كلية المدربين التقنيين
Technical Trainers College

Electronics and Electrical Technology

Circuit Technology

Audio and video AS-10

Name:
Class:
ID-Nr.:

AS-10
Audio and video

Target definition

The trainee learns to know how to transfer the knowledge

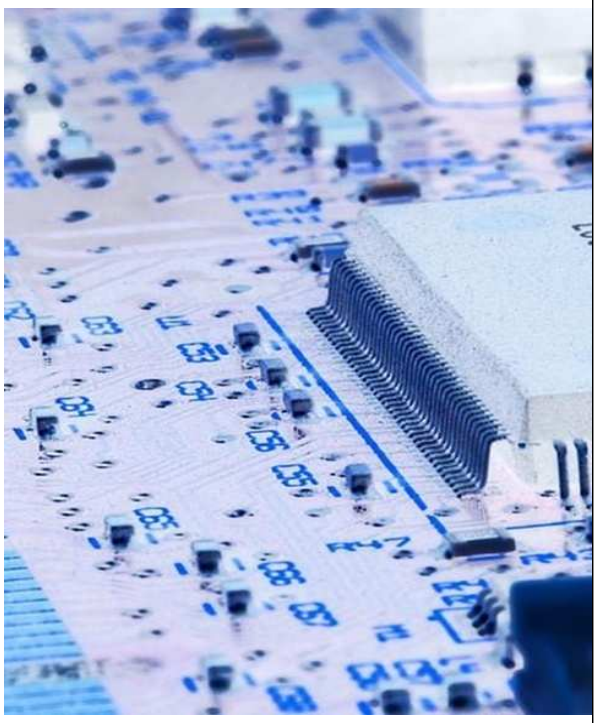
The trainee learns how to make a video podcast

The trainee learns to work with color tables, to use the right font and to use the right pictures

The trainee learns the functionality for CCTV cameras and compression codes

AS – 10 Audio and Video

- **Knowledge transfer methods**
- **How to make the own podcast?**
- **Camera characteristics**
- **Compression codes**



Knowledge transfer methods

Example:

To read a book is a good knowledge transfer method and good for a self study training.

1. Which methods of knowledge transfer do you know? How can you transfer your knowledge to other persons?

2. Decide how good is each method for

   - ❑ training by a teacher
   - ❑ self study training
   - ❑ networked training

   Work in Groups and present your result.

Knowledge transfer methods

Knowledge transfer methods - Answers from other students

- Video lessons, online courses
- Group work
- Learn from Audio CD
- Podcast, e-learning
- Using forums, visit a factory
- Solve equations
- Learning by doing, experiment, simulation
- Weblink as required reading
- Read a book

Knowledge transfer methods

Which method is suitable for which kind of knowledge transfer?

	Dokumentation	On the job	Online help	Book	Social Networks	Classroom Training	Webinar	E-Learning	Video Tutorials	Podcast	Event Recordings
Instructor lead Formal											
Self-study Self driven	X										
Peer to peer Networked		X									

"Tell me and I forget,
teach me and I remember,
involve me and I learn."

Benjamin Franklin (1706-1790)

Listen to the podcasts and fill in the table below

podcast	Answer	
Security fun, to much monitors	Understandable	
	Time	
	Quality, design	
	Remarks	
Mathematics, Binary division	Understandable	
	Time	
	Quality, design	
	Remarks	
LAN network functionality	Understandable	
	Time	
	Quality, design	
	Remarks	
CCTV, Megapixel cameras	Understandable	
	Time	
	Quality, design	
	Remarks	
Oscilloscope functionality	Understandable	
	Time	
	Quality, design	
	Remarks	
Webinar recording about camera portfolio (only some minutes)	Understandable	
	Time	
	Quality, design	
	Remarks	

Video podcast examples

1st podcast: video about to much monitors.

2nd podcast: binary division, downloaded from YouTube.

3rd podcast: LAN network functionality.

Video podcast examples

4th podcast: CCTV and megapixel cameras, made by Siemens, 2009

5th podcast: oscilloscope functionality (made by a TTC student, winter 2010)

6th podcast made by TTC winter 2012

Video podcast examples

1st podcast: video about to much monitors.

