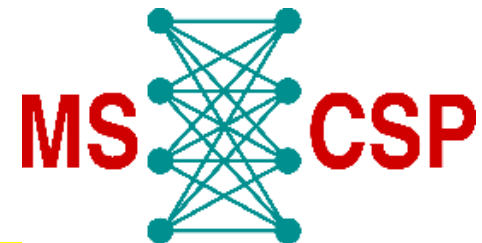

Digital Teaching in MSCSP

Best Practice Examples

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Outline

- ❑ Digital teaching in MSCSP
- ❑ Communication Networks – Best practices
- ❑ Media Technology – Best practices
- ❑ Lab tour
- ❑ Summary and conclusions



Digital teaching in MSCSP

- Lectures
 - ⇒ Hybrid (mostly)
 - ⇒ Inverted classroom
 - ⇒ Asynchronous (video lectures)

- Exams and Quizzes
 - ⇒ Video surveillance of written exams
 - ⇒ Digital exams and quizzes through Webex
 - ⇒ H5P apps (Webex or exported as standalone) for teaching

- Project presentations with VR
 - ⇒ As part of the communication Networks course

- Lab tour using 3D-Vista

Communication Networks

- ❑ Hybrid lectures
- ❑ Excellent use of Moodle and H5P for quizzes, home works, and take-home bonus exams

Quizzes using Moodle

- ❑ There is a degree of freedom in choosing different types of questions, such as, multiple choices, adding images, fill in the text, numerical answer, and many more.
- ❑ The quiz is made available for only a limited time (e.g., one week) and the students must submit their answers within some time (e.g., one hour) after they start the trial.
- ❑ The results for all the quizzes are available in Moodle. They can be weighed and manipulated otherwise to calculate the final grade.

Example Quiz

The screenshot shows a web interface for a quiz. At the top left is the logo of Technische Universität Ilmenau. The main title is "Lectures on 'Communication Networks'". A breadcrumb trail shows: Dashboard > My courses > CN > Quizzes > Quiz 2. Protocol Specification > Preview. The main content area contains a message: "You can preview this quiz, but if this were a real attempt, you would be blocked because: This quiz is not currently available". Below this is a question card for "Question 1", which is "Not yet answered" and "Marked out of 3.00". The question text is: "What is the remainder obtained by dividing $x^7 + x^5 + 1$ (information bits written in polynomial form) by the generator polynomial $x^3 + 1$? (The answer in numerical in bits)". There is an "Answer:" label followed by an empty text input field. To the right of the question card is a "Quiz navigation" section with six numbered boxes (1-6), where box 1 is highlighted. Below this is a "Global search" section with a search input field and a "Search" button. At the bottom of the main content area, there is a "Previous activity" section with a link to "Quiz 1. Fundamentals" and a "Next activity" section with a link to "Quiz 3. Transmission Technique". A "Next page" button is also visible. The footer contains contact information for Technische Universität Ilmenau, including the website URL <https://www.tu-ilmenau.de> and the phone number +49 3677 69-1111.

Example Quiz

TECHNISCHE UNIVERSITÄT ILMENAU Help

You can preview this quiz, but if this were a real attempt, you would be blocked because:
This quiz is not currently available

Question 4
Not yet answered
Marked out of 3.00
Flag question
Edit question

Mobile Station Base Station Subsystem Network Subsystem & OSS

In the figure above is given the architecture of a GSM network. In the questions below, match the network component with the given functionality.

- Stores user parameters of only a user
- Handover management
- Encryption and decryption
- Switching of the radio channels
- Channel coding and decoding
- Stores the secret keys of all the users in the network
- Stores your private key K_i
- Is the switching centre
- Contain information for the users that are currently in the domain of an MSC
- Mapping of terrestrial channels onto radio channels
- Permanent and semi-permanent data of all subscribers

Choose...
SIM
BSC and BTS
BSC
AuC
VLR
BTS
SIM and AuC
MSC
HLR

Quiz navigation
1 2 3 4 5
Finish attempt ...
Start a new preview

Global search
Search
Advanced search

Example Quiz

TECHNISCHE UNIVERSITÄT ILMENAU

Lectures on "Communication Networks"

Dashboard > My courses > CN > Quizzes > Quiz 3. Transmission Technique > Preview

You can preview this quiz, but if this were a real attempt, you would be blocked because:
This quiz is not currently available

Question 6
Not yet answered
Marked out of 1.50
Flag question
Edit question

Time Division Multiplexing (TDM) and Frequency Division Multiplexing (FDM) are two multiplexing techniques based on time division and frequency division respectively. In the text below choose which of the multiplexing techniques fit better.

