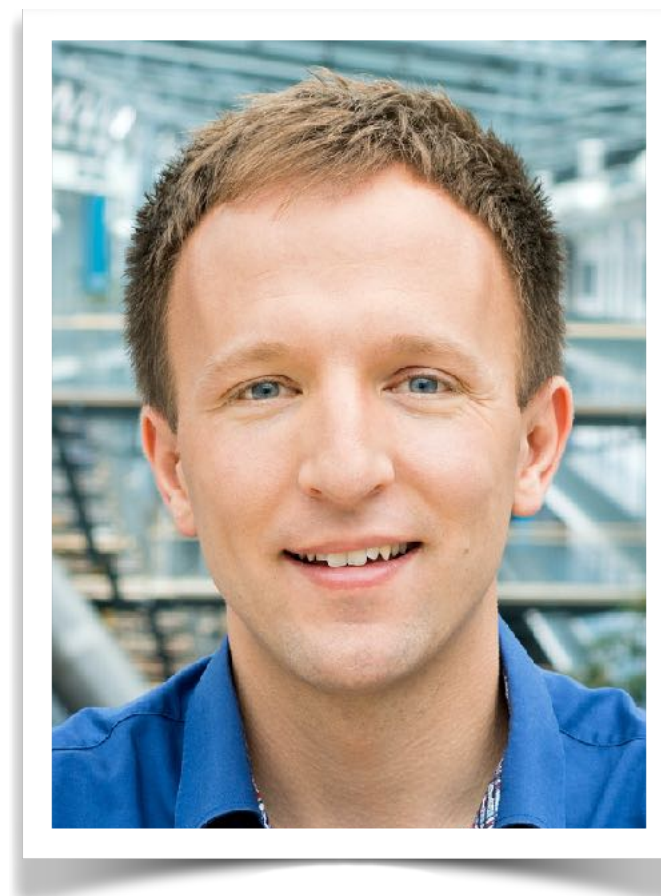


Digitale Bearbeitung und Abgabe Kompetenzorientierter Fernprüfungen

Verbesserungen des Klausurmodus in Artemis



Prof. Dr. Stephan Krusche
<https://ase.in.tum.de/krusche>

Artemis Klausurmodus

- Kompletter digitaler Prozess im Web Browser



1. Erstellung und Konfiguration

Exercise Groups

[+ Create new Exercise Group](#)

Number of exercise groups: 6

^ v
Programming 1
mandatory

+ Add Quiz
+ Add File Upload Exercise
+ Import a Text Exercise
+ Import Modelling Exercise
+ Import Programming Exercise
✎ Edit

+ Add Text Exercise
+ Add Modelling Exercise
+ Add Programming Exercise
✕ Delete

ID	Type	Title	Points	Bonus points	Included in Score	Short Name	Repositories	Build Plans	Participation Mode	Assessment Mode					
3523		TOE L03E03 Flyweight pattern	20	0	Yes	toeL03E03	Template Solution Test	Template Solution	Offline IDE : true Online Editor : true	Automatic	☰ Scores ✎ Grading ☰ Participation ☰ Submissions ☰ Example submissions ✎ Edit in editor ✎ Edit ✕ Delete				
3525		TOE L03E04 Builder Pattern	20	0	Yes	toeL03E04	Template Solution Test	Template Solution	Offline IDE : true Online Editor : true	Automatic	☰ Scores ✎ Grading ☰ Participation ☰ Submissions ☰ Example submissions ✎ Edit in editor ✎ Edit ✕ Delete				

^ v
Text
mandatory

+ Add Quiz
+ Add File Upload Exercise
+ Import a Text Exercise
+ Import Modelling Exercise
+ Import Programming Exercise
✎ Edit

+ Add Text Exercise
+ Add Modelling Exercise
+ Add Programming Exercise
✕ Delete

ID	Type	Title	Points	Bonus points	Included in Score	Assessment Mode				
3521	A	L01E01 Strategy vs. bridge pattern	10	0	Yes	Semi-Automatic	☰ Scores ☰ Participation ☰ Submissions ☰ Example submissions ✎ Edit ✕ Delete			

https://docs.artemis.ase.in.tum.de/user/exam_mode

1. Erstellung und Konfiguration

Test Run Management: Patterns in Software Engineering

Create a Test Run

Assess Your Test Runs

Here you can create a test run for the exam. Pick which exercises your exam should contain and run the conduction. Afterwards you will be able to assess your submissions and grade them as a tutor. You have the option to view the results and complain as a student. Additionally, you can also respond to the complaints about the assessment as a tutor.

Note: Submissions made within test runs do not count towards the exam scores.

