Introductory mathematical course

Introductory mathematical course in calculus for students of IT, engineering, economics etc. Teaching and learning strategies implemented: Flipped classroom (FC), Instruction-based learning and Project-based learning (PBL-WBL)

Planned ECTS: 5, **Number of learners:** 200, **Mode of delivery**: Blended
Status: IN PLANNING, **Course public access**: Public
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Course learning outcome	Level	Weight
Explain the concept of the derivative of a real function of one real variable and its geometric interpretation	Understanding	10
Analyze an elementary function using derivatives and sketch its graph	Analysing	12
Apply differential calculus to find local extrema of a function with one variable and inflection points of the function.	Applying	12
Determine the primitive function and apply integral calculus in calculating surface area and volume.	Applying	12
Analyze and solve a problem task in the area of mathematical analysis of the function of one variables	Analysing	10
Create a program solution for a specific mathematical problem and present the solution in written format	Creating	16
Explain the concept of primitive function and integrals of a function with one variable	Understanding	10
Define elementary functions of a real variable, analyze their properties and sketch their graphs.	Analysing	10
Explain a concept of a limit and determine standard limits of functions	Applying	8
		Total Weight: 100

Topic / Unit name	Workload	Learning type	Mode of delivery			Groups	Collaboration	Feedback	Assessment		
									Points	Types	Providers
Introduction											
Introduction of the course and TLAs											
Introduction of the course Content, assessment and TLAs	45 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No		
Disscusssion Students use disscusion online and ask questions, propose ideas	60 min	Discussion	Hybrid	Asynchronous	Teacher not present	No	Yes	Peer	No		
Total unit workload	1.75h										

Topic / Unit name	Workload	Learning type	Mode of delivery		Groups	Collaboration	Feedback	Assessment		
								Points	Types	Providers
Real functions of real variables Analyze and solve a problem task in the area of mathematical analysis of the function of one variables (**40%)**, Define elementary functions of a real variable, analyze their properties and sketch their graphs. (**60%)**										
The domain of the function. Composition. Bijection. Graph of the function.										
Repetition of basic concepts Students receive a pre-prepared video with which they repeat basic concepts of function and graphs of elementary functions.	30 min	Acquisition	Online	Asynchronous	Teacher not present	No	No	No	No	

Disscusion Students participate in discussions related to the introductory video. They can ask questions that can be answered by other students or a teacher.	15 min	Discussion	Online	Asynchronous	Teacher present	No	No	Peer, Teacher	No		
Quiz (basic concepts) Students take a short quiz which cover the basic notions from the video.	10 min	Assessment	Online	Asynchronous	Teacher not present	No	No	Automated	1	Summative	Automated

Lecture Professor checks how many students watched the video lesson and what the quiz results were. Based on the results of the quiz, teacher repeats concepts that are less well understood and designs lecture to upgrade and broad the topic. Students have possibility for additional questions.	120 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No

Practice Assistants work with students. During the exercises, students do standard tasks related to the topic. In a group, they solve slightly more complex tasks.	90 min	Practice	Hybrid	Synchronous	Teacher present	Yes	No	Teacher, Peer	No
Total unit workload	4.41h								
Properties of real functions of a real variable									
Properties of real functions Students receive a pre-prepared video with which they repeat basic properties of real functions.	30 min	Acquisition	Online	Asynchronous	Teacher not present	No	No	No	No

Disscusion Students participate in discussions related to the introductory video. They can ask questions that can be answered by other students or a teacher.	15 min	Discussion	Online	Asynchronous	Teacher present	No	No	Peer	No		
Quiz (properties of real function) Students take a short quiz which cover the basic notions from the video.	10 min	Assessment	Online	Asynchronous	Teacher not present	No	No	Automated	1	Summative	Automated

Lecture Professor checks how many students watched the video lesson and what the quiz results were. Based on the results of the quiz, teacher repeats concepts that are less well understood and designs lecture to upgrade and broad the topic. Students have possibility for additional questions.	120 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No

