korbar et al. (2012): Guidelines for the construction of Basic geological map of the Republic of Croatia 1:50 000.		
2.17. Methods of monitoring quality that ensure acquisition of exit competences	Monitoring student's performance and completion of tasks during the field work.		

1. COURSE DECRIPTION – GENERAL INFORMATION				
1.7. Course teacher	Josip Halamić, associate professor	1.21.	Year of study	3rd
1.8. Name of the course	Field course in Geology IIIB	1.22. (ECTS)	Credit value	7
1.6. Associate teachers	Ladislav Palinkaš, professor, Ervin	1.23.	Type of	0+0+105+0

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	Mrinjek, assistant professor	instruction (number of hours L+S+E+e-learning)	
1.7. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.24. Expected enrolment in the course	25
1.8. Status of the course	Compulsory	1.25. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	

2. COURSE DESCRIPTION						
2.28. Course objectives	Obtaining skills for construction of geological maps, applications of acquired knowledge on geology of mineral deposits and analyses and interpretation of facies.					
2.29. Enrolment requirements and required entry competences for the course	Involvement in courses Geological mapping II, Geology of mineral deposits and Analysis and interpretation of facies					
2.30. Learning outcomes at the level of the study programme to which the course contributes	Mastering the use of geological maps and skills to make new geological maps and interpretations of mineral deposits and sedimentary facies					
2.31. Expected learning outcomes at the level of the course (4-10 learning outcomes)	1. Spatial orientation in the field 2. Reading of the topographic maps in the filed 3. Independently leading of the fieldbook 4. Teamwork 5. Construction of the geological map in the field					
2.32. Course content broken down in detail by weekly class schedule (syllabus)	1. Field introduction 2. Individual work in field and camp 3. Introduction to ore bodies structures 4. Introduction to structure of sedimentary rocks 5. Sedimentological logging					
2.33. Type of instruction	☐ lectures ☐ seminars and workshops ☐ exercises ☐ online in entirety ☐ mixed e-learning x☐ field work	☐ independent study ☐ multimedia and the internet ☐ laboratory ☐ work with the mentor ☐ (other)	2.34. Comments:			
2.35. Student responsibilities	Independent work on geological map of specific area					
2.36. Screening of student's work (specify the	Class attendance		Research		Practical training	7
	Experimental work		Report			

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proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)*:*	Essay		Seminar essay		(Other--describe)	
	Tests		Oral exam		(Other—describe)	
	Written exam		Project		(Other—describe)	
2.7. Grading and evaluation of student work over the course of instruction and at a final exam	Evaluation of the final geological map of targeted area.					

2.8. Required literature (available at the library and via other media)	**Title**	**Number of copies at the library**	**Availability via other media**
	Bahun, S. (1993): Geološko kartiranje	10	
	Dimitrijević, M. (1978): Geološko kartiranje	2	
	Freeman, T. (2005): Procedures in field geology.- Blackwell.	1	
	Compton, R.R. (1985): Geology in the field.- John Wiley & Sons.	1	

2.18. Optional literature (at the time of the submission of the study programme proposal)	Korbar et al. (2012): Guidelines for the construction of Basic geological map of the Republic of Croatia 1:50 000.
2.19. Methods of monitoring quality that ensure acquisition of exit competences	Monitoring student's performance and completion of tasks during the field work.

1. COURSE DECRIPTION – GENERAL INFORMATION			
1.9. Course teacher	Ervin Mrinjek, assistant profesor	1.26. Year of study	3rd
1.10. Name of the course	Facies analysis and interpretation	1.27. Credit value (ECTS)	5
1.7. Associate teachers	Dr.sc. Borna Lužar-Oberiter	1.28. Type of instruction (number of hours L+S+E+e-learning)	45+0+30+0
1.8. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.29. Expected enrolment in the course	30-35
1.9. Status of the course	Compulsory	1.30. Level of use of e-learning (1, 2, 3	1

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		level), percentage of instruction in the course on line (20% maximum)	
2. COURSE DESCRIPTION			
2.37. Course objectives	The basic knowledge and skills on facies analysis and interpretaion realized on sedimentary successions and profiles.		
2.38. Enrolment requirements and required entry competences for the course	Physical geology, Stratigraphy, Sedimentary petrology.		
2.39. Learning outcomes at the level of the study programme to which the course contributes	The basic knowledge and skills for paleoenvironments reconstruction. The basic knowledge and skills for undestanding recent environments and their protection.		
2.40. Expected learning outcomes at the level of the course (4-10 learning outcomes)	The course gives a basic knowledge needed for analysis of depositional sequences and sedimetary basins, for a location and exploitation of mineral resources and a recent environments protection.		
2.41. Course content broken down in detail by weekly class schedule (syllabus)	1) Facies (lithofacies, biofacies, microfacies, discreptive facies, genetic facies), facies associations, facies sequences, architectural elements and lateral profiles). 2) Facies models. 3) Sedimentary logs, drawing sedimentary logs. 4) Fundamental principles of sequence stratigraphy. 5) Sedimentary basins, sedimentary basins and plate tectonics. 6) Alluvial fans. 7) Rivers, characteristic facies and facies associations, glacial and glaciofluvial facies and environments. 8) Deltas, types of deltas, threepartite division of deltas, delta successions, fan deltas, Gilbert deltas. 9) Clastic and carbonate coasts, coastal processes and environments. 10) Clastic and carbonate shelfs, carbonate platforms shelfal processes, shelfal facies and associations. 11) Estuary and incised valleys 12) Deepsea environments, deepsea turbidites, debrites, slumps and slides, olitostoliths, contourites, pelagic and hemipelagic sediments. 13) Aeolian sediments and environments.		
2.42. Type of instruction	X lectures ☐ seminars and workshops X exercises ☐ online in entirety	X independent study ☐ multimedia and the internet ☐ laboratory ☐ work with the mentor	2.43. Comments:

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	☐ mixed e-learning X field work		☐ (other)			
2.44. Student responsibilities						
2.45. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)*:*	Class attendance	**1**	Research		Practical training	
	Experimental work		Report			
	Essay		Seminar essay		(Other--describe)	
	Tests	**1**	Oral exam	**2**	(Other—describe)	
	Written exam	**1**	Project		(Other—describe)	
2.9. Grading and evaluation of student work over the course of instruction and at a final exam	exercises, written exam and oral exam.					

2.10. Required literature (available at the library and via other media)	**Title**	**Number of copies at the library**	**Availability via other media**
	Tišljar, J. (2004): Sedimentologija klastičnih i silicijskih taložina.	2	
	Tišljar, J. (1994): Sedimentne stijene. Školska knjiga, Zagreb.	2	
	Tucker, M. E. (2001): Petrologija sedimenata.	2	
	Nichols, G. (2003): Sedimentology and Stratigraphy. Blackwell Science Ltd,	1	

2.20. Optional literature (at the time of the submission of the study programme proposal)	Walker, R.G. & James, N.P. (eds.)(1992): Facies models. Geological Association of Canada.
2.21. Methods of monitoring quality that ensure acquisition of exit competences	Monitoring student's performances during exercises and completing obligatory programs.

