Introductory mathematical course

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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)

Geplante ECTS: 5

Anzahl der Lernenden: 200

Bereitstellungsmodus: Blended

Status: IN PLANUNG

Öffentlicher Zugang zum Kurs: Öffentlich

Mitwirkende:
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Kurs-Lernergebnis	Niveau	Gewicht
Explain the concept of the derivative of a real function of one real variable and its geometric interpretation	Verstehen	10
Analyze an elementary function using derivatives and sketch its graph	Analysieren	12
Apply differential calculus to find local extrema of a function with one variable and inflection points of the function.	Anwenden	12
Determine the primitive function and apply integral calculus in calculating surface area and volume.	Anwenden	12
Analyze and solve a problem task in the area of mathematical analysis of the function of one variables	Analysieren	10
Create a program solution for a specific mathematical problem and present the solution in written format	Erstellen	16
Explain the concept of primitive function and integrals of a function with one variable	Verstehen	10
Define elementary functions of a real variable, analyze their properties and sketch their graphs.	Analysieren	10
Explain a concept of a limit and determine standard limits of functions	Anwenden	8
		Gesamtgewicht: 100

Thema / Einheitsname	Arbeitsbelastung	Lernart	Lieferart	Gruppen	Zusammenarbeit	Rückmeldungen	Verpflichtende Aktivität	Bewertung		
								Punkte	Typ	Anbieter
Introduction										
Introduction of the course and TLAs										

Introduction of the course Content, assessment and TLAs	45 min	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		
Disscusssion Students use disscusion online and ask questions, propose ideas	60 min	Diskussion	Hybrid	Asynchron	Lehrer nicht anwesend	Nein	Ja	Kollege	Nein	Nein		
Gesamtarbeitsbelastung der Einheit	1.75h											
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	Erwerb	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	Nein		
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	Diskussion	Online	Asynchron	Lehrer anwesend	Nein	Nein	Kollege, Lehrer	Nein	Nein		
Quiz (basic concepts) Students take a short quiz which cover the basic notions from the video.	10 min	Bewertung	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	1	Formativ	Automatisiert
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	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		

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	Übung	Hybrid	Synchron	Lehrer anwesend	Ja	Nein	Lehrer, Kollege	Nein	Nein		
Gesamtarbeitsbelastung der Einheit	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	Erwerb	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	Nein		
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	Diskussion	Online	Asynchron	Lehrer anwesend	Nein	Nein	Kollege	Nein	Nein		
Quiz (properties of real function) Students take a short quiz which cover the basic notions from the video.	10 min	Bewertung	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	1	Formativ	Automatisiert
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	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		
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	Übung	Hybrid	Synchron	Lehrer anwesend	Ja	Nein	Lehrer, Kollege	Nein	Nein		
Independent practical work Students work independently using the material in LMS Moodle and textbook.	90 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Ja	Automatisiert, Kollege	Nein	Nein		

Quiz (properties of real function-math problems) Students take a short quiz which cover the basic math problems.	30 min	Bewertung	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	2	Formativ	Automatisiert
Gesamtarbeitsbelastung der Einheit	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	Erwerb	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	Nein		
Disscusion Students participate in discussions related to the introductory video.	15 min	Diskussion	Online	Asynchron	Lehrer anwesend	Nein	Nein	Kollege, Lehrer	Nein	Nein		
Quiz (examples) Students take a short quiz which cover the basic notions from the video.	10 min	Bewertung	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	1	Formativ	Automatisiert
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	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		
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	Übung	Hybrid	Synchron	Lehrer anwesend	Ja	Nein	Lehrer, Kollege	Nein	Nein		
Independent practical work Students work independently using the material in LMS Moodle and textbook.	90 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Ja	Automatisiert, Kollege	Nein	Nein		
Gesamtarbeitsbelastung der Einheit	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	Untersuchung	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	Nein		
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	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		
Quiz (sequences) Students take a short quiz which cover the basic notions from lecture.	10 min	Bewertung	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	1	Formativ	Automatisiert
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	Übung	Hybrid	Synchron	Lehrer anwesend	Ja	Nein	Lehrer, Kollege	Nein	Nein		
Independent practical work Students work independently using the material in LMS Moodle and textbook.	120 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Ja	Automatisiert, Kollege	Nein	Nein		
Quiz (sequences-math problems) Students take a short quiz which cover basic math problems.	30 min	Bewertung	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	2	Formativ	Automatisiert
Gesamtarbeitsbelastung der Einheit	10.16h											