Practice Assistants work with students. During the exercises, students do standard tasks related to the topic. In a group, they solve slightly more complex tasks.	90 min	Practice	Hybrid	Synchronous	Teacher present	Yes	No	Teacher, Peer	No		
Independent practical work Students work independently using the material in LMS Moodle and textbook.	90 min	Practice	Onsite	Asynchronous	Teacher not present	No	Yes	Automated, Peer	No		
Quiz (properties of real function-math problems) Students take a short quiz which cover the basic math problems.	30 min	Assessment	Online	Asynchronous	Teacher not present	No	No	Automated	2	Summative	Automated

Total unit workload	6.41h										
Examples of functions and their graphs											
Examples (real functions of real variable) Students receive a pre-prepared video with which they repeat basic properties of real functions.	30 min	Acquisition	Online	Asynchronous	Teacher not present	No	No	No	No		
Disscusion Students participate in discussions related to the introductory video.	15 min	Discussion	Online	Asynchronous	Teacher present	No	No	Peer, Teacher	No		
Quiz (examples) Students take a short quiz which cover the basic notions from the video.	10 min	Assessment	Online	Asynchronous	Teacher not present	No	No	Automated	1	Summative	Automated

Lecture Professor checks how many students watched the video lesson and what the quiz results were. Based on the results of the quiz, teacher repeats concepts that are less well understood and designs lecture to upgrade and broad the topic. Students have possibility for additional questions.	120 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No

Practice Assistants work with students. During the exercises, students do standard tasks related to the topic. In a group, they solve slightly more complex tasks.	90 min	Practice	Hybrid	Synchronous	Teacher present	Yes	No	Teacher, Peer	No
Independent practical work Students work independently using the material in LMS Moodle and textbook.	90 min	Practice	Onsite	Asynchronous	Teacher not present	No	Yes	Automated, Peer	No
Total unit workload	5.91h								
Sequences of real numbers and their properties									

Examples (real functions of real variable) Students receive a pre-prepared materials with which they repeat basic properties of sequences. Students have to independently investigate and repeat the basic concepts of arithmetic and geometric series.	90 min	Investigation	Online	Asynchronous	Teacher not present	No	No	No	No

Lecture Teacher repeats basic concepts of sequences (definition, arithmetic and geometric sequences, properties and examples of sequences) and upgrades and broad the topic with limit of sequence.	180 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No		
Quiz (sequences) Students take a short quiz which cover the basic notions from lecture.	10 min	Assessment	Online	Asynchronous	Teacher not present	No	No	Automated	1	Summative	Automated

Practice Assistants work with students. During the exercises, students do standard tasks related to the topic. In a group, they solve slightly more complex tasks.	180 min	Practice	Hybrid	Synchronous	Teacher present	Yes	No	Teacher, Peer	No		
Independent practical work Students work independently using the material in LMS Moodle and textbook.	120 min	Practice	Onsite	Asynchronous	Teacher not present	No	Yes	Automated, Peer	No		
Quiz (sequences-math problems) Students take a short quiz which cover basic math problems.	30 min	Assessment	Online	Asynchronous	Teacher not present	No	No	Automated	2	Summative	Automated
Total unit workload	10.16h										

Topic / Unit name	Workload	Learning type	Mode of delivery		Groups	Collaboration	Feedback	Assessment		
								Points	Types	Providers
Limit of functions Explain a concept of a limit and determine standard limits of functions (**100%)**, Analyze an elementary function using derivatives and sketch its graph (**10%)**, Define elementary functions of a real variable, analyze their properties and sketch their graphs. (**10%)**										
Limit of function										
Motivational example Students receive a pre-prepared video with motivational example for limit of function and intuitive definition.	60 min	Acquisition	Online	Asynchronous	Teacher not present	No	No	No	No	

Lecture Professor checks how many students watched the video lesson. Professor explains basic concepts and designs lecture to upgrade and broad the topic (Heine's and Cauchy's definition of function limit, main properties and theorems with proofs, continuity of function). Students have possibility for additional questions.	180 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No		
Quiz (limit of function) Students take a short quiz which cover the basic notions from lecture.	15 min	Assessment	Online	Asynchronous	Teacher not present	No	No	Automated	1	Summative	Automated