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1. COURSE DECRIPTION – GENERAL INFORMATION			
1.11. Course teacher	Bruno Tomljenović, associate professor	1.31. Year of study	3rd .
1.12. Name of the course	Structural geology and tectonics	1.32. Credit value (ECTS)	5
1.8. Associate teachers		1.33. Type of instruction (number of hours L+S+E+e-learning)	30+0+30+0
1.9. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.34. Expected enrolment in the course	20
1.10. Status of the course	Compulsory	1.35. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	1
2. COURSE DESCRIPTION			
2.46. Course objectives	To provide an up-to-date knowledge and skills in Structural geology and Tectonics in particular on (i) types of deformational structures in rocks, (ii) methods for collection and processing of structural data inevitable for (iii) description of morphology of deformational structures, (iv) reconstruction of tectonic movements, (v) interpretation of genesis of deformational structures and (vi) interpretation of tectonic history of the Earth crust.		
2.47. Enrolment requirements and required entry competences for the course	Knowledge and skills of basic geological principles usually obtained through courses of Physical geology of General geology.		
2.48. Learning outcomes at the level of the study programme to which the course contributes	Solid foundation of theoretical knowledge and practical skills in structural geology and tectonics, both integrated into the study programme of geology.		

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2.49. Expected learning outcomes at the level of the course (4-10 learning outcomes)	Theoretical knowledge and practical skills that would enable students in resolving tasks and problems related to (i) recognition, appropriate description and classification of deformational structures in rocks, (ii) selection and use of proper methods for structural data collection and processing, (iii) recognition and reconstruction of tectonic movements and (iv) correct interpretation of deformational structures formation as an essential key for unravelling the geological and tectonic history of any given area or part the Earth crust.
2.50. Course content broken down in detail by weekly class schedule (syllabus)	WEEK 1: LECTURES: Basic definitions, goals and applications of Structural geology and Tectonics. Relations to other disciplines in geology and geosciences. Concept of detailed structural analysis. EXERCISES: The principles of stereographic projection of planes and lines in structural geology. WEEK 2: LECTURES: Concept of stress ellipsoid. Gravity and tectonic stress in the Earth crust. Rock rheology, elastic, plastic and brittle behaviour of rocks and minerals. EXERCISES: Stereographic nets and their practical use. Methods for plotting planes and lines. WEEK 3: LECTURES: Concept of detailed structural analysis: descriptive, kinematic and dynamic structural analysis. Types of tectonic movements: translation, rotation, distortion and dilatation. Homogeneous and heterogeneous deformation. EXERCISES: The use of stereographic projection in structural geology and tectonics – examples and the most common tasks (1. part). WEEK 4: LECTURES: Concept of strain ellipse and strain ellipsoid. Pure shear and simple shear. EXERCISES: Strain analysis and reconstruction of strain ellipse in deformed rocks. The use of stereographic projection in structural geology and tectonics – examples and the most common tasks (1. part). WEEK 5: LECTURES: Joints and fractures (Part 1): Morphology of joint surfaces, types of mineral aggregates in veins. Methods for structural analysis of joints and fractures. EXERCISES: Analysis of morphology of joint surfaces and mineral growth in veins. WEEK 6: LECTURES: Joints and fractures (Part 2): Genetic classification of joints and fractures. Interpretation of regional jointing and relative age relationship between joint sets. Type of joints and fractures in relation to faults and folds. EXERCISES: Analysis of joint sets in faulted and folded rocks. WEEK 7: LECTURES: Rock mechanics in structural geology. Mohr circle and diagram, failure envelope and Anderson's classification of tectonic stress. EXERCISES: Palaeostress calculations from shear joints and faults. WEEK 8: LECTURES: Faults (Part 1): Definitions, morphology, kinematics and classification. Shear zones, mylonites vs. cataclasites. EXERCISES: Analysis of fault and shear zones kinematics based on microstructures. WEEK 9: LECTURES: Faults (Part 2): How to recognize faults? Local deformations related to ramps and flats of faults – examples from normal, reverse and strike-slip faults. EXERCISES: Interpretation of faults geometry and kinematics and related deformational structures based on geophysical and borehole data. WEEK 10: LECTURES: Folds (Part 1): Definitions, descriptive analysis of fold morphology and classification. Methods for calculation of fold axis: principles of construction of "beta" and "pi" diagrams. EXERCISES: Construction of "beta" and "pi" diagrams for calculation of fold axis. WEEK 11: LECTURES: Folds (Part 2): Fold classification based on layer thickness variation and construction of isogons. Order of folds and superposed folding. EXERCISES: Structural analysis in terrenes characterised by superposed folding. WEEK 12: LECTURES: Foliations and lineations in tectonites – morphology and classification. Overprinting relations between

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

<table>
<tr><td></td><td colspan="6">foliations and lineations. Deformational mechanisms in formation of foliations and lineations. Axial plane cleavage, intersection lineation and pencil structures. Boudinage – morphology and genesis. EXERCISES: Construction of geological cross-sections based on bedding/cleavage relationship.
WEEK 13: LECTURES: Structural characteristics in fold-thrust belts. EXERCISES: Construction of geological cross-sections in fold-thrust belts based on fault-bend fold and fault-propagation fold models (identification of pre-, syn- and post-kinematic sequences).
WEEK 14: LECTURES: Structural characteristics in regions with extensional tectonics. EXERCISES: Construction of geological cross-sections through grabens and half-grabens (identification of pre-, syn- and post-kinematic sequences).
WEEK 15: LECTURES: Structural characteristics in regions with strike-slip (wrench) tectonics. EXERCISES: Construction of geological cross-sections through positive and negative flower structures.</td></tr>
<tr><td>2.51. Type of instruction</td><td colspan="2">X lectures
☐ seminars and workshops
X exercises
☐ online in entirety
☐ mixed e-learning
X field work</td><td colspan="2">X independent study
X multimedia and the internet
☐ laboratory
☐ work with the mentor
☐ (other)</td><td colspan="2">2.52. Comments:</td></tr>
<tr><td>2.53. Student responsibilities</td><td colspan="6">Periodical written exams during the course (3 times) with obligation to pass at least one exam by the end of semester, as well as continuous performing of 15 exercises during the course.</td></tr>
<tr><td rowspan="5">2.54. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course):</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td>1</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other--describe)</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td>1</td><td>(Other—describe)</td><td></td></tr>
<tr><td>Written exam</td><td>2</td><td>Project</td><td></td><td>(Other—describe)</td><td></td></tr>
<tr><td>2.11. Grading and evaluation of student work over the course of instruction and at a final exam</td><td colspan="6">On the basis of achieved results in periodical written exams, 15 exercises during the course and on oral exam.</td></tr>
<tr><td rowspan="4">2.12. Required literature (available at the library and via other media)</td><td colspan="3">Title</td><td>Number of copies at the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">Structural geology and tectonics – syllabus material for lectures and exercises</td><td>For all students</td><td>Web site of lectures</td></tr>
<tr><td colspan="3">G. H. Davis & S. J. Reynolds (1996) Structural Geology of Rocks and Regions. 2-nd ed., John Wiley & Sons, New York, 776 pp</td><td>2</td><td></td></tr>
<tr><td colspan="3">Fossen H., E-learning modules on Structural geology</td><td></td><td>Web site</td></tr>
</table>

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2.22. Optional literature (at the time of the submission of the study programme proposal)	Fossen H. (2010): Structural geology.- Cambridge Univ. Press, 463 pp		
2.23. Methods of monitoring quality that ensure acquisition of exit competences	Monitoring students activity on lectures, exercises and performance on tests.		