[] works only with analog signals while [] works with digital signals as well as analog signals. In [], a synchronization pulse is necessary. [] can be synchronous or asynchronous.

In order to avoid interferences between the signals, guard bands are used in [] . [] does not cause propagation delay, while [] can cause propagation delay.

[] utilizes the frequency bandwidth better than [] .

Previous page Finish attempt ...

Previous activity Next activity
◀ Quiz 2. Protocol Specification Jump to... Quiz 4. Interconnection of Networks ▶

Quiz navigation
1 2 3 4 5 6
Finish attempt ...
Start a new preview

Global search
[]
Search
Advanced search

Impressum
So erreichen Sie uns:
<https://www.tu-ilmenau.de>

Example Quiz

TECHNISCHE UNIVERSITÄT ILMENAU

Question 4
Not yet answered
Marked out of 2.00
Flag question
Edit question

In the figure below are shown the waveforms for several line codes. A positive feature of a line code is if it's DC-free or DC-balanced. In the options given below choose the codes that you think are DC-free.

	1	0	1	1	0	0	0	1	1	0	1
NRZ-L	High	Low	High	High	Low	Low	Low	High	High	Low	High
NRZ-M	Low	High	Low	Low	High	High	High	Low	Low	High	Low
NRZ-S	Low	High	High	Low	High	Low	Low	High	High	Low	High
RZ	High	Low	High	High	Low	Low	Low	High	High	Low	High
Biphase-L (manchester)	High-Low	Low-High	High-Low	High-Low	Low-High	Low-High	Low-High	High-Low	High-Low	Low-High	High-Low
Biphase-M	Low-High	High-Low	Low-High	Low-High	High-Low	High-Low	High-Low	Low-High	Low-High	High-Low	Low-High
Biphase-S	Low-High	High-Low	High-Low	Low-High	High-Low	Low-High	Low-High	High-Low	High-Low	Low-High	High-Low
Differential manchester	High-Low	Low-High	Low-High	High-Low	High-Low	Low-High	Low-High	Low-High	High-Low	High-Low	Low-High
Delay modulation	High	Low	High	High	Low	Low	Low	High	High	Low	High
Bipolar	High	Low	Low	High	High	Low	Low	High	High	Low	High

- NRZ-L (Non Return to Zero - Level)
- NRZ-M (Non Return to Zero - Mark)
- NRZ-S (Non Return to Zero - Space)
- RZ (Return to Zero)
- Biphase-L (Manchester)
- Biphase-M
- Biphase-S
- Differential Manchester
- Delay Modulation (Miller Code)
- Bipolar (AMI-Alternate Mark Inversion)

Global search

Search

Advanced search

Take-Home bonus exams

- ❑ The exam is made available to students in pdf format.
- ❑ They can download it and then upload their answers in a variety of formats.
- ❑ The exams are graded directly on Moodle platform and students can be notified right away about their results.
- ❑ Comments and other files can be added to the review. Also, students can directly see their graded exam sheet to see their performance in each question.

Take-Home bonus exams

The screenshot shows a Moodle course page for 'First Bonus Exam 2021/2022'. The page includes a navigation menu on the left with options like 'Course sections', 'Participants', 'Certificates', 'Grades', 'Dashboard', 'My courses', and 'Content bank'. The main content area displays the exam title, instructions, and a grading summary table. The instructions state that students have 1 hour and 30 minutes to finish and upload their answers, and that answers must be submitted by email if not possible in Moodle. The grading summary table provides details on the number of participants, drafts, submissions, and the due date.