Practice Assistants work with students. During the exercises, students do standard tasks related to the topic. In a group, they solve slightly more complex tasks.	120 min	Practice	Hybrid	Synchronous	Teacher present	No	No	No	No		
Independent practical work Students work independently using the material in LMS Moodle and textbook.	180 min	Practice	Onsite	Asynchronous	Teacher not present	No	Yes	Automated, Peer	No		
Quiz (limit of function-math problems) Students take a short quiz which cover the basic math problems.	60 min	Assessment	Online	Asynchronous	Teacher not present	No	No	Automated	2	Summative	Automated
Total unit workload	10.25h										

Topic / Unit name	Workload	Learning type	Mode of delivery		Groups	Collaboration	Feedback	Assessment		
								Points	Types	Providers
Monthly test 1 Analyze and solve a problem task in the area of mathematical analysis of the function of one variables (**10%)**, Define elementary functions of a real variable, analyze their properties and sketch their graphs. (**20%)**										
Preparation fot the test										
Independent practical work Students work independently	200 min	Practice	Onsite	Asynchronous	Teacher not present	No	Yes	Automated, Peer	No	
Disscussion about technical and content related isssues Students are given information in LMS and then they can ask questions.	60 min	Discussion	Online	Asynchronous	Teacher not present	No	Yes	Teacher, Peer	No	
Total unit workload	4.33h									
Monthly test (kolokvij)										

Test The test is prepared in hybrid delivery mode using individualised assignments from the databases in LMS.	90 min	Assessment	Hybrid	Synchronous	Teacher present	No	No	Teacher, Automated	20	Formative	Teacher, Automated
Total unit workload	1.5h										
Analysis of the test											
Students' feedback A questionnaire with open and closed questions is used. Students give feedback to teachers (technical and content wise).	20 min	Discussion	Online	Asynchronous	Teacher not present	No	No	No	No		
Analysis of the test Reliability, validity, students' satisfaction survey, explaining solutions	45 min	Discussion	Hybrid	Synchronous	Teacher present	No	No	Teacher	No		

Further student investigation Students investigate application areas of mathematics learned.	90 min	Investigation	Online	Asynchronous	Teacher not present	Yes	Yes	Peer	No
Total unit workload	2.58h								

Topic / Unit name	Workload	Learning type	Mode of delivery		Groups	Collaboration	Feedback	Assessment		
								Points	Types	Providers
The Derivative - basic concepts, techniques and rules Explain the concept of the derivative of a real function of one real variable and its geometric interpretation (**90%)**, Apply differential calculus to find local extrema of a function with one variable and inflection points of the function. (**30%)**, Analyze an elementary function using derivatives and sketch its graph (**20%)**, Define elementary functions of a real variable, analyze their properties and sketch their graphs. (**10%)**										
Concept and definition of the derivative										
Introduction of problems - motivation FC approach Video on problems that lead to the derivative: the slope of a tangent, velocity, optimization	30 min	Acquisition	Online	Asynchronous	Teacher not present	No	No	No	No	
Disscusion Students participate in discussions related to the introductory video.	30 min	Discussion	Online	Asynchronous	Teacher not present	No	No	Peer	0	Summative	Peer

Lecture - concept of derivative Professors work with students in a hybrid format on the development od the concept of the derivative, geometric interpretation and definition.	60 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No		
Quiz Students take a short quiz based on the concept od the derivative.	20 min	Assessment	Online	Asynchronous	Teacher present	No	No	Automated	1	Summative	Automated
Practice Assistants work with students on derivatives; techniques and rules application.	90 min	Practice	Onsite	Synchronous	Teacher present	No	Yes	Teacher	No		

Independent practical work. Students practice different differentiation techniques based on material in LMS and texbooks.	90 min	Practice	Onsite	Asynchronous	Teacher not present	No	No	Automated	No
Total unit workload	5.33h								
Derivatives of implicit functions, chain rule, higher-order derivatives									
Video lecture - advanced techniques Students listen to a short video on the introduction advanced techniques of differentiation and then participate in a face to face presentation by the teacher on these techniques.	60 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No