1. COURSE DECRIPTION – GENERAL INFORMATION			
1.13. Course teacher	Prof.dr.sc. Mladen Juračić, Doc.dr.sc. Sabina Strmić Palinkaš	1.36. Year of study	3rd
1.14. Name of the course	Software in geology	1.37. Credit value (ECTS)	5
1.9. Associate teachers	Dr.sc. Borna Lužar-Oberiter - – entrusted classes (50%)	1.38. Type of instruction (number of hours L+S+E+e-learning)	30+0+30+0
1.10. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.39. Expected enrolment in the course	30-35
1.11. Status of the course	Compulsory	1.40. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	1 (10%)
2. COURSE DESCRIPTION			
2.55. Course objectives	The aim of the course is to acquaint students with principles in spatial data collections, input, editing, processing, and visualization. The course provides an opportunity for students to use geology-related software		
2.56. Enrolment requirements and required entry competences for the course	Knowledge of PC basics and general knowledge of a Windows operating system is recommended prior to this class		
2.57. Learning outcomes at the level of the study programme to which the course contributes	The course will familiarize students with the basic concepts and practices of geology-related software.		

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

<table>
<tr><td>2.58. Expected learning outcomes at the level of the course (4-10 learning outcomes)</td><td colspan="6">Knowledge of the fundamentals of GIS theory and applications
Understanding of GIS data structures (vector and raster)
Basic basic knowledge about map projections.
Understanding the database structure relations and the concept of data modeling.
Improving skills related to searching and collecting spatial data.
Basic knowledge in MS-Office Suite (Word, Excel, PowerPoint, FrontPage and Access)
Theoretical and working knowledge of ArcGIS (ESRI) – editing and georeferencing of raster data, editing of vector data, adding data, working with tables and attributes, querying data, creating of maps, charts and reports.</td></tr>
<tr><td>2.59. Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">1. Introduction to MS Word and MS Excel
2. Introduction to MS PowerPoint and MS FrontPage
3. Introduction to MS Access
4. Introduction to GIS
5. Spatial data collection – sources and availability
6. Spatial data models
7. Principles of the map projections
8. Database
9. Work with raster data
10. Work with vector data
11. Work with tables and attributes
12. Query of spatial data
13. Visualization of spatial data
14.-15- Individual projects</td></tr>
<tr><td rowspan="2">2.60. Type of instruction</td><td colspan="3">x lectures
☐ seminars and workshops
x exercises
☐ online in entirety
☐ mixed e-learning
☐ field work</td><td colspan="3">☐ independent study
x multimedia and the internet
x laboratory
☐ work with the mentor
☐ (other)</td></tr>
<tr><td colspan="3">2.61. Comments:</td><td colspan="3"></td></tr>
<tr><td>2.62. Student responsibilities</td><td colspan="6">To attend the classes and to pass the tests.</td></tr>
<tr><td rowspan="5">2.63. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)):</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other--describe)</td><td></td></tr>
<tr><td>Tests</td><td>1</td><td>Oral exam</td><td>1</td><td>(Other—describe)</td><td></td></tr>
<tr><td>Written exam</td><td>1</td><td>Project</td><td>1</td><td>(Other—describe)</td><td></td></tr>
<tr><td>2.13. Grading and evaluation of</td><td colspan="6">Class attendance 10%</td></tr>
</table>

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

<table>
<tr><td>student work over the course of instruction and at a final exam</td><td colspan="3">Tests 30%
Written exam 30%
Oral exam 30%</td></tr>
<tr><td rowspan="6">2.14. Required literature (available at the library and via other media)</td><td>Title</td><td>Number of copies at the library</td><td>Availability via other media</td></tr>
<tr><td>Graeme F. Bonham-Carter (1994) Geographic information systems for geoscientists: Modelling with GIS. Computer methods in geosciences, Volume 13. Pergamon. 398 p.</td><td>1</td><td></td></tr>
<tr><td>Syllabus material for lectures and exercises</td><td></td><td>online</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>2.24. Optional literature (at the time of the submission of the study programme proposal)</td><td colspan="3">Varga, M. (1994) Baze Podataka: Konceptualno, logičko i fizičko modeliranje podataka. DRIP - Društvo za razvoj informacijske pismenosti, Zagreb. 217 p.
Molenaar, M. (1998): An Introduction to the Theory of Spatial Object Modelling. Taylor & Francis, 200 p.</td></tr>
<tr><td>2.25. Methods of monitoring quality that ensure acquisition of exit competences</td><td colspan="3">Student evaluation of teaching and teachers, internal and external evaluation of the expert committees,</td></tr>
</table>

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1. COURSE DECRIPTION – GENERAL INFORMATION			
1.15. Course teacher	Đurđica Pezelj	1.41. Year of study	2nd
1.16. Name of the course	Invertebrate Paleontology	1.42. Credit value (ECTS)	4
1.10. Associate teachers	-	1.43. Type of instruction (number of hours L+S+E+e-learning)	30+0+15+0
1.11. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.44. Expected enrolment in the course	30-35
1.12. Status of the course	Compulsory	1.45. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	
2. COURSE DESCRIPTION			
2.64. Course objectives	Description and classification of various fossil invertebrate groups. Their major morphological characteristics, paleoecological requirements and evolutionary trends. Fossil invertebrate as indicators of geological time and past environments.		
2.65. Enrolment requirements and required entry competences for the course	Knoweledge of terminology of different groups of fossils and their evolution history.		
2.66. Learning outcomes at the level of the study programme to which the course contributes	Paleontological interpretation of invertebrate fossils and their age attribution, paleoecology and evolution.		
2.67. Expected learning outcomes at the level of the course (4-10 learning outcomes)	Students will be able to incorporate fossil invertebrate data in order to interpret and reconstruct depositional environment.		
2.68. Course content broken down in detail by weekly class schedule (syllabus)	1. Introduction to the fossil invertebrates. Classification and geological ranges 2. Parazoa: porifera, stromatoporoides, archaeocyatha 3. Cnidaria: anthozoa 4. Cnidaria: hydrozoa, scyphozoa, conuradiida, cubozoa 5. Mollusca: polyplacophora, monoplacophora, scaphopoda, bivalvia I. 6. Mollusca: bivalvia II. 7. Mollusca: gastropoda 8. Mollusca: cephalopoda - nautiloidea, ammonoidea 9. Mollusca: cephalopoda - coleoidea 10. Annelida, bryozoa 11. Brachiopoda 12. Arthropoda: trilobitomorpha		

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	13. Arthropoda: crustacea, chelicerata, tracheata 14. Echinodermata: crinoidea, blastoidea, ophiuroidea, asteroidea, holothuroidea 15. Echinodermata: echinoidea, henichordata					
2.69. Type of instruction	X lectures ☐ seminars and workshops X exercises ☐ online in entirety ☐ mixed e-learning ☐ field work		X independent study ☐ multimedia and the internet ☐ laboratory ☐ work with the mentor ☐ (other)		2.70. Comments:	
2.71. Student responsibilities	To attend the class, to pass the test					
2.72. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)*:*	Class attendance		Research		Practical training	
	Experimental work		Report			
	Essay		Seminar essay		(other--describe)	
	Tests	1	Oral exam	1	(other—describe)	
	Written exam	2	Project		(other—describe)	
2.15. Grading and evaluation of student work over the course of instruction and at a final exam						

2.16. Required literature (available at the library and via other media)	**Title**	**Number of copies at the library**	**Availability via other media**
	Prothero, D.R.: Bringing fossils to life: An introduction to paleobiology. Wcb/McGraw-Hill, New York, 2003.	2	
	Chernicoff, S., Fox, H.A. & Tanner, L.H.: Earth: geologic principles and history. Houghton Mifflin com. Boston, New York, 2002.	2	
	Sremac, J.: Opća paleontologija. Skripta. PMF, Zagreb, 1999.	15	
	Boardman, R.S.: Fossil invertebrates. Blackwell Sci. Publ., Palo Alto, 1987.	3	