TECHNISCHE UNIVERSITÄT ILMENAU

Dashboard > My courses > CN > Bonus Exam > First Bonus Exam 2021/2022

First Bonus Exam 2021/2022

You have 1 hour and 30 minutes to finish and upload your answers.

If for any reason, you can not upload your answers in Moodle, you can send them to my email: mendrit.shala@tu-ilmenau.de. Any response that comes later will not be counted!

Everybody has to submit her/his own answers. If I find answers that are obviously copied, I will not give points for them. Furthermore, please answer the questions so that I can read them.

If you have any questions during the exam, I will be available on Webex (<https://tu-ilmenau.webex.com/meet/mendrit.shala>) or you can call me on my phone number: +49 3677 69-1145.

[Take_Away_Bonus_Exam_Dec.21.pdf](#) 15 December 2021, 11:45 AM

Grading summary

Hidden from students	No
Participants	114
Drafts	7
Submitted	40
Needs grading	0
Due date	Wednesday, 15 December 2021, 2:30 PM
Time remaining	Assignment is due
Late submissions	Only allowed for participants who have been granted an extension

[View all submissions](#) [Grade](#)

Take-Home bonus exams

Select	User picture	First name / Surname	Email address	Status	Grade	Edit	Last modified (submission)	File submissions	Submission comments	Last modified (grade)	Annotate PDF	Final grade
<input type="checkbox"/>		[Redacted]	[Redacted]@tu-ilmenau.de	Submitted for grading 3 mins 14 secs late Released	Grade 0.00 / 40.00	Edit	Wednesday, 15 December 2021, 2:33 PM	Take Away Bonus Exam_Dec 21.pdf 15 December 2021, 2:33 PM	Comments (2)	Monday, 17 January 2022, 3:17 PM		0.00 / 40.00
<input type="checkbox"/>		[Redacted]	[Redacted]@tu-ilmenau.de	Submitted for grading Released	Grade 28.50 / 40.00	Edit	Wednesday, 15 December 2021, 2:29 PM	Adobe Scan 15.12.2021.pdf 15 December 2021, 2:28 PM	Comments (0)	Monday, 17 January 2022, 3:17 PM	[Redacted].pdf 3 January 2022, 3:01 PM View annotated PDF...	28.50 / 40.00
<input type="checkbox"/>		[Redacted]	[Redacted]@tu-ilmenau.de	Submitted for grading Released	Grade 18.00 / 40.00	Edit	Wednesday, 15 December 2021, 2:28 PM	[Redacted].pdf 15 December 2021, 2:28 PM	Comments (0)	Monday, 17 January 2022, 3:17 PM	[Redacted].pdf 3 January 2022, 3:11 PM View annotated PDF...	18.00 / 40.00
<input type="checkbox"/>		[Redacted]	[Redacted]@tu-ilmenau.de	Submitted for grading Released	Grade 6.00 / 40.00	Edit	Wednesday, 15 December 2021, 2:29 PM	[Redacted] Take Home Exam.pdf 15 December 2021, 2:28 PM	Comments (0)	Monday, 17 January 2022, 3:18 PM	[Redacted].pdf 3 January 2022, 3:17 PM View annotated PDF...	6.00 / 40.00
<input type="checkbox"/>		[Redacted]	[Redacted]@tu-ilmenau.de	Submitted for grading 22 mins 53 secs late Released	Grade 9.50 / 40.00	Edit	Wednesday, 15 December 2021, 2:52 PM	Exam.pdf 15 December 2021, 2:50 PM	Comments (1)	Monday, 17 January 2022, 3:16 PM	[Redacted].pdf 3 January 2022, 3:48 PM View annotated PDF...	9.50 / 40.00
<input type="checkbox"/>		[Redacted]	[Redacted]@tu-ilmenau.de	Submitted for grading Released	Grade 2.00 / 40.00	Edit	Wednesday, 15 December 2021, 2:24 PM	WhatsApp Image 2021-12-15 at 14.19.19.jpeg 15 December 2021, 2:24 PM WhatsApp Image 2021-12-15 at 14.19.20 (1).jpeg 15 December 2021, 2:24 PM WhatsApp Image 2021-12-15 at 14.19.20.jpeg 15 December 2021, 2:24 PM	Comments (0)	Monday, 17 January 2022, 3:19 PM	[Redacted].pdf 3 January 2022, 3:53 PM View annotated PDF...	2.00 / 40.00
<input type="checkbox"/>		[Redacted]	[Redacted]@tu-ilmenau.de	Submitted for grading Released	Grade 1.00 / 40.00	Edit	Wednesday, 15 December 2021, 2:16 PM	Bonus Exam [Redacted].jpg 15 December 2021, 2:16 PM	Comments (0)	Monday, 17 January 2022, 3:19 PM	[Redacted].pdf 3 January 2022, 3:57 PM View annotated PDF...	1.00 / 40.00
<input type="checkbox"/>		[Redacted]	[Redacted]@tu-ilmenau.de	Submitted for grading 3 secs late Released	Grade 17.00 / 40.00	Edit	Wednesday, 15 December 2021, 2:30 PM	Take Away Bonus Exam_Dec 21.pdf 15 December 2021, 2:29 PM	Comments (0)	Monday, 17 January 2022, 3:19 PM	[Redacted].pdf 3 January 2022, 4:13 PM View annotated PDF...	17.00 / 40.00
<input type="checkbox"/>		[Redacted]	[Redacted]@tu-ilmenau.de	Submitted for grading Released	Grade 15.00 / 40.00	Edit	Wednesday, 15 December 2021, 2:27 PM	Take away bonus [Redacted].pdf 15 December 2021, 2:26 PM	Comments (0)	Monday, 17 January 2022, 3:19 PM	[Redacted].pdf 6 January 2022, 2:49 PM View annotated PDF...	15.00 / 40.00