Quiz Students take a short quiz based on advanced techniques of differentiation.	20 min	Assessment	Online	Asynchronous	Teacher present	No	No	No	2	Summative	Automated
Practice Assistants work with students on examples of derivation of implicit functions and chain rule.	90 min	Practice	Onsite	Synchronous	Teacher present	No	Yes	Teacher	No		
Independent practical work - advanced techniques. Students learn and practice higher-order derivatives based on material in LMS and texbooks.	90 min	Practice	Onsite	Asynchronous	Teacher not present	No	No	Automated	No		

Independent investigation Students are required to investigate on their own the application areas and history of calculus.	90 min	Investigation	Online	Asynchronous	Teacher not present	No	No	No	No
Total unit workload	5.83h								

Topic / Unit name	Workload	Learning type	Mode of delivery	Groups	Collaboration	Feedback	Assessment		
							Points	Types	Providers
Application of derivatives Apply differential calculus to find local extrema of a function with one variable and inflection points of the function. (**60%)**, Analyze an elementary function using derivatives and sketch its graph (**50%)**, Analyze and solve a problem task in the area of mathematical analysis of the function of one variables (**10%)**									
Finding local extrema									
Video-lecture - function extrema Student listen video lecture about finding the absolute (or global) minimum and maximum values of a function.	30 min	Acquisition	Online	Synchronous	Teacher not present	No	No	Teacher	No		
Quiz Students take a short quiz based on finding extrema of function.	20 min	Assessment	Online	Asynchronous	Teacher present	No	No	Automated	1	Summative	Automated

Practice Assistants work with students on finding function increasing or decrease intervals by use of local extrema.	90 min	Practice	Onsite	Synchronous	Teacher present	No	Yes	Teacher	No
Independent practical work- finding extrema Students practice finding increasing or decreasing intervals based on material in LMS and texbooks.	90 min	Practice	Onsite	Asynchronous	Teacher not present	No	No	Automated	No

Self-assessment Students take self-assessment based on the assessment tasks in LMS (database). Based on the results they are instructed to further investigate.	90 min	Investigation	Online	Asynchronous	Teacher not present	No	Yes	Teacher	0	Summative	Teacher
Total unit workload	5.33h										
Plotting graph											
Reading-graph plotting Students read material about applying derivatives on plotting graph functions.	60 min	Acquisition	Online	Synchronous	Teacher not present	No	No	No	0	Summative	Automated

Independent practical work - graph plotting Students practice graph plotting based on material in LMS and texbooks.	90 min	Practice	Onsite	Asynchronous	Teacher not present	No	No	Automated	No		
Practice Assistants work with students on plotting graphs.	90 min	Practice	Onsite	Synchronous	Teacher present	No	Yes	Teacher	No		
Self-assessment Students in small group take self-assessment based on the assessment tasks in LMS (database).	90 min	Assessment	Online	Asynchronous	Teacher not present	Yes	Yes	Teacher, Automated	2	Summative	Teacher
Total unit workload	5.5h										
Curvature- Concavity and convexity											

Video-lecture-Concavity and convexity Student watch video lecture that explains points of inflection, and concavity and convexity of a function.	25 min	Acquisition	Online	Synchronous	Teacher not present	No	No	Teacher	No		
Independent practical work -concavity and convexity Students practice finding point of inflection based on material in LMS and texbooks.	90 min	Practice	Onsite	Asynchronous	Teacher not present	No	No	Automated	No		
Quiz Students take a short quiz about function concavity and convexity.	20 min	Assessment	Online	Asynchronous	Teacher present	No	No	Automated	2	Summative	Automated

Practice Assistants work with students on describing the shape or curvature of a curve.	90 min	Practice	Onsite	Synchronous	Teacher present	No	Yes	Teacher	No		
Self-assessment Students take self-assessment based on the assessment tasks in LMS (database). Based on the results they are instructed to further investigate.	90 min	Investigation	Online	Asynchronous	Teacher not present	No	Yes	Teacher	0	Summative	Teacher
Total unit workload	5.25h										