2.26. Optional literature (at the time of the submission of the study programme proposal)	Textbooks about paleontology, recent scientific articles
2.27. Methods of monitoring quality that ensure acquisition of exit	Written exams throught the semester

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

competences	

1. COURSE DECRIPTION – GENERAL INFORMATION			
1.17. Course teacher	Zlatan Bajraktarević, professor	1.46. Year of study	2nd
1.18. Name of the course	Vertebrate Paleontology	1.47. Credit value (ECTS)	3
1.11. Associate teachers		1.48. Type of instruction (number of hours L+S+E+e-learning)	30+0+15+0
1.12. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.49. Expected enrolment in the course	35
1.13. Status of the course	Compulsory	1.50. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	1

2. COURSE DESCRIPTION			
2.73. Course objectives	Training of candidates for the scientific and practical work related to vertebrate paleontology		
2.74. Enrolment requirements and required entry competences for the course	Passed courses Physical Geology'and General Palaeontology		
2.75. Learning outcomes at the level of the study programme to which the course contributes	Learning about fossils and fossilization processes of vertebrates, the possibility of recognizing and interpreting vertebrate fossil sites, exploring the most important evolutionary series; knowledge of taxonomic interpretation.		
2.76. Expected learning outcomes at the level of the course (4-10 learning outcomes)	After completing the degree program, students will know the use of a specialized theoretical and practical knowledge that forms the basis for originality in developing and / or application of science ideas. In doing so, develop the new understandings in response to new knowledge and techniques. Show independence in the direction of learning and a high level of understanding of the learning process.		
2.77. Course content broken down in detail by weekly class schedule (syllabus)	Fossil skeletons and fossilization of vertebrates in marine, freshwater and continental sedimentary areas. The principles of classical, evolutionary and phylogenetic systematics (kladograms). Characteristics of osteological materials and odontological parts (skeleton head and limb bones, teeth and other inorganic "formation." Taxonomy of the most common vertebrate fossils preserved (from agnatha to gnathostomata, fish, amphibians, reptiles, birds and mammals, with particular emphasis on the development of primates and the origin man). The main examples of evolutionary sequences, distribution and extinction. the role of vertebrates in biostratigraphy. Palaeobiogeography		
2.78. Type of instruction	X lectures	X independent study	2.79. Comments:

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	X seminars and workshops X exercises ☐ online in entirety ☐ mixed e-learning ☐ field work		X multimedia and the internet ☐ laboratory ☐ work with the mentor ☐ (other)			
2.80. Student responsibilities	regular attendance at exercises, taking tests, work assignments, seminar essays					
2.81. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)*:*	Class attendance	0.5	Research		Practical training	0.5
	Experimental work		Report			
	Essay		Seminar essay	0.5	(Other--describe)	
	Tests	0.5	Oral exam		(Other—describe)	
	Written exam	2	Project		(Other—describe)	
2.17. Grading and evaluation of student work over the course of instruction and at a final exam	oral, written					

2.18. Required literature (available at the library and via other media)	**Title**	**Number of copies at the library**	**Availability via other media**
	Benton, M.J.: Vertebrate Paleontology. Chapman & Hall. London, 1998.	1	
	Chernicoff, S., Fox, H.A. & Tanner, L.H.: Earth: Geologic principles and history. Houghton Mifflin Comp. Boston, New York,2002.	1	
	Carroll, R.L.: Vertebrate Paleontology and Evolution. W.H. Freeman & Co.,New York,1998.	1	
	Palmer, D.: Earth in 100 groundbreaking discoveries.Quercus Pub. Pic.London, 2011.	1	

2.28. Optional literature (at the time of the submission of the study programme proposal)	Scientific articles
2.29. Methods of monitoring quality that ensure acquisition of exit competences	Consultations, test, exam

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1. COURSE DECRIPTION – GENERAL INFORMATION			
1.19. Course teacher	Vlasta Ćosović, professor	1.51. Year of study	3rd
1.20. Name of the course	Methods in paleontological studies	1.52. Credit value (ECTS)	4
1.12. Associate teachers		1.53. Type of instruction (number of hours L+S+E+e-learning)	15+0+30+0
1.13. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.54. Expected enrolment in the course	5 - 10
1.14. Status of the course	Elective	1.55. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	
2. COURSE DESCRIPTION			
2.82. Course objectives	Sampling of fossils, laboratory work and paleontological interpretation of fossils (age attribution paleoecology and evolution)		
2.83. Enrolment requirements and required entry competences for the course	Knowledge of the characteristics and terminology of the different groups of fossils (microfossils, vertebrate and invertebrate fossils), knowledge of the paleobiology of the fossil groups, knowledge of evolution history of the different fossil groups.		
2.84. Learning outcomes at the level of the study programme to which the course contributes	To use field and lab methods common in paleontology to collect and document fossils and data in the field and to analyze collected samples and data to solve a problem; to evaluate the limitations of a sparse data set and predict the impact of sparse data on the security of conclusions.		
2.85. Expected learning outcomes at the level of the course (4-10 learning outcomes)	Students will be able to evaluate paleontological research articles and analyze both the strong and weak aspects; to incorporate fossil data in order to interpret and reconstruct depositional environments; to use phylogenetic information to make predictions about biological and geological processes; to reconstruct the taphonomic history of a given fossil or fossil assemblage; to interpret the modes of life of fossil organisms, and to estimate the approximate age of a sequence of rocks from the assemblage of fossils present.		
2.86. Course content broken down in detail by weekly class schedule (syllabus)	1. Fossils, what are they, where to look for them? 2. Sampling techniques (surface vs. Subsurface) 3 - 4. Microfossils and applied laboratory methods 5. Vertebrates' laboratory methods 6. Invertebrates laboratory techniques 7. Systematic in paleontology (Synonymy)		

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<table>
<tr><td></td><td colspan="6">8. Systematic II (What are criteria for species identification?)
9. Classification: Numerical taxonomy and basics of cladistic analysis (phylogenetic tree and cladograms, coefficient of similarity)
10. Biostratigraphy
11. Biostatistics (diversity indices, Past program)
12. Functional morphology
13. Paleoecologic interpretation
14 – 15. Writing an essay (presentation of results of studied sample)</td></tr>
<tr><td>2.87. Type of instruction</td><td colspan="2">X lectures
☐ seminars and workshops
X exercises
☐ online in entirety
☐ mixed e-learning
☐ field work</td><td colspan="2">X independent study
X multimedia and the internet
X laboratory
☐ work with the mentor
☐ (other)</td><td colspan="2">2.88. Comments:</td></tr>
<tr><td>2.89. Student responsibilities</td><td colspan="6">To attend the class, to pass the test and to mak ean research report</td></tr>
<tr><td rowspan="5">2.90. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course):</td><td>Class attendance</td><td></td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td></td><td></td></tr>
<tr><td>Essay</td><td>0.5</td><td>Seminar essay</td><td></td><td>(Other--describe)</td><td></td></tr>
<tr><td>Tests</td><td>1.0</td><td>Oral exam</td><td>1.5</td><td>(Other—describe)</td><td></td></tr>
<tr><td>Written exam</td><td>1.0</td><td>Project</td><td></td><td>(Other—describe)</td><td></td></tr>
<tr><td>2.19. Grading and evaluation of student work over the course of instruction and at a final exam</td><td colspan="6"></td></tr>
<tr><td rowspan="6">2.20. Required literature (available at the library and via other media)</td><td colspan="4">Title</td><td>Number of copies at the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">Armstrong, H. & Brasier, M.D., (2005): Microfossils, John Wiley & Sons, 296 pp.</td><td>1</td><td>x</td></tr>
<tr><td colspan="4">Monk et al. (eds) (2007), Environmental sampling, Guideline for Archaeologists, 56 pp.</td><td>0</td><td>x</td></tr>
<tr><td colspan="4">Cifelli, R.L. (ed), (1996), Technique for recovery and preparation of Microvertebrate fossils, Oklahoma Geological Survey, 41 pp.</td><td>0</td><td>x</td></tr>
<tr><td colspan="4"></td><td></td><td></td></tr>
<tr><td colspan="4"></td><td></td><td></td></tr>
</table>