2nd podcast: binary division.

3rd podcast: LAN network functionality.

Video podcast examples

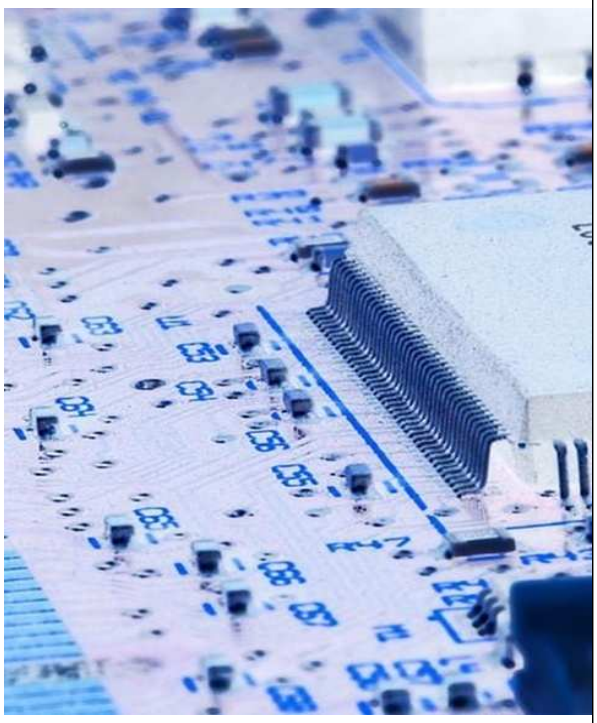
4th podcast: megapixel cameras.

5th podcast: Oscilloscope functionality.

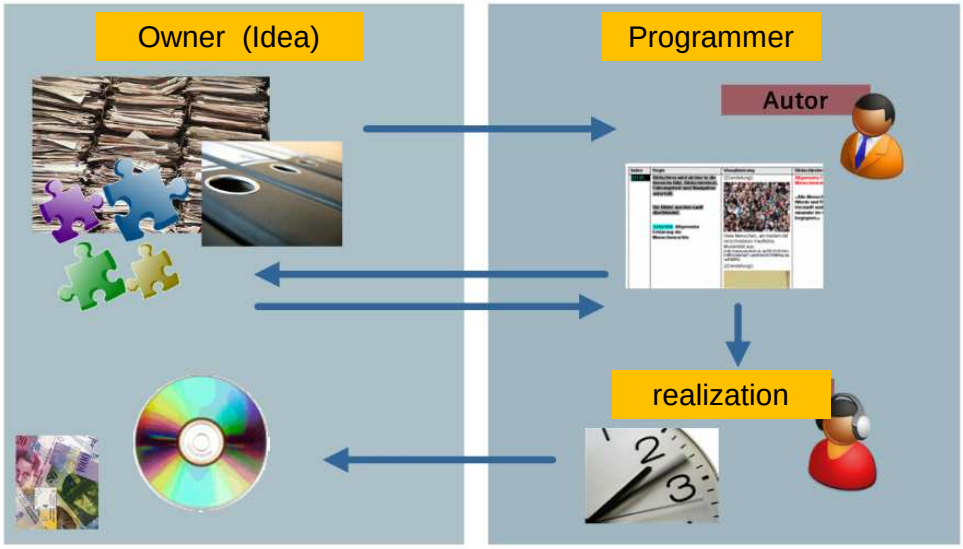
6th Podcast: made by TTC winter 20122

AS – 10 Audio and Video

- ✓Knowledge transfer methods
- How to make the own podcast?
- Camera characteristics
- Compression codes



The podcast process



How to produce a podcast

The way in detail to produce a video podcast

How to produce a podcast

What do you have to consider to produce a video podcast?

Rules to produce a TTC podcast

- Subject: digital and analogue electronics from 1st or 2nd semester
- Minimum time for the podcast 8 Minutes, maximum time 12 minutes
- Target group: other students at 1st and 2nd semester

- All students have to use the same 1st and the same last page.
- All students have to use the same color table.
- The student has to create a rough concept
- The student has to create the script (What to speak during podcast) for Audio at the PowerPoint notes
- The student has to develop the PowerPoint slides.
- The student has to speak the Audio files in PowerPoint and has to produce the WMV file (EN).
- Grading (60%) at the end of the semester.