Topic / Unit name	Workload	Learning type	Mode of delivery		Groups	Collaboration	Feedback	Assessment		
								Points	Types	Providers
Monthly test 2 Explain the concept of the derivative of a real function of one real variable and its geometric interpretation (**10%)**, Apply differential calculus to find local extrema of a function with one variable and inflection points of the function. (**10%)**, Analyze an elementary function using derivatives and sketch its graph (**20%)**										
Preparation fot the test										
Independent practical work Students work independently	200 min	Practice	Onsite	Asynchronous	Teacher not present	No	Yes	Automated, Peer	No	
Disscussion about technical and content related isssues Students are given information in LMS and then they can ask questions.	60 min	Discussion	Online	Asynchronous	Teacher not present	No	Yes	Teacher, Peer	No	
Total unit workload	4.33h									
Monthly test (kolokvij)										

Test The test is prepared in hybrid delivery mode using individualised assignments from the databases in LMS.	90 min	Assessment	Hybrid	Synchronous	Teacher present	No	No	Teacher, Automated	20	Formative	Teacher, Automated
Total unit workload	1.5h										
Analysis of the test											
Students' feedback A questionnaire with open and closed questions is used. Students give feedback to teachers (technical and content wise).	20 min	Discussion	Online	Asynchronous	Teacher not present	No	No	No	No		
Analysis of the test Reliability, validity, students' satisfaction survey, explaining solutions	45 min	Discussion	Hybrid	Synchronous	Teacher present	No	No	Teacher	No		

Further student investigation Students investigate application areas of mathematics learned.	90 min	Investigation	Online	Asynchronous	Teacher not present	Yes	Yes	Peer	No
Total unit workload	2.58h								

Topic / Unit name	Workload	Learning type	Mode of delivery	Groups	Collaboration	Feedback	Assessment		
							Points	Types	Providers
Project team work - PEER ASSESSMENT Analyze and solve a problem task in the area of mathematical analysis of the function of one variables (**5%)**, Create a program solution for a specific mathematical problem and present the solution in written format (**100%)**									
Preparation for the project									
Presentation of teamwork Professors and assistants present the way of working on the project, the choice of the project topic and the formation of the project team. The link of the project assignment (PBL) with the learning outcomes is explained, and how the PBL will contribute to students' future jobs. Teachers present the initial proposal of evaluation criteria for the project. The	45 min	Discussion	Hybrid	Synchronous	Teacher present	No	No	No	No

initial criteria include: research on the theoretical background, investigation of possible methodology for a solution, problem solution, presentation of the solution, quality of teamwork. Number of students: cca 100, 3-4 per team									

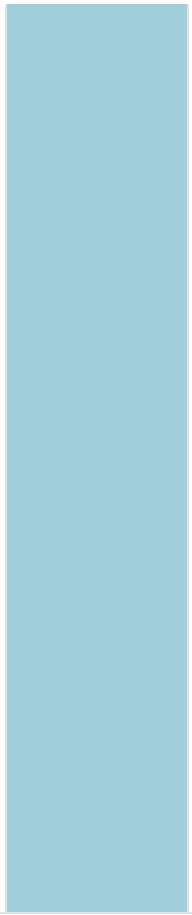
Choice of project topic and team Students form teams of 3-4 (based on their own choice) and then choose a project topic from the list. Students investigate the research topics before making a final choice. Each team will be provided with their own virtual environment for teamwork (wiki).	75 min	Discussion	Online	Asynchronous	Teacher not present	Yes	Yes	No	No
Initial research, discussion and questions Students research the project topic and discuss the topic within the team, but can also ask questions in a discussion forum in the LMS.	90 min	Investigation	Online	Asynchronous	Teacher not present	Yes	Yes	Teacher, Peer	No
Total unit workload	3.5h								
Work on project									

Disscusion of peer-assessment criteria Teachers and students discuss the criteria for project assessment, the level of achievement, and how to recognize the level of achievement. At the end, a rubric is finalized and hopefully understood by all the students. The initial criteria may be changed based on discussion. The levels of achievement will be described, ranging from 0 do 4 (depending on a specific criterion - some may have 2, and other 3 or 4 levels).	45 min	Discussion	Hybrid	Synchronous	Teacher present	No	No	No	No