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

2.30. Optional literature (at the time of the submission of the study programme proposal)	Textbooks of paleontology.		
2.31. Methods of monitoring quality that ensure acquisition of exit competences	Written exams throghout the semester.		

1. COURSE DECRIPTION – GENERAL INFORMATION			
1.21. Course teacher	Goran Kniewald, professor; Vladimir Bermanec, professor	1.56. Year of study	3rd
1.22. Name of the course	Gemmology	1.57. Credit value (ECTS)	4
1.13. Associate teachers	Dr. Željka Žigovečki Gobac – entrusted classes (50%, i.e. part of classes taught previously by prof. Bermanec)	1.58. Type of instruction (number of hours L+S+E+e-learning)	30+0+15+0
1.14. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.59. Expected enrolment in the course	10
1.15. Status of the course	elective	1.60. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	
2. COURSE DESCRIPTION			
2.91. Course objectives	The aim of the course is to acquaint students with the minerals and materials used as gems, with modern methods of gemological testing, and systematically process each group of minerals from gemological point of view.		
2.92. Enrolment requirements and required entry competences for the course	Completed Undergraduate study of Geology.		
2.93. Learning outcomes at the level of the study programme to which the course contributes	Upon completion of the course, students should have general and specific competencies requisite for a basic gemmological identification of a gem.		
2.94. Expected learning outcomes at the level of the course (4-10 learning outcomes)	Students are expected to have acquired general and specific competencies in the identification of natural gems, imitations, stimulants, as well as recognition of synthetic and treated gems.		

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

<table>
<tr><td>2.95. Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">1. Fundamental concepts in gemmology
2. Geology of gemstone deposits
3. Crystal optics in gemmology
4. Optical effects on gemstones
5. Colour theory – causes of gemstone colour
6. Gemmological instruments
7. Methods of gemstone testing
8. Common gemstones
9. Rare gemstones
10. Organic gemstones
11. Diamond – grading and imitations
12. Synthetic gemstones
13. Imitations, composites and gemstone treatments
14. Cutting of gemstones and types of cuts
15. Presentation of student projects</td></tr>
<tr><td>2.96. Type of instruction</td><td colspan="2">x lectures
x seminars and workshops
x exercises
☐ online in entirety
☐ mixed e-learning
☐ field work</td><td colspan="2">☐ independent study
☐ multimedia and the internet
☐ laboratory
☐ work with the mentor
☐ (other)</td><td colspan="2">2.97. Comments:</td></tr>
<tr><td>2.98. Student responsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="5">2.99. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course):</td><td>Class attendance</td><td>2</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td>1</td><td>(Other--describe)</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td>2</td><td>(Other—describe)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other—describe)</td><td></td></tr>
<tr><td>2.21. Grading and evaluation of student work over the course of instruction and at a final exam</td><td colspan="6"></td></tr>
<tr><td rowspan="2">2.22. Required literature (available at the library and via other media)</td><td colspan="4">Title</td><td>Number of copies at the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">Read, P. (1999): Gemmology, 2nd edition, Butterworth-Heinemann, London.</td><td>1</td><td></td></tr>
</table>

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

2.32. Optional literature (at the time of the submission of the study programme proposal)	Anderson B. W. (1990): Gem Testing, 10th edition (revised by E. A. Jobbins), Butterworths & Co., London. Hurlbut, C. S. and Kammerling, R. C. (1991): Gemmology, John Wiley and Sons, New York.		
2.33. Methods of monitoring quality that ensure acquisition of exit competences	Final oral examination.		

1. COURSE DECRIPTION – GENERAL INFORMATION			
1.23. Course teacher	Mladen Juračić, professor	1.61. Year of study	3rd
1.24. Name of the course	Marine geology	1.62. Credit value (ECTS)	4
1.14. Associate teachers	Dr. Kristina Pikelj	1.63. Type of instruction (number of hours L+S+E+e-learning)	30+0+30+0
1.15. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.64. Expected enrolment in the course	5
1.16. Status of the course	elective	1.65. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	1 (5%)
2. COURSE DESCRIPTION			
2.100. Course objectives	Recognition and understanding of the sea bottom, the important part of the marine environment, its composition, structure and interaction with marine water. Understanding of marine sedimentation and of the role of biotic processes in it.		
2.101. Enrolment requirements and required entry competences for the course	No special requirements. Basic knowledge of physical geology, mineralogy, biology, physics and chemistry.		
2.102. Learning	Understanding physical and chemical processes in the sea and role of organisms in sediment formation and diagenisis.		

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outcomes at the level of the study programme to which the course contributes						
2.103. Expected learning outcomes at the level of the course (4-10 learning outcomes)	The development of critical thinking, concluding based on the data, understanding of the processes in the nature combining knowledge of individual disciplines in the understanding of sedimentary rock formation.					
2.104. Course content broken down in detail by weekly class schedule (syllabus)	History of marine research. Morphology and genesis of the oceans. Sources and composition of marine sediments. Lithogenous, hydrogenous and biogenous sediments. Physical oceanography relevant for genesis and sea sediment disposition (wave, current, tide). Sea water and hydrogenous sediments. Coast, sea level processes and effects of sea level change. Climates and sediments. Estuarine and anti-estuarine water exchange currents and their influence onto the sediments. Organisms and sea bottom. Residence time. Sedimentation rates. Paleocanography. Deep-sea sediments. Mediterranean and Adriatic Sea. Marine geological cartography. Sea-bottom sampling and data acquisition.					
2.105. Type of instruction	x☐ lectures ☐ seminars and workshops x☐ exercises ☐ online in entirety ☐ mixed e-learning ☐ field work		x☐ independent study x☐ multimedia and the internet ☐ laboratory ☐ work with the mentor ☐ (other)		2.106. Comments:	
2.107. Student responsibilities						
2.108. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)*:*	Class attendance	**0.5**	Research		Practical training	
	Experimental work		Report			
	Essay		Seminar essay		(Other--describe)	
	Tests	**2.5**	Oral exam		(Other—describe)	
	Written exam	2	Project		(Other—describe)	
2.23. Grading and evaluation of student work over the course of instruction and at a final exam						

2.24. Required literature (available at the library and via other media)	**Title**	**Number of copies at the library**	**Availability via other media**
	Juračić, M.: Geologija mora (http://geol.gfz.hr/Juracic/predavanja/index.html)		internet
	Selbold E. & Berger W.H.: The Sea Floor. An introduction to Marine geology. Springer Verlag, Berlin, 1996.	3	