How to produce a podcast

corporate design

- is the official graphical design.
- the style is created in such a way that all the elements are arranged in a distinctive design.
- they communicate their mission, objectives, needs, and product information.
- these interactions include sound, video, animation and user feedback mechanisms.

Corporate design

- A corporate design is the official graphical design of a company used on letterheads, envelopes, forms, folders, brochures, etc. The house style is created in such a way that all the elements are arranged in a distinctive design and pattern.
- Corporations do have special design needs based on their behaviors. They communicate their mission, objectives, needs, and product information -- with users, clients, or members; with suppliers, distributors, service providers; with the surrounding community and the media; with financial institutions and other corporations, and with the state.
- A designer whose client is a corporation will include the logo and other elements of the corporate brand as a way to standardize and unify all communication between company and audience, whether in print or online
- These interactions are increasingly taking place through Web sites, through mobile devices and at dedicated terminals, and may include sound, video, animation and user feedback mechanisms. A savvy designer will create designs that can be adapted to all of these applications.

Example of a start page

Content

Content

Content

Content

Content

Content

Content

Content

Example of a last page

Summary

Summary

Summary

Summary

Summary

Example to show a trend

information

information

information

information

Information

Example for learning with an computer

information

information

information

information

Information

The cover page - examples

The cover page - examples

The Technical Teaching Collection

How to find a not working resistor in a circuit.

Presented by **Mohmmad Ali, Technical Teacher College, Riyadh, Kingdom of Saudi Arabia**

The cover page - examples

The next generation of learning

How to transpose the equation for momentary voltage to the time.

Presented by **Mohmmad Ali, Technical Teacher College**

The cover page - examples

The next generation of learning

How to find the periodic time in a sin wave chart and how to calculate the frequency.

Presented by **Technical Teacher College, Riyadh, Kingdom of Saudi Arabia**

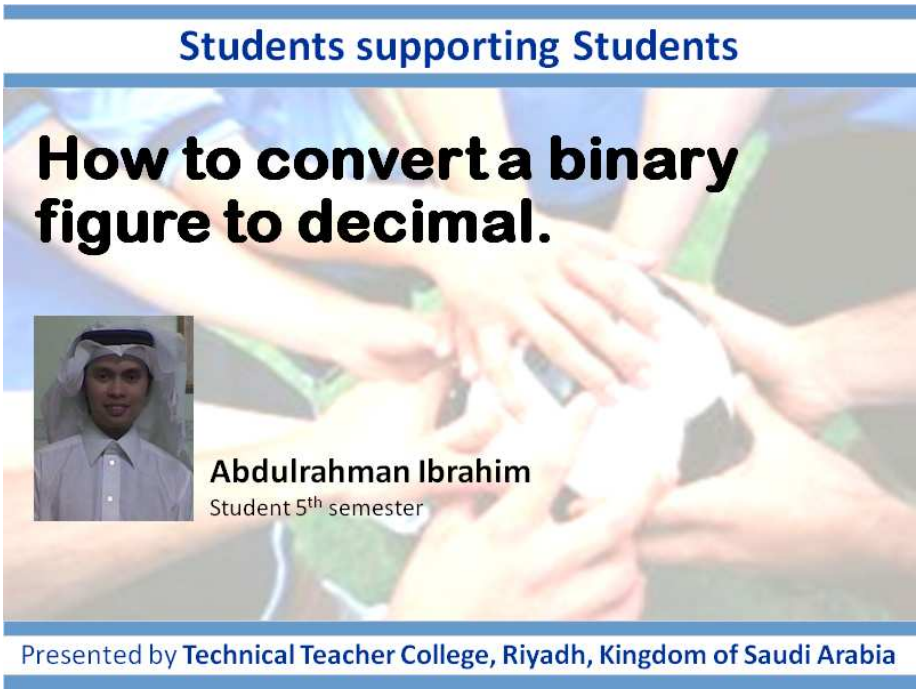
The cover page - examples

Expand your knowledge and understanding

How to determine the time constant in a RC circuit.