Take-Home bonus exams

Course: Lectures on "Communication Networks"
Assignment: Second Bonus Exam 2021/2022
View all submissions

Due date: 2 February 2022, 2:30 PM

Page 2 of 4

second_bonus.pdf2 February 2022, 2:28 PM

Comments (0)

Grade

Grade out of 40

25.00

Marking workflow state

Released

Current grade in gradebook

25.00

Feedback comments

Download feedback PDF

Feedback files

Maximum size for new files: 100MB

Files

You can drag and drop files here to add them.

Notify students Save changes Save and show next Reset

Task 8

① **Proactive** → In this case there is a periodic exchange of routing information.
The delay in network is low since the routes are already determined.
It comes with high overhead and storage requirements.

Reactive → In this routes are determined on demand and there is high delay.
It needs less storage compared to proactive and less overhead.

② Optimized link state routing (OLSR) works as a proactive routing algorithm, given that the control messages between the neighbors can be used to get the routing information.
Even though it requires high overhead being a proactive algorithm, it does reduce the delay in packet transmission as it is already from routing information.

③

```
graph TD
    Node1[Node1] -- RREQ --> Node2[Node2]
    Node1 -- RREQ --> Node3[Node3]
    Node2 -- RREP --> Node1
    Node3 -- RREP --> Node1
    Node2 -- RREQ --> Node4[Node4]
    Node3 -- RREQ --> Node4
    Node4 -- RREP --> Node2
    Node4 -- RREP --> Node3
    Node4 -- RREQ --> Node5[Node5]
    Node5 -- RREP --> Node4
```