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

2.34. Optional literature (at the time of the submission of the study programme proposal)	Open University Course Team, Butterworth-Heinemann, Oxford, 2002: • The Ocean Basins: Their Structure and Evolution • Seawater: Its Composition, Properties and Behaviour • Waves, Tides and Shallow Water Processes • Ocean Chemistry and Deep Sea Sediments		
2.35. Methods of monitoring quality that ensure acquisition of exit competences	Anonimous student evaluation. The survey includes assessment of the quality of teaching, content and concepts of subject		

1. COURSE DECRIPTION – GENERAL INFORMATION				
1.25. Course teacher	Mladen Juračić, professor	1.66. Year of study	3rd
1.26. Name of the course	History of geology	1.67. Credit value (ECTS)	4
1.15. Associate teachers		1.68. Type of instruction (number of hours L+S+E+e-	30+0+0+0

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<table>
<tr><td></td><td></td><td colspan="3">learning)</td><td></td></tr>
<tr><td>1.16. Study programme (undergraduate, graduate, integrated)</td><td>Undergraduate study of Geology</td><td colspan="3">1.69. Expected enrolment in the course</td><td>5</td></tr>
<tr><td>1.17. Status of the course</td><td>elective</td><td colspan="3">1.70. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)</td><td>1 (5%)</td></tr>
<tr><td colspan="6">2. COURSE DESCRIPTION</td></tr>
<tr><td>2.109. Course objectives</td><td colspan="5">Students should be acquainted with ideas that occurred in the history of geology.</td></tr>
<tr><td>2.110. Enrolment requirements and required entry competences for the course</td><td colspan="5"></td></tr>
<tr><td>2.111. Learning outcomes at the level of the study programme to which the course contributes</td><td colspan="5">Students should be acquainted with controversies of ideas that occurred in the history of geological thought and should perceive geology as a unique natural and historical science, dependent on general socio-cultural circumstances in particular periods of its history.</td></tr>
<tr><td>2.112. Expected learning outcomes at the level of the course (4-10 learning outcomes)</td><td colspan="5">The development of critical thinking, concluding based on the data.</td></tr>
<tr><td>2.113. Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">The course should demonstrate the chronological development of ideas in geology, their mutual controversies and opposition, resistance of old ideas and their gradual submission to the newer ones. 1. Pre-scientific epoch (antiquity, Middle ages); 2-3. Neptunists – vulcanists – plutonists; 4-5. catastrophists – uniformitarianists; 6. ice ages (glaciations); 7. Age of the Earth; 8-9. geosynclinal theory – plate tectonics (including fixists and mobilists in the Alpine tectonics); 10-11. Constraints of the uniformitarian approach and (12-13) its role in other natural sciences; 14-15. History of geology in Croatia and neighbouring countries.</td></tr>
<tr><td>2.114. Type of instruction</td><td colspan="2">x☐ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☐ mixed e-learning
☐ field work</td><td colspan="2">☐ independent study
x☐ multimedia and the internet
☐ laboratory
☐ work with the mentor
☐ (other)</td><td>2.115. Comments:</td></tr>
<tr><td>2.116. Student responsibilities</td><td colspan="5"></td></tr>
<tr><td>2.117. Screening</td><td>Class attendance</td><td>0.5</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
</table>

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)*:*	Experimental work		Report			
	Essay		Seminar essay		(Other--describe)	
	Tests	**2.5**	Oral exam		(Other—describe)	
	Written exam	2	Project		(Other—describe)	
2.25. Grading and evaluation of student work over the course of instruction and at a final exam						

2.26. Required literature (available at the library and via other media)	**Title**	**Number of copies at the library**	**Availability via other media**
	Hallam, A.: Great geological controversies, Oxford University Press, 1983.	1	
	Hallam, A.: Revolutions in Earth History. Oxford University Press, 1982.	1	

2.36. Optional literature (at the time of the submission of the study programme proposal)	Selected articles from domestic and (predominantly) international geological journals.
2.37. Methods of monitoring quality that ensure acquisition of exit competences	Anonimous student evaluation. The survey includes assessment of the quality of teaching, content and concepts of subject

1. COURSE DECRIPTION – GENERAL INFORMATION				
1.27. Course teacher	Dražen Balen, professor	1.71. Year of study	3rd
1.28. Name of the course	Rock Microstructure	1.72. Credit value (ECTS)	4
1.16. Associate teachers		1.73. Type of instruction (number of hours L+S+E+e-	0+0+45+0

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		learning)	
1.17. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.74. Expected enrolment in the course	10
1.18. Status of the course	elective	1.75. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	
2. COURSE DESCRIPTION			
2.118. Course objectives	Students achieve basic knowledge needed for mineral, structure and texture identification in common rock types using microscope. Classification of rocks using polarizing microscope		
2.119. Enrolment requirements and required entry competences for the course	Mineral optics, Petrology of igneous and metamorphic rocks, Petrology of sedimentary rocks		
2.120. Learning outcomes at the level of the study programme to which the course contributes	- the development of new knowledge and insights in research of thin sections that cover different branches of petrology and mineralogy; which represent the foundation for a successful upgrade in the future work of students in the field of geology; - promotion of scientific thinking and taking a critical view; - development of (self)evaluation and communication skills, adopting to challenge of group but also to individual work and tasks.		
2.121. Expected learning outcomes at the level of the course (4-10 learning outcomes)	- detailed knowledge of the mineralogy and petrology courses taught during the first five semesters will be practically used in the course; - students will acquire basic knowledge and skills to effectively conduct the methods and use of sophisticated tool like polarizing microscope, students will also develop new skills in response to new knowledge and techniques; - with active participation in preparation students will acquire basic knowledge for understanding and solving problems by multidisciplinary linking knowledge; - demonstrate critical thinking in problem solving, including use of information from scientific sources. Acquire experience of teamwork in a complex research environment; - upon completion of the course, students will have developed analytical abilities and critical thinking. They will increase communication skills.		
2.122. Course content broken down in detail by weekly class schedule (syllabus)	1. Polarizing microscope. Rock forming minerals in igneous, sedimentary and metamorphic rocks. 2. Mineral, structure and texture identification, mineral relations and reactions. Rock classifications, IUGS classification system and recommendations. 3. Acid plutonic, volcanic and vein rocks. 4. Intermediate plutonic and volcanic rocks. 5. Basic plutonic, volcanic and vein rocks. 6. Ultramafic magmatic rocks. 7. Pyroclastic rocks and volcanic glass.		

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	8. Diagenesis vs. metamorphism. Sedimentary protoliths. 9. Very low grade metamorphism (VLGM). 10. Low grade metamorphism (LG). 11. Medium grade metamorphism (MG). 12. High grade metamorphism (HG). Anatexis. Ultrametamorphism. 13. Metamorphic rocks without preferred orientations (granofels, hornfels, marble, quartzite). 14. Equilibrium mineral assemblages, mineral reactions, graphical presentation, approx. determination of metamorphic conditions. 15. Specific textures and microstructures in sedimentary rocks.					
2.123. Type of instruction	☐ lectures ☐ seminars and workshops ☒ exercises ☐ online in entirety ☐ mixed e-learning ☐ field work		☒ independent study ☒ multimedia and the internet ☐ laboratory ☐ work with the mentor ☐ (other)		2.124. Comments:	
2.125. Student responsibilities						
2.126. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)*:*	Class attendance		Research		Practical training	
	Experimental work		Report			
	Essay		Seminar essay		(Other--describe)	
	Tests		Oral exam	2	(Other—describe)	
	Written exam	2	Project		(Other—describe)	
2.27. Grading and evaluation of student work over the course of instruction and at a final exam	Average of individual reports, oral exam.					