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	Erwerb	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	Nein		
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	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		
Quiz (limit of function) Students take a short quiz which cover the basic notions from lecture.	15 min	Bewertung	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	1	Formativ	Automatisiert
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	Übung	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		
Independent practical work Students work independently using the material in LMS Moodle and textbook.	180 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Ja	Automatisiert, Kollege	Nein	Nein		
Quiz (limit of function-math problems) Students take a short quiz which cover the basic math problems.	60 min	Bewertung	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	2	Formativ	Automatisiert
Gesamtarbeitsbelastung der Einheit	10.25h											
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	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Ja	Automatisiert, Kollege	Nein	Nein			
Disscussion about technical and content related isssues Students are given information in LMS and then they can ask questions.	60 min	Diskussion	Online	Asynchron	Lehrer nicht anwesend	Nein	Ja	Lehrer, Kollege	Nein	Nein			
Gesamtarbeitsbelastung der Einheit	4.33h												
Monthly test (kolokvij)													
Test The test is prepared in hybrid delivery mode using individualised assignments from the databases in LMS.	90 min	Bewertung	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Lehrer, Automatisiert	Nein	20	Summativ	Lehrer, Automatisiert	
Gesamtarbeitsbelastung der Einheit	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	Diskussion	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	Nein			
Analysis of the test Reliability, validity, students' satisfaction survey, explaining solutions	45 min	Diskussion	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Lehrer	Nein	Nein			
Further student investigation Students investigate application areas of mathematics learned.	90 min	Untersuchung	Online	Asynchron	Lehrer nicht anwesend	Ja	Ja	Kollege	Nein	Nein			
Gesamtarbeitsbelastung der Einheit	2.58h												

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	Erwerb	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	Nein		
Disscusion Students participate in discussions related to the introductory video.	30 min	Diskussion	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Kollege	Nein	0	Formativ	Kollege
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	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		
Quiz Students take a short quiz based on the concept od the derivative.	20 min	Bewertung	Online	Asynchron	Lehrer anwesend	Nein	Nein	Automatisiert	Nein	1	Formativ	Automatisiert
Practice Assistants work with students on derivatives; techniques and rules application.	90 min	Übung	Vor Ort	Synchron	Lehrer anwesend	Nein	Ja	Lehrer	Nein	Nein		
Independent practical work. Students practice different differentiation techniques based on material in LMS and texbooks.	90 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	Nein		

Gesamtarbeitsbelastung der Einheit	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	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		
Quiz Students take a short quiz based on advanced techniques of differentiation.	20 min	Bewertung	Online	Asynchron	Lehrer anwesend	Nein	Nein	Nein	Nein	2	Formativ	Automatisiert
Practice Assistants work with students on examples of derivation of implicit functions and chain rule.	90 min	Übung	Vor Ort	Synchron	Lehrer anwesend	Nein	Ja	Lehrer	Nein	Nein		
Independent practical work - advanced techniques. Students learn and practice higher-order derivatives based on material in LMS and texbooks.	90 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	Nein		
Independent investigation Students are required to investigate on their own the application areas and history of calculus.	90 min	Untersuchung	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	Nein		
Gesamtarbeitsbelastung der Einheit	5.83h												
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	Erwerb	Online	Synchron	Lehrer nicht anwesend	Nein	Nein	Lehrer	Nein	Nein		
Quiz Students take a short quiz based on finding extrema of function.	20 min	Bewertung	Online	Asynchron	Lehrer anwesend	Nein	Nein	Automatisiert	Nein	1	Formativ	Automatisiert
Practice Assistants work with students on finding function increasing or decrease intervals by use of local extrema.	90 min	Übung	Vor Ort	Synchron	Lehrer anwesend	Nein	Ja	Lehrer	Nein	Nein		
Independent practical work-finding extrema Students practice finding increasing or decreasing intervals based on material in LMS and texbooks.	90 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	Nein		
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	Untersuchung	Online	Asynchron	Lehrer nicht anwesend	Nein	Ja	Lehrer	Nein	0	Formativ	Lehrer
Gesamtarbeitsbelastung der Einheit	5.33h											
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	Erwerb	Online	Synchron	Lehrer nicht anwesend	Nein	Nein	Lehrer	Nein	Nein		
Independent practical work -concavity and convexity Students practice finding point of inflection based on material in LMS and texbooks.	90 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	Nein		
Quiz Students take a short quiz about function concavity and convexity.	20 min	Bewertung	Online	Asynchron	Lehrer anwesend	Nein	Nein	Automatisiert	Nein	2	Formativ	Automatisiert