ID ^	Author ^	Working time (mm:ss) ⇅	Started ⇅	Submitted ⇅	Submission date ⇅
------	----------	------------------------	-----------	-------------	-------------------

8804	Jane Doe	90:00	Yes	No	
------	----------	-------	-----	----	--

Continue

Manage Working Time

✕ Delete



2. Durchführung

Exercise 1 of 4

«» »

1 2 3 4

Save & continue Hand in early Time left: 83 min

Modeling the University [5 points]

Help Fullscreen

```
classDiagram
    class Abstract {
        <<abstract>>
        + attribute: Type
        + method()
    }
    class Class {
        + attribute: Type
        + method()
    }
    Abstract <|-- Class
```

Package

Class

+ attribute: Type

+ method()

«abstract» Abstract

+ attribute: Type

+ method()

«interface» Interface

+ attribute: Type

+ method()

«enumeration» Enumeration

Case 1

Case 2

Case 3

Problem statement:

A university course has a title, a description and an exam date. Students have a matriculation number, a name and an age, they can join and drop a course. Instructors hold the lectures of a course.

Your task: Create an analysis object model (UML class diagram) to model this problem

Your answers will be saved every 30s. Connected

https://docs.artemis.ase.in.tum.de/user/exam_mode

3. Bewertung

Assessment Dashboard for exam Patterns in Software Engineering

- End Date : Mar 5, 2021 09:25
- Release Date of Results : Mar 8, 2021 11:30









Information about your assessments

- **Your assessments:** 74
- **Assessments locked by you:** 0

Information about the exam

- **Total assessments:** 908 / 908 (100%)
- **Assessments for correction rounds:** 908
- **Total complaints:** 65
- **Total assessment locks:** 3

Show finished exercises

Exercise type ^	Exercise ⇅	Your status	Actions
	Modeling with Design Patterns	 154 / 154 (100%) 9 / 9 (100%)	Exercise Dashboard Submissions
	Modeling with Design Patterns	 145 / 145 (100%) 7 / 7 (100%)	Exercise Dashboard Submissions
	Modeling with Design Patterns	 155 / 155 (100%) 16 / 16 (100%)	Exercise Dashboard Submissions
A	Compare Architectural Patterns	 82 / 82 (100%) 4 / 4 (100%)	Exercise Dashboard Submissions
A	Compare Architectural Patterns	 87 / 87 (100%) 2 / 2 (100%)	Exercise Dashboard Submissions

https://docs.artemis.ase.in.tum.de/user/exam_mode

Verbesserungen des Klausurmodus in Artemis



- AP1: Identifikation von Bearbeitungsschwierigkeiten
- AP2: Technische Realisierung der Verbesserungen
- AP3: Evaluation der realisierten Ergebnisse

AP1: Identifikation von Bearbeitungsschwierigkeiten



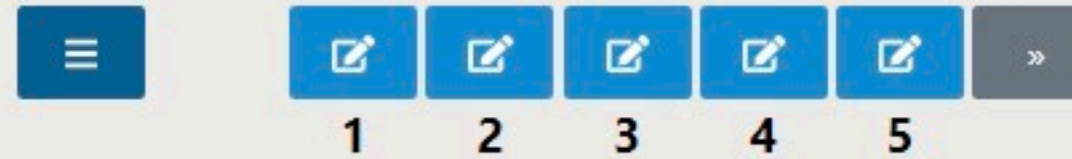
- Online Umfrage und persönliche Gespräche
- Ergebnisse
 - Der Klausurmodus funktioniert sehr gut
 - Eine automatische Notenberechnung fehlt
 - Checkliste für die Erstellung von Klausuren wäre hilfreich
 - Übersicht der Aufgaben während der Bearbeitung
 - Lastspitzen bei über 1.000 gleichzeitigen Teilnehmern

AP2: Technische Realisierung der Verbesserungen

- Beschaffung von zusätzlicher Hardware nach Umwidmung (2 zusätzliche Dell Server mit je 32 vCPUs und 256GB RAM)
- Iterative Verbesserungen: Insgesamt 87 Anpassungen in der Prüfungssoftware Artemis implementiert und in das Produktivsystem der TUM integriert
 - Alle Details im Open Source Projekt auf <https://github.com/ls1intum/Artemis> in den Release Notes und in Pull Requests dokumentiert

Verbesserung 1: Übersicht der Aufgaben

Exam Overview



Hand in early

Time left: 399 min

Exercises

#	Type	Name	Points	Status
1		Modeling	20	
2		Programming	20	
3		Quiz	20	
4	A	Text Exercise	20	
5	A	Text Exercise 2	20	

https://docs.artemis.ase.in.tum.de/user/exam_mode

Verbesserung 2: Checkliste für Erstellung

Retake Introduction to Informatics

Exam preparation	Exam conduction	Exam correction
<ul style="list-style-type: none"> 1. Configure exercises: 4 exercise groups ✓ 2. Register students: 20 registered ✓ 3. Generate student exams: 20 of 20 ✓ 4. Prepare exercise start ✓ 	<p>Apr 12, 2022 14:15 - Apr 12, 2022 15:55</p> <ul style="list-style-type: none"> 1. Started exams: 18 (90%) 2. Submitted exams: 18 (90%) 	<ul style="list-style-type: none"> 1. Correction progress in round 1: 100% 2. Publishing results: Apr 14, 2022 20:00 ✓ 3. Exam review: Running 4. Complaints: 50%

Exam Checklist

This page gives an overview over the various steps when conducting an exam. In the [external documentation](#) you can find more details about the individual steps.