2.28. Required literature (available at the library and via other media)	**Title**	**Number of copies at the library**	**Availability via other media**
	Vernon, R.H. (2004): A practical guide to Rock Microstructure.- Cambridge University Press, 594 p	2	yes
	Adams, A.E., MacKenzie,W.S. & Guilford, C. (1987): Atlas of sedimentary rocks under the microscope. Longham Scientific & Techical, VII+104, London	1	yes
	Collinson, J.D. & Thompson, D.B. (1993): Sedimentary Structures. 2. izdanje. Chapman & Hall. 207 str. London.	1	yes

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	Shelley, D. (1995): Igneous and metamorphic rocks under the microscope: classification, textures, microstructures and mineral preferred orientations.- Chapman & Hall, London.p.	1	yes
2.38. Optional literature (at the time of the submission of the study programme proposal)			
2.39. Methods of monitoring quality that ensure acquisition of exit competences	Student evaluation of teaching and teachers, internal and external evaluation of the expert committees, Self-evaluation of teachers, Students survey.		

1. COURSE DECRIPTION – GENERAL INFORMATION			
1.29. Course teacher	Aleksandar Mezga, assistant professor	1.76. Year of study	3rd
1.30. Name of the course	Quaternary Geology	1.77. Credit value (ECTS)	4
1.17. Associate teachers	-	1.78. Type of instruction (number of hours L+S+E+e-learning)	30+0+0+0
1.18. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.79. Expected enrolment in the course	20
1.19. Status of the course	elective	1.80. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	1
2. COURSE DESCRIPTION			
2.127. Course objectives	recognition of the youngest deposits, their distribution and facies, flora and fauna in the Quaternary, human development		
2.128. Enrolment requirements and required entry competences for the course	-		
2.129. Learning	possibility of recognition and interpretation of Quaternary deposits; recognition and interpretation of paleoenvironment;		

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<table>
<tr><td>outcomes at the level of the study programme to which the course contributes</td><td colspan="6">systematic excavation and analysis of fossil sites</td></tr>
<tr><td>2.130. Expected learning outcomes at the level of the course (4-10 learning outcomes)</td><td colspan="6">sampling of Quaternary deposits, recording of lithological columns; recognition of paleoclimatic relations, interpretation of findings of animal and plant origin</td></tr>
<tr><td>2.131. Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Quaternary Stratigraphy, Research methods, Depositional Environment, Causes of Climate change, Pleistocene megafauna, Development of human civilization, Quaternary in Croatia</td></tr>
<tr><td>2.132. Type of instruction</td><td colspan="2">X lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☐ mixed e-learning
X field work</td><td colspan="2">☐ independent study
☐ multimedia and the internet
☐ laboratory
☐ work with the mentor
☐ (other)</td><td colspan="2">2.133. Comments:</td></tr>
<tr><td>2.134. Student responsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="6">2.135. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course):</td><td>Class attendance</td><td>0.5</td><td>Research</td><td></td><td>Practical training</td><td>0.5</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other--describe)</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td></td><td>(Other—describe)</td><td></td></tr>
<tr><td>Written exam</td><td>3</td><td>Project</td><td></td><td>(Other—describe)</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.29. Grading and evaluation of student work over the course of instruction and at a final exam</td><td colspan="6">written</td></tr>
<tr><td rowspan="5">2.30. Required literature (available at the library and via other media)</td><td colspan="4">Title</td><td>Number of copies at the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">Stepen, J. & Peter, G. 1991. Quaternary Sediments. John Wiley & Sons, London.</td><td>1</td><td></td></tr>
<tr><td colspan="4">Nilsson, T. 1983. The Pleistocene: Geology and Life in the Quaternary Ice Age. Springer Verlag, Stuttgart, 651 str.</td><td>1</td><td></td></tr>
<tr><td colspan="4">Fagan, B. 2009. The Complete Ice Age. Thames & Hudson, London, 240 str.</td><td>1</td><td></td></tr>
<tr><td colspan="4">Lowe, J. & Walker, M. 1997. Reconstructing Quaternary Environments. Prentice Hall, London, 472 str.</td><td>1</td><td></td></tr>
</table>

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2.40. Optional literature (at the time of the submission of the study programme proposal)	scientific articles		
2.41. Methods of monitoring quality that ensure acquisition of exit competences	consultations; exam		

1. COURSE DECRIPTION – GENERAL INFORMATION			
1.31. Course teacher	Nenad Tomašić, associate professor	1.81. Year of study	3rd
1.32. Name of the course	Universal stage methods	1.82. Credit value (ECTS)	4
1.18. Associate teachers	-	1.83. Type of instruction (number of hours L+S+E+e-learning)	15+0+30+0
1.19. Study programme (undergraduate, graduate, integrated)	Undergraduate study of Geology	1.84. Expected enrolment in the course	10
1.20. Status of the course	Elective	1.85. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	-
2. COURSE DESCRIPTION			
2.136. Course objectives	Getting familiar with multi-axis microscope and principles of universal stage methods. The students should acquire knowledge and skills in application of a multi-axis microscope in solving different problems on their own.		
2.137. Enrolment requirements and required entry competences for the course	General mineralogy, System of mineralogy, Mineral optics		
2.138. Learning outcomes at the level of the study programme to which the course contributes	1. Acquiring specific knowledge in mineralogy important for professional work and understanding of research problems in various geological disciplines. 2. Development of skills needed in students' individual research as well as finding out the procedures in solving problems and making conclusions.		

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

<table>
<tr><td></td><td colspan="6">3. Development of scientific thinking.
4. Analytical approach in solving problems through individual and group work.</td></tr>
<tr><td>2.139. Expected learning outcomes at the level of the course (4-10 learning outcomes)</td><td colspan="6">1. Getting familiar with more specific optical properties of minerals.
2. Getting familiar with principles of multi-axis microscope.
3. Acquiring knowledge and skills of multi stage methods applications in mineralogy and petrology.
4. Getting familiar with procedures in determination of optical properties of minerals by using multi-axis microscope.
5. Understanding relations between crystallographic and optical properties of minerals.</td></tr>
<tr><td>a. Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">1. Multi-axis microscope (universal stage)
2. Adjustments of universal stage and thin sections
3. Determination of the vibration directions of optical inicatrix
4. Measurement of cleavage and twin composition planes
5. Plotting the results
6. Measurement and solution of twins
7. Determination of plagioclase chemical composition
8. Refractive index corrections
9-10. Determination of plagioclase using universal stage
11-12. Determination of pyroxene using universal stage
13-14. Determination of amphibole using universal stage
15. Determination of topaz using universal stage</td></tr>
<tr><td>8.1. Type of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ mixed e-learning
☐ field work</td><td colspan="2">☒ independent study
☐ multimedia and the internet
☐ laboratory
☐ work with the mentor
☐ (other)</td><td>8.2. Comments:
-</td></tr>
<tr><td>8.3. Student responsibilities</td><td colspan="6">Class attendance. Practical training and accomplishment of the exercises.</td></tr>
<tr><td rowspan="5">8.4. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course):</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td>2</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other--describe)</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td></td><td>(Other—describe)</td><td></td></tr>
<tr><td>Written exam</td><td>1</td><td>Project</td><td></td><td>(Other—describe)</td><td></td></tr>
<tr><td>2.31. Grading and evaluation of student work over the course of instruction and at a final exam</td><td colspan="6">Reports on the results of practical training. Written exam.</td></tr>
<tr><td>2.32. Required literature (available at the</td><td colspan="4">Title</td><td>Number of</td><td>Availability via</td></tr>
</table>