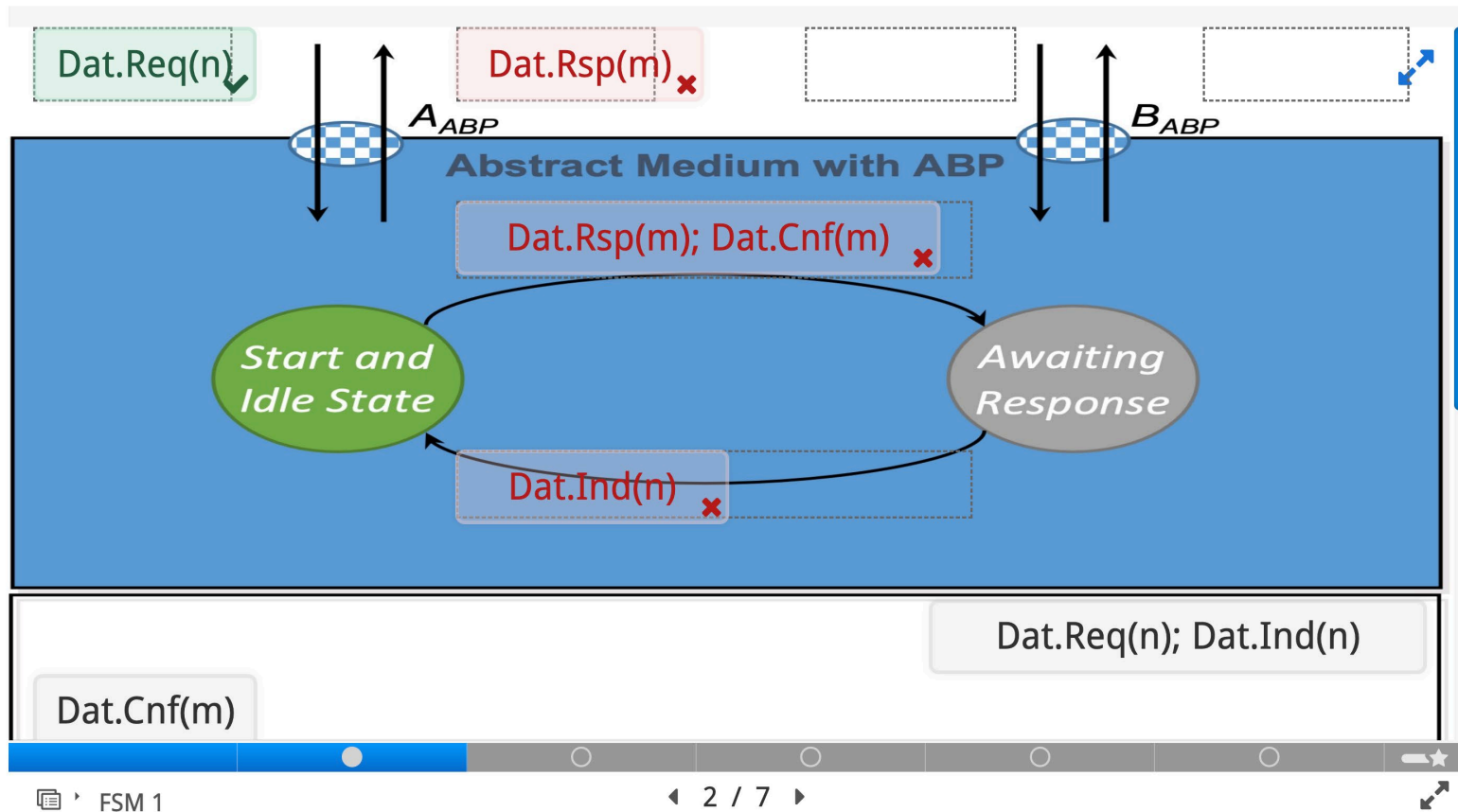
④ There is no regular period to send the packets, it will throw an RREQ message to inform the nodes about missing neighbors.

⑤ Intradomain: Intra domain routing is within Autonomous System (AS) and.
Interdomain routing is between Autonomous Systems (AS).

Scanned with CamScanner

H5P app for homework

- Stand-alone app (can be opened in a browser) or in Moodle
- Students can interact and “play” with the state machines



H5P app for homework

- The mistakes are pointed out

Feedback

**Dat.Cnf(m) +
Dat.Rsp(m)**

Incorrect. The Correct Answer is Dat.Cnf(m)

**Dat.Req(n);
Dat.Ind(n) +
Dat.Rsp(m);
Dat.Cnf(m)**

Incorrect. The Correct Answer is Dat.Req(n); Dat.Ind(n)

**Dat.Rsp(m);
Dat.Cnf(m) +
Dat.Ind(n)**

Incorrect. The Correct Answer is Dat.Rsp(m); Dat.Cnf(m)

1 / 6

Retry

FSM 1

2 / 7

Group presentation using VR

- ▣ Students had fun and were also able to “socialize” with their peers



Group presentation using VR



Digital Teaching in Media Technology

- Lectures
 - Lectures' videos, materials and corresponding Python files are available on Moodle
 - Questions & Answers sessions are held at the lectures' timing in a hybrid mode
- Seminars
 - Teacher uses “nbgrader” system to release assignment
 - Students fetch the assignment
 - Students solve and submit the assignment
 - Teacher releases a feedback, then students fetch it in an HTML format.
- Quizzes and Final Exam
 - Quizzes and final exam are held through Moodle.
 - Quizzes and the final exam use random numbers in each assignment, so every student solves their own version of them.