Excercise peer-assessment (peer-grading) Students are supposed to peer-assess two projects (for previous years - including one better and one not-so-good) to practice how to use the LMS, criteria, and rubrics. After that, discussion about the process is performed and the criteria are clarified if necessary. Students discuss (mutually and with the teacher) the issues related to academic integrity, fair assessment and ethical issues related to cheating.	90 min	Practice	Online	Asynchronous	Teacher present	No	Yes	Teacher, Automated, Peer	No

Project work Students research the chosen topic and collaborate within their teams. Students solve a project task, create a software solution and/or use adequate tools, and prepare written material(s) and other necessary documentation. Finally, they upload all the artifacts into the LMS (workshop in Moodle).	640 min	Production	Hybrid	Asynchronous	Teacher not present	Yes	Yes	Teacher, Peer	No
Total unit workload	12.91h								
Project assessment and presentation									

Presentation Students' teams present their projects to teachers and other students. Teachers and other students ask questions and discuss the solutions.	120 min	Discussion	Hybrid	Synchronous	Teacher present	Yes	Yes	Teacher, Peer	No		
Assessment and peer-assessment (peer-grading) Students participate in peer-assessment based on the pre-defined assessment criteria and levels of achievement given in the assessment rubric in the Moodle workshop. Each student is assigned with 2 projects to assess - the distribution is done automatically in the Moodle workshop. Peer-	90 min	Assessment	Hybrid	Asynchronous	Teacher present	No	No	Teacher, Peer	20	Formative	Teacher, Peer

assessment is double-blinded: students are not given information about whose work they are assessing or who is assessing their work. The final grade is calculated based on teacher assessment (higher weight) and student peer-assessment (lower weight). Students are given grades for (1) their project submission and (2) their peer-assessment.											

Reflection on results Students and teachers discuss the results of the PBL and peer-assessment, based on the learning analytics provided in Moodle and not on an individual basis. Each team has the opportunity to propose improvements to their artifact based on the feedback received. Improved artifacts can be resubmitted and teachers decides on whether the grades should be modified based on that.	90 min	Investigation	Hybrid	Synchronous	Teacher present	No	Yes	Teacher, Automated, Peer	No
Total unit workload	5h								

Topic / Unit name	Workload	Learning type	Mode of delivery		Groups	Collaboration	Feedback	Assessment		
								Points	Types	Providers
Integration - basic concepts, techniques and rules Explain the concept of primitive function and integrals of a function with one variable (**45%)**, Determine the primitive function and apply integral calculus in calculating surface area and volume. (**20%)**, Analyze and solve a problem task in the area of mathematical analysis of the function of one variables (**35%)**										
Concept and definition of integration										
Introduction of problems - motivation Video on problems that lead to the integral: calculating surface of area, concept of primitive function and integrals of a function (upper and lower Darboux sum).	30 min	Acquisition	Online	Asynchronous	Teacher not present	No	No	No	No	
Disscusion Students participate in discussions related to the introductory video	15 min	Discussion	Online	Asynchronous	Teacher not present	No	No	Peer	0	Summative	Peer

Lecture - concept of integral Professors work with students in a hybrid format on the development od the concept of the integral, geometric interpretation and definition.	120 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No		
Quiz Students take a short quiz based on the concept od the integral	10 min	Assessment	Online	Asynchronous	Teacher present	No	No	Automated	1	Summative	Automated
Total unit workload	2.91h										
Integration techniques											
Lecture - advanced techniques Professor presents advanced techniques of integration. Students can ask questions.	90 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No		

Practice Assistants work with students on integrals; techniques and rules application.	120 min	Practice	Onsite	Synchronous	Teacher present	No	Yes	Teacher	No		
Independent practical work. Students learn and practice bsed on material in LMS and texbooks.	120 min	Practice	Onsite	Asynchronous	Teacher not present	No	No	Automated	No		
Quiz (Integration-math problems) Students take a short quiz based on the concept od the derivative.	30 min	Assessment	Online	Asynchronous	Teacher present	No	No	Automated	2	Summative	Automated
Total unit workload	6h										