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

library and via other media)		**copies at the library**	**other media**
	Međimorec, S. (1998): Kristalna optika, interna skripta, Prirodoslovno-matematički fakultet, Zagreb		
	Sarančina, G. M. & Koževnikov, V. N. (1985): Fedrovski metoda (Opredelenie mineralov, mikrostrukturnjii analiz), Nedra, Leningrad, p.		
2.42. Optional literature (at the time of the submission of the study programme proposal)	-		
2.43. Methods of monitoring quality that ensure acquisition of exit competences	-		

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Table 3. Plan of the study programme according to the accreditation (L- lecture, S – seminar, E – exercises, F – field work)
***As needed, copy the table.**
****As needed, add rows to the table.**

COURSE STATUS	COURSE CODE	COURSE NAME	TOTAL HOURS				ECTS
			L	S	E	F	
I semester							
required	5112	Mathematics I	30		15		4
	5118	Chemistry I	30		30		5
	5001	General mineralogy	45		45		7
	5002	Physical geology	45		45		7
	5003	General paleontology	45		45		7
		Required courses total:	195		180		30
elective							

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

COURSE STATUS	COURSE CODE	COURSE NAME	TOTAL HOURS				ECTS
			L	S	E	F	
II **semester**							
required	5113	Mathematics II	30		15		4
	5119	Chemistry II	30		30		5
	5114	Physics	45		30		6
	5004	System of mineralogy	45		45		7
	5115	Fundamentals of biology	30		15		3
	5092	Field course in Geology I				60	5
		Required courses total:	180		135	60	30
elective							

COURSE	COURSE	COURSE NAME	TOTAL HOURS	ECTS

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

STATUS	CODE		L	S	E	F	
III **semester**							
required	5005	Historical Geology I	45		30		6
	5006	Mineral optics	30		60		5
	5007	Systematic palaeontology	45		45		7
	5116	Geophysics	30		15		5
	5009	Principles of elemental and phase analysis	30		30		5
	5093	Seminar I		30			2
		Required courses total:	180	30	180		30
elective							

COURSE	COURSE	COURSE NAME	TOTAL HOURS	ECTS

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

STATUS	CODE		L	S	E	F	
IV **semester**							
required	5010	Historical Geology II	30		30		4
	5011	Igneous and metamorphic petrology	45		45		7
	5012	Sedimentary petrology	45		45		7
	5008	Micropaleontology I	15		30		3
	5094	Seminar II		30			2
	5101	Field course in Geology II				90	7
		Required courses total:	135	30	150	90	30
elective							

COURSE	COURSE	COURSE NAME	TOTAL HOURS	ECTS

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

STATUS	CODE		L	S	E	F	
		V semester					
required	5013	Geological mapping	30		90		8
	5014	Structure geology and tectonics	30		30		4
	5015	Software in geology	30		30		4
	5016	Geochemistry	30		15		4
	5017	Hydrogeology	30		15		4
	5018	Sedimentary basins	45		30		6
		Required courses total:	195		210		30
elective							

COURSE	COURSE	COURSE NAME	TOTAL HOURS	ECTS

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

STATUS	CODE		L	S	E	F	
VI **semester**							
required	5019	Geology of mineral deposits	45		15		5
	5020	Engineering geology	30		15		4
	5095	Seminar III		30			2
	5102	Field course in Geology III				135	9
		Required courses total:	75	30	30	135	20
elective	5053	Rock Microstructure			45		5
	5403	Quaternary Geology	30				5
	5060	Universal stage methods	15		30		5

Table 4. Plan of the study programme with changes and additions (L—lecture, S – seminar, E – Exercises, F – field work)
***As needed, copy the table.**

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

****As needed, add rows to the table.**

COURSE STATUS	COURSE CODE	COURSE NAME	TOTAL HOURS				ECTS
			L	S	E	F	
I semester							
required	36211	Mathematics I	30		15		4
	36206	Chemistry I	30		30		5
	36199	General mineralogy	45		45		7
	36200	Physical geology	45		45		7
	36201	General paleontology	45		45		7
	38079	Physical Education 1			30		
		Required courses total:	195		210		30
elective							

COURSE	COURSE	COURSE NAME	TOTAL HOURS	ECTS

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

STATUS	CODE		L	S	E	F	
		II **semester**					
required	36212	Mathematics II	30		15		4
	36207	Chemistry II	30		30		5
	36208	Physics	45		30		6
	36213	System of mineralogy	45		45		7
	36209	Fundamentals of biology	30		15		3
	36210	Field course in Geology I				60	5
	38080	Physical Education 2			30		
		Required courses total:	180		165	60	30
elective							

COURSE	COURSE	COURSE NAME	TOTAL HOURS	ECTS

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

STATUS	CODE		L	S	E	F	
		III semester					
required	41025	Historical Geology I	45		30		6
	41026	Mineral optics	30		60		5
		Invertebrate paleontology	30		15		4
	41035	Micropaleontology I	15		30		3
	41028	Geophysics	30		15		5
	41029	Principles of elemental and phase analysis	30		30		5
	41030	Seminar I		30			2
	40849	Physical Education 3			30		
		Required courses total:	180	30	310		30
elective							

COURSE	COURSE	COURSE NAME	TOTAL HOURS	ECTS

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

STATUS	CODE		L	S	E	F	
IV **semester**							
required	41031	Historical Geology II	30		30		4
	41032	Igneous and metamorphic petrology	45		45		7
	41033	Sedimentary petrology	45		45		7
		Vertebrate paleontology					3
	41036	Seminar II		15			2
	41037	Field course in Geology II				90	7
	40850	Physical Education 4			30		
		Required courses total:	135	15	180	90	30
elective							

COURSE	COURSE	COURSE NAME	TOTAL HOURS	ECTS

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

STATUS	CODE		L	S	E	F	
		V semester					
required	63318	Geological mapping I	30		90		6
	63320	Structure geology and tectonics	30		30		5
	63321	Software in geology	30		30		5
	41041	Geochemistry	30		15		4
	41042	Hydrogeology	30		15		4
	63322	Field course in Geology IIIA				30	2
		Required courses total:	150		180	30	26
elective	63324	Methods in paleontology	15		30		4
	63325	Gemmology	30		15		4
	63326	History of geology	30				4
	63327	Marine Geology	30		30		4

COURSE	COURSE	COURSE NAME	TOTAL HOURS	ECTS

DESCRIPTION OF CHANGES AND ADDITIONS TO UNDERGRADUATE, GRADUATE AND INTEGRATED UNDERGRADUATE AND GRADUATE STUDY PROGRAMMES

STATUS	CODE		L	S	E	F	
VI **semester**							
required	63319	Geological mapping II	15		30		3
	41043	Geology of mineral deposits	45		15		5
	41044	Engineering geology	30		15		4
	71835	Analysis and interpretation of facies	45		30		5
	41046	Seminar III		30			2
	63323	Field course in Geology IIIB				105	7
		Required courses total:	135	30	90	105	26
elective	63328	Rock Microstructure			45		4
	63329	Quaternary Geology	30				4
	63330	Universal stage methods	15		30		4