Presented by **Technical Teacher College, Riyadh, Kingdom of Saudi Arabia**

The cover page - examples



The cover page - examples

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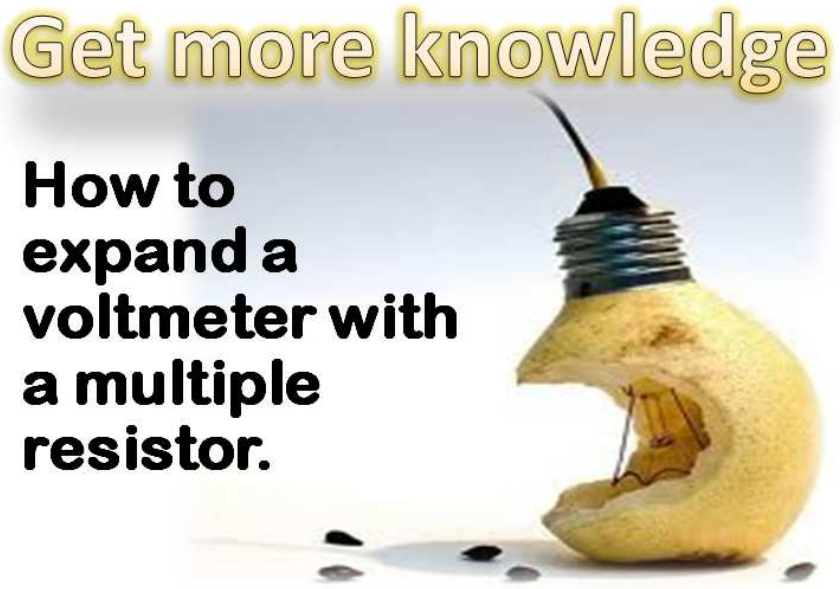
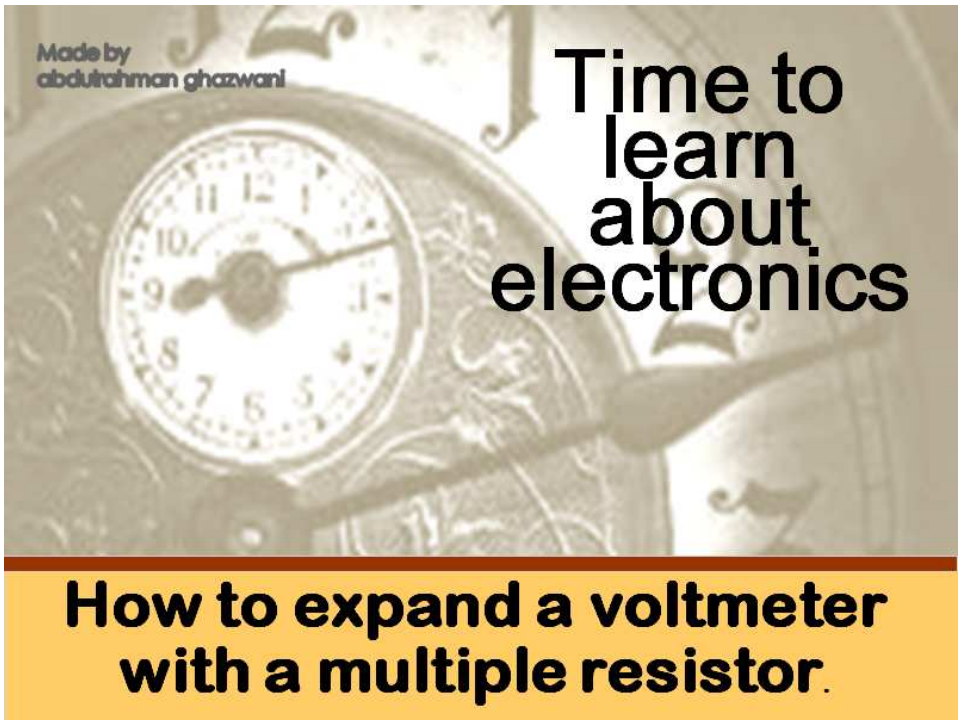