#	Task	Description	Page
1	Create at least one exercise group with exercises	<p>You can create exercise groups with multiple exercise variants to make cheating for students more difficult. The points in all exercises within a given exercise group must be identical, and the number of exercise groups must equal the exam's number of exercises.</p> <ul style="list-style-type: none"> ✓ At least one exercise group ✓ Number of exercises in the exam equals the number of exercise groups ✓ Each exercise group contains at least one exercise ✓ Points in exercises of each exercise group are identical ✓ Maximum number of points in exam can be attained with the current exercise group configuration 	Exercise Groups

Verbesserung 3: Hinterlegung von Notenschlüssel



Erreichbare Punktzahl : Notentyp: Inklusivität: Bestanden

Intervall	Min % - Max %	Notenname
<input type="text" value="30"/>	[0 - 30)	<input type="text" value="5.0"/>
<input type="text" value="5"/>	[30 - 35)	<input type="text" value="4.7"/>
<input type="text" value="5"/>	[35 - 40)	<input type="text" value="4.3"/>
<input type="text" value="5"/>	[40 - 45)	<input type="text" value="4.0"/>
<input type="text" value="5"/>	[45 - 50)	<input type="text" value="3.7"/>
<input type="text" value="5"/>	[50 - 55)	<input type="text" value="3.3"/>
<input type="text" value="5"/>	[55 - 60)	<input type="text" value="3.0"/>
<input type="text" value="5"/>	[60 - 65)	<input type="text" value="2.7"/>

<https://artemis.in.tum.de>

AP3: Evaluation der realisierten Ergebnisse

- Einsatz und Evaluation der Verbesserungen in mehreren Klausuren mit bis zu 2.000 Teilnehmern gleichzeitig
 - Finalklausuren Juli/August 2021
 - Wiederholungsklausuren Oktober 2021
 - Finalklausuren Februar/März 2022
- Die Hardware hat zuverlässig funktioniert
- Die Zahl der Bearbeitungsschwierigkeiten ist zurückgegangen

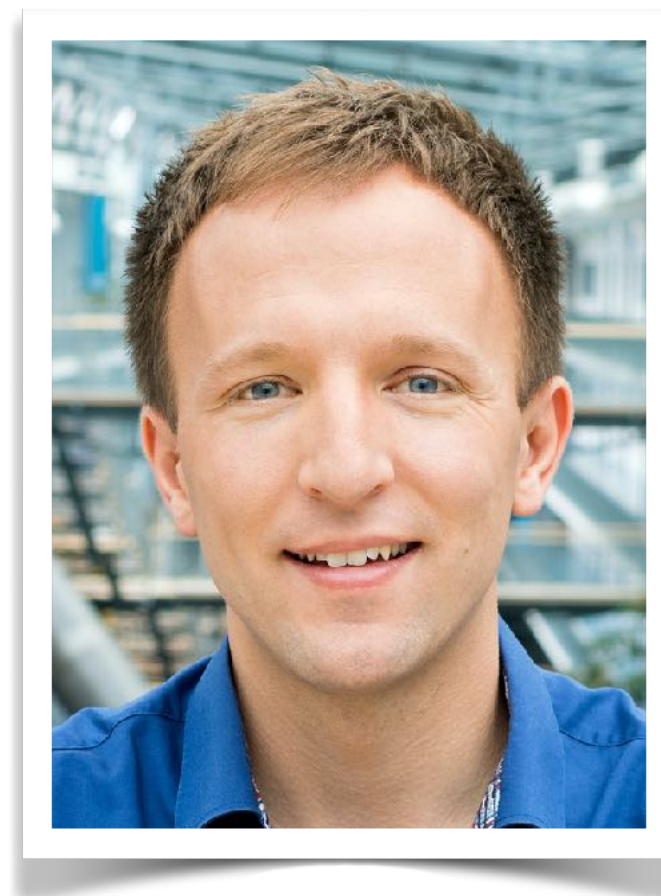
Fazit und Ausblick



- Das Projekt war ein Erfolg
- Weitere Ideen für Verbesserungen
 - Live Dashboard für Dozierende
 - Testklausuren für Studierende
- Weitere Nutzung von Artemis als Fernprüfungssystem im SS22
- Verstärkte Nutzung für computer basierte Klausuren am Campus

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Danke!