Topic / Unit name	Workload	Learning type	Mode of delivery		Groups	Collaboration	Feedback	Assessment		
								Points	Types	Providers
Application of integral calculus Explain the concept of primitive function and integrals of a function with one variable (**35%)**, Determine the primitive function and apply integral calculus in calculating surface area and volume. (**60%)**										
Calculating surface area										
Lecture - calculating surface Student listen video lecture about calculating surface area.	45 min	Acquisition	Online	Synchronous	Teacher not present	No	No	Teacher	No	
Quiz Students take a short quiz based on calculating surface area.	20 min	Assessment	Online	Asynchronous	Teacher present	No	No	Automated	1	Summative	Automated

Lecture Professor checks how many students watched the video lesson and what the quiz results were. Based on the results of the quiz, teacher repeats concepts that are less well understood and designs lecture to upgrade and broad the topic. Students have possibility for additional questions.	120 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No
Practice Assistants work with students on calculating surface area.	120 min	Practice	Onsite	Synchronous	Teacher present	No	Yes	Teacher	No
Independent practical work-calculating surface area Students practice calculating surface area.	180 min	Practice	Onsite	Asynchronous	Teacher not present	No	No	Automated	No

Self-assessment Students take self-assessment based on the assessment tasks in LMS (database).	90 min	Assessment	Online	Asynchronous	Teacher not present	No	Yes	Teacher	2	Summative	Teacher
Total unit workload	9.58h										
Calculating volume											
Lecture - calculating volume Student listen video lecture about calculating volume.	30 min	Acquisition	Online	Synchronous	Teacher not present	No	No	Teacher	No		
Quiz Students take a short quiz based on calculating volume.	20 min	Assessment	Online	Asynchronous	Teacher present	No	No	Automated	1	Summative	Automated

Lecture Professor checks how many students watched the video lesson and what the quiz results were. Based on the results of the quiz, teacher repeats concepts that are less well understood and designs lecture to upgrade and broad the topic. Students have possibility for additional questions.	90 min	Acquisition	Hybrid	Synchronous	Teacher present	No	No	No	No
Practice Assistants work with students on calculating volume.	90 min	Practice	Onsite	Synchronous	Teacher present	No	Yes	Teacher	No
Independent practical work-calculating volume Students practice calculating volume.	120 min	Practice	Onsite	Asynchronous	Teacher not present	No	No	Automated	No

Self-assessment Students take self-assessment based on the assessment tasks in LMS (database).	90 min	Assessment	Online	Asynchronous	Teacher not present	No	Yes	Teacher	2	Summative	Teacher
Total unit workload	7.33h										

Topic / Unit name	Workload	Learning type	Mode of delivery		Groups	Collaboration	Feedback	Assessment		
								Points	Types	Providers
Monthly test 3 Explain the concept of primitive function and integrals of a function with one variable (**20%)**, Determine the primitive function and apply integral calculus in calculating surface area and volume. (**20%)**										
Preparation fot the test										
Independent practical work Students work independently	200 min	Practice	Onsite	Asynchronous	Teacher not present	No	Yes	Automated, Peer	No	
Disscussion about technical and content related isssues Students are given information in LMS and then they can ask questions.	60 min	Discussion	Online	Asynchronous	Teacher not present	No	Yes	Teacher, Peer	No	
Total unit workload	4.33h									
Monthly test (kolokvij)										

Test The test is prepared in hybrid delivery mode using individualised assignments from the databases in LMS.	90 min	Assessment	Hybrid	Synchronous	Teacher present	No	No	Teacher, Automated	20	Formative	Teacher, Automated
Total unit workload	1.5h										
Analysis of the test											
Students' feedback A questionnaire with open and closed questions is used. Students give feedback to teachers (technical and content wise).	20 min	Discussion	Online	Asynchronous	Teacher not present	No	No	No	No		
Analysis of the test Reliability, validity, students' satisfaction survey, explaining solutions	45 min	Discussion	Hybrid	Synchronous	Teacher present	No	No	Teacher	No		

Further student investigation Students investigate application areas of mathematics learned.	90 min	Investigation	Online	Asynchronous	Teacher not present	Yes	Yes	Peer	No
Total unit workload	2.58h								

Total course workload: 138.66h