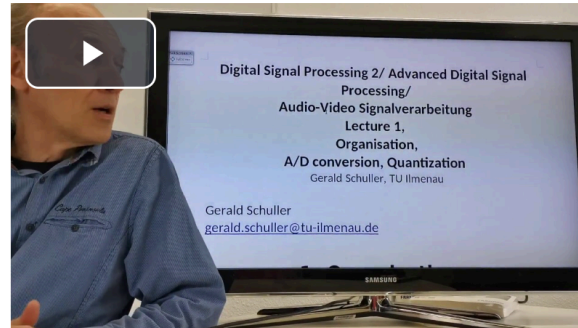
Digital Teaching in Media Technology

Lecture Videos & Materials

Lecture 1 slides, Introduction, Quantization

Introduction, Uniform Quantization,

Video to the lecture slides 1:



Also watch our Jupyter notebook tutorial in Jupyter Notebook, including the Python examples:

https://github.com/TUIlmenauAMS/ADSP_Tutorials

If you click on button "Launch with Google Colab", it opens in the browser and you can even let the Python examples run there, by clicking on the "run" button ("run all" or play button in the individual cells).

Part 1 is e.g.:

https://colab.research.google.com/github/GuitarsAI/ADSP_Tutorials/blob/master/ADSP_01_Quantization.ipynb

Updated 2022-10-23

Short Python Intro

Python examples. Lecture 1, Quantization, Real Time Plot

Here you find the Python example scripts `sound.py`, `pyrecplay_quantization.py`, and `pyrecplotanimation.py`

Python Jupyter Notebook Files for Lecture 1

Here are files for the Python Jupyter Notebook, where you can see the slides in your browser, and where you can execute and even modify the python examples of the lecture inside your browser!

Digital Teaching in Media Technology

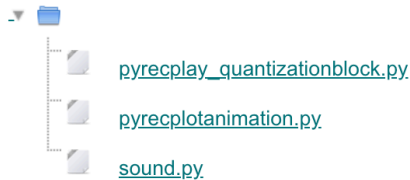
Python Examples

AVS / ADSP / DSP II

Dashboard > My courses > AVS/ADSP/DSP II > Part 1. Quantization > Python examples. Lecture 1, Quantization, Real Time Plot

Python examples. Lecture 1, Quantization, Real Time Plot

Here you find the Python example scripts `sound.py`, `pyrecplay_quantization.py`, and `pyrecplotanimation.py`



Download folder

Previous activity

◀ Short Python Intro

Jump to...

Next activity

Python Jupyter Notebook Files for Lecture 1 ▶

Digital Teaching in Media Technology

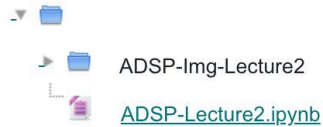
Jupyter Notebook Example

AVS / ADSP / DSP II

Dashboard > My courses > AVS/ADSP/DSP II > Part 1. Quantization > Jupyter Notebook Files for Lecture 2

Jupyter Notebook Files for Lecture 2

updated 2018-10-09



Download folder

Previous activity

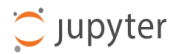
[Google Colab Jupyter Tutorial on Quantization 02](#)

Jump to...

Next activity

[Quiz 2. Non-uniform quantization](#)

Digital Teaching in Media Technology Seminars



Quit Logout

Files Running Clusters Formgrader Courses Assignments

Released, downloaded, and submitted assignments for course: ADSP_seminars_ws22

Released assignments

There are no assignments to fetch.