Practice Assistants work with students on describing the shape or curvature of a curve.	90 min	Übung	Vor Ort	Synchron	Lehrer anwesend	Nein	Ja	Lehrer	Nein	Nein		
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	Untersuchung	Online	Asynchron	Lehrer nicht anwesend	Nein	Ja	Lehrer	Nein	0	Formativ	Lehrer
Gesamtarbeitsbelastung der Einheit	5.25h											
Plotting graph												
Reading- graph plotting Students read material about applying derivatives on plotting graph functions.	60 min	Erwerb	Online	Synchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	0	Formativ	Automatisiert
Independent practical work - graph plotting Students practice graph plotting based on material in LMS and texbooks.	90 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	Nein		
Practice Assistants work with students on plotting graphs.	90 min	Übung	Vor Ort	Synchron	Lehrer anwesend	Nein	Ja	Lehrer	Nein	Nein		
Self-assessment Students in small group take self-assessment based on the assessment tasks in LMS (database).	90 min	Bewertung	Online	Asynchron	Lehrer nicht anwesend	Ja	Ja	Lehrer, Automatisiert	Nein	2	Formativ	Lehrer
Gesamtarbeitsbelastung der Einheit	5.5h											
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	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Ja	Automatisiert, Kollege	Nein	Nein			
Disscussion about technical and content related isssues Students are given information in LMS and then they can ask questions.	60 min	Diskussion	Online	Asynchron	Lehrer nicht anwesend	Nein	Ja	Lehrer, Kollege	Nein	Nein			
Gesamtarbeitsbelastung der Einheit	4.33h												
Monthly test (kolokvij)													
Test The test is prepared in hybrid delivery mode using individualised assignments from the databases in LMS.	90 min	Bewertung	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Lehrer, Automatisiert	Nein	20	Summativ	Lehrer, Automatisiert	
Gesamtarbeitsbelastung der Einheit	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	Diskussion	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	Nein			
Analysis of the test Reliability, validity, students' satisfaction survey, explaining solutions	45 min	Diskussion	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Lehrer	Nein	Nein			
Further student investigation Students investigate application areas of mathematics learned.	90 min	Untersuchung	Online	Asynchron	Lehrer nicht anwesend	Ja	Ja	Kollege	Nein	Nein			
Gesamtarbeitsbelastung der Einheit	2.58h												

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 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	45 min	Diskussion	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein
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	Diskussion	Online	Asynchron	Lehrer nicht anwesend	Ja	Ja	Nein	Nein	Nein
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	Untersuchung	Online	Asynchron	Lehrer nicht anwesend	Ja	Ja	Lehrer, Kollege	Nein	Nein
Gesamtarbeitsbelastung der Einheit	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	Diskussion	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein
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	Übung	Online	Asynchron	Lehrer anwesend	Nein	Ja	Lehrer, Automatisiert, Kollege	Nein	Nein
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	Produktion	Hybrid	Asynchron	Lehrer nicht anwesend	Ja	Ja	Lehrer, Kollege	Nein	Nein
Gesamtarbeitsbelastung der Einheit	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	Diskussion	Hybrid	Synchron	Lehrer anwesend	Ja	Ja	Lehrer, Kollege	Nein	Nein		
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-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.	90 min	Bewertung	Hybrid	Asynchron	Lehrer anwesend	Nein	Nein	Lehrer, Kollege	Nein	20	Summativ	Lehrer, Kollege
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	Untersuchung	Hybrid	Synchron	Lehrer anwesend	Nein	Ja	Lehrer, Automatisiert, Kollege	Nein	Nein		
Gesamtarbeitsbelastung der Einheit	5h											