Fetching Assignments

Downloaded assignments

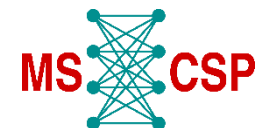
seminar_01	ADSP_seminars_ws22	Submit
seminar_01		Validate
seminar_02	ADSP_seminars_ws22	Submit
seminar_02		Validate

Solving and submitting downloaded assignment

Submitted assignments

seminar_01	ADSP_seminars_ws22	Fetch Feedback
2022-10-11 18:56:03.880230 UTC		
2022-10-11 18:56:46.667754 UTC (view feedback)		

Fetching and viewing feedback



Digital Teaching in Media Technology Seminars

The screenshot shows a Jupyter Notebook titled 'seminar_02' with a Python 3 kernel. The interface includes a menu bar (File, Edit, View, Insert, Cell, Kernel, Widgets, Help) and a toolbar with icons for file operations, running, and validation. The notebook contains two code cells, each with a red box highlighting the code area. The first cell is for a function named 'rise_quantization_student' and the second for 'tread_quantization_student'. Both functions take 'n_bits', 'sine_amplitude', and 'sine_wave' as arguments and return quantized values. The code in both cells is partially completed, with comments indicating where to start and end the implementation. A red callout box on the right side of the notebook points to the highlighted code areas with the text: 'Students write down the appropriate code in different Jupyter Notebook cells'.

```
In [ ]: def rise_quantization_student(n_bits, sine_amplitude, sine_wave):  
    """  
    This function quantizes an input signal 'sine_wave' using the parameters in the functions arguments.  
    It returns a numpy array with the quantized values.  
  
    Parameters:  
    -----  
    n_bits : int  
        The number of bits used for quantization.  
    sine amplitude :  
    """  
    # Start your code here  
  
    # End your code before here...  
    return sinewave_quant_rise_rec
```

```
In [ ]: def tread_quantization_student(n_bits, sine_amplitude, sine_wave):  
    """  
    This function quantizes an input signal 'sine_wave' using the parameters in the functions arguments.  
    It returns a numpy array with the quantized values.  
  
    Parameters:  
    -----  
    n_bits : int  
        The number of bits used for quantization.  
    sine amplitude :  
    """  
    # Start your code here  
  
    # End your code before here...  
    return sinewave_quant_tread_rec
```

Students write down the appropriate code in different Jupyter Notebook cells

Digital Teaching in Media Technology

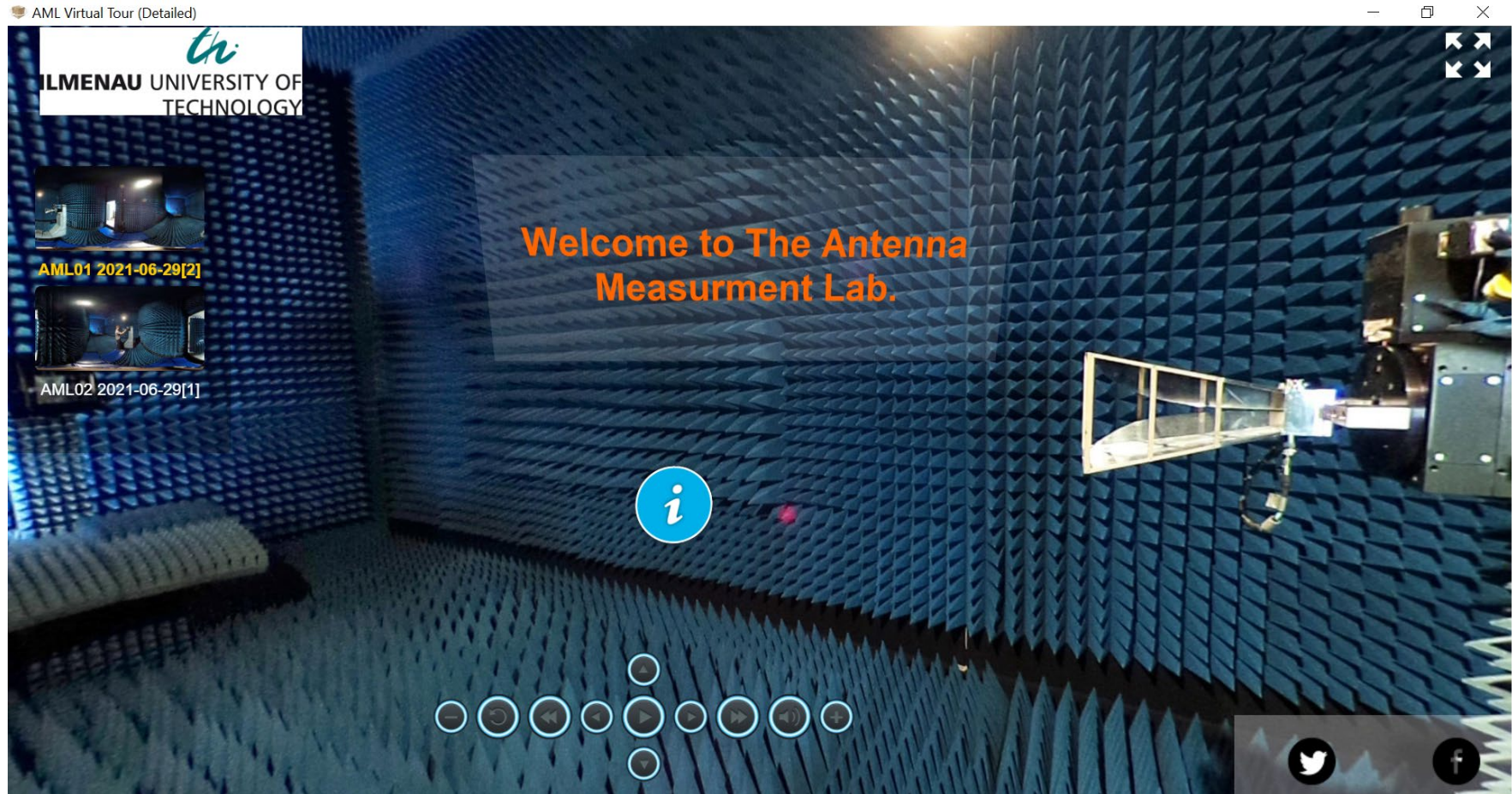
Quizzes and Final Exam

- There is a degree of freedom in choosing **different types of questions**, such as, multiple choices, fill in the text, numerical answer, and many more.
- The **quizzes** are made available for only a **limited time** (e.g. one week) and the student receives the **grade immediately**. The results for all the quizzes are available on Moodle
- The **final exam** is held online through **Moodle** on an exact date for a limited time period.
- Eventually, the grading takes into consideration the different difficulties across different years and creates a competition: **the top 10%** (mean + 1.5* stddev, over a time span which ensures good statistics) **get a 1.0**, the **bottom 10%** (mean -1.5*stddev) **get a 4.0 or a fail**.

Lab tour

- Multimedia tools to help students with lab work
 - ⇒ Pictures of equipment (antennas etc.) were taken and the slides were updated with them so the hybrid students would get a better look at what the lecturer was demonstrating
 - ⇒ A prototype Lab tour for the HMT lab was prepared using the 3-D vista software

Lab tour



Lab tour

AML Virtual Tour (Detailed)

th
ILMENAU UNIVERSITY OF
TECHNOLOGY

AML01 2021-06-29[2]

AML02 2021-06-29[1]

Anechoic Chamber

Antenna characterization using far-field measurements, optional near-field-to-far-field transformation when used as a spherical near-field scanner.

Manufacturer: NearfieldSystems, Inc.

Measurement system: NSI-800F-10x with near-field measurement option NSI-SW5305

Shielding chamber:

horizontal and vertical polarisation E-field

transmitting antenna

DUT

Phi

Theta

Q

Summary and conclusions

- ❑ A variety of excellent methods were employed, mainly by two departments for their courses
- ❑ The result was a higher standard of pedagogy and a greatly enhanced feeling of inclusion for the online students
- ❑ While the online students were satisfied and appreciative of the didactic methods, the lecturers would often hope for a higher level of participation from the online students, and the grades of the online students were slightly below average as well

Thank you for your attention