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	Erwerb	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	Nein		
Disscusion Students participate in discussions related to the introductory video	15 min	Diskussion	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Kollege	Nein	0	Formativ	Kollege
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	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		
Quiz Students take a short quiz based on the concept od the integral	10 min	Bewertung	Online	Asynchron	Lehrer anwesend	Nein	Nein	Automatisiert	Nein	1	Formativ	Automatisiert
Gesamtarbeitsbelastung der Einheit	2.91h											
Integration techniques												
Lecture - advanced techniques Professor presents advanced techniques of integration. Students can ask questions.	90 min	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		

Practice Assistants work with students on integrals; techniques and rules application.	120 min	Übung	Vor Ort	Synchron	Lehrer anwesend	Nein	Ja	Lehrer	Nein	Nein		
Independent practical work. Students learn and practice bsed on material in LMS and texbooks.	120 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	Nein		
Quiz (Integration-math problems) Students take a short quiz based on the concept od the derivative.	30 min	Bewertung	Online	Asynchron	Lehrer anwesend	Nein	Nein	Automatisiert	Nein	2	Formativ	Automatisiert
Gesamtarbeitsbelastung der Einheit	6h											
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	Erwerb	Online	Synchron	Lehrer nicht anwesend	Nein	Nein	Lehrer	Nein	Nein		
Quiz Students take a short quiz based on calculating surface area.	20 min	Bewertung	Online	Asynchron	Lehrer anwesend	Nein	Nein	Automatisiert	Nein	1	Formativ	Automatisiert
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	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		
Practice Assistants work with students on calculating surface area.	120 min	Übung	Vor Ort	Synchron	Lehrer anwesend	Nein	Ja	Lehrer	Nein	Nein		

Independent practical work-calculating surface area Students practice calculating surface area.	180 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	Nein		
Self-assessment Students take self-assessment based on the assessment tasks in LMS (database).	90 min	Bewertung	Online	Asynchron	Lehrer nicht anwesend	Nein	Ja	Lehrer	Nein	2	Formativ	Lehrer
Gesamtarbeitsbelastung der Einheit	9.58h											
Calculating volume												
Lecture - calculating volume Student listen video lecture about calculating volume.	30 min	Erwerb	Online	Synchron	Lehrer nicht anwesend	Nein	Nein	Lehrer	Nein	Nein		
Quiz Students take a short quiz based on calculating volume.	20 min	Bewertung	Online	Asynchron	Lehrer anwesend	Nein	Nein	Automatisiert	Nein	1	Formativ	Automatisiert
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	Erwerb	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Nein	Nein	Nein		
Practice Assistants work with students on calculating volume.	90 min	Übung	Vor Ort	Synchron	Lehrer anwesend	Nein	Ja	Lehrer	Nein	Nein		
Independent practical work-calculating volume Students practice calculating volume.	120 min	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Nein	Automatisiert	Nein	Nein		
Self-assessment Students take self-assessment based on the assessment tasks in LMS (database).	90 min	Bewertung	Online	Asynchron	Lehrer nicht anwesend	Nein	Ja	Lehrer	Nein	2	Formativ	Lehrer
Gesamtarbeitsbelastung der Einheit	7.33h											

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	Übung	Vor Ort	Asynchron	Lehrer nicht anwesend	Nein	Ja	Automatisiert, Kollege	Nein	Nein			
Disscussion about technical and content related isssues Students are given information in LMS and then they can ask questions.	60 min	Diskussion	Online	Asynchron	Lehrer nicht anwesend	Nein	Ja	Lehrer, Kollege	Nein	Nein			
Gesamtarbeitsbelastung der Einheit	4.33h												
Monthly test (kolokvij)													
Test The test is prepared in hybrid delivery mode using individualised assignments from the databases in LMS.	90 min	Bewertung	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Lehrer, Automatisiert	Nein	20	Summativ	Lehrer, Automatisiert	
Gesamtarbeitsbelastung der Einheit	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	Diskussion	Online	Asynchron	Lehrer nicht anwesend	Nein	Nein	Nein	Nein	Nein			
Analysis of the test Reliability, validity, students' satisfaction survey, explaining solutions	45 min	Diskussion	Hybrid	Synchron	Lehrer anwesend	Nein	Nein	Lehrer	Nein	Nein			
Further student investigation Students investigate application areas of mathematics learned.	90 min	Untersuchung	Online	Asynchron	Lehrer nicht anwesend	Ja	Ja	Kollege	Nein	Nein			

Gesamtarbeitsbelastung der Einheit	2.58h
Gesamtarbeitsbelastung des Kurses	**138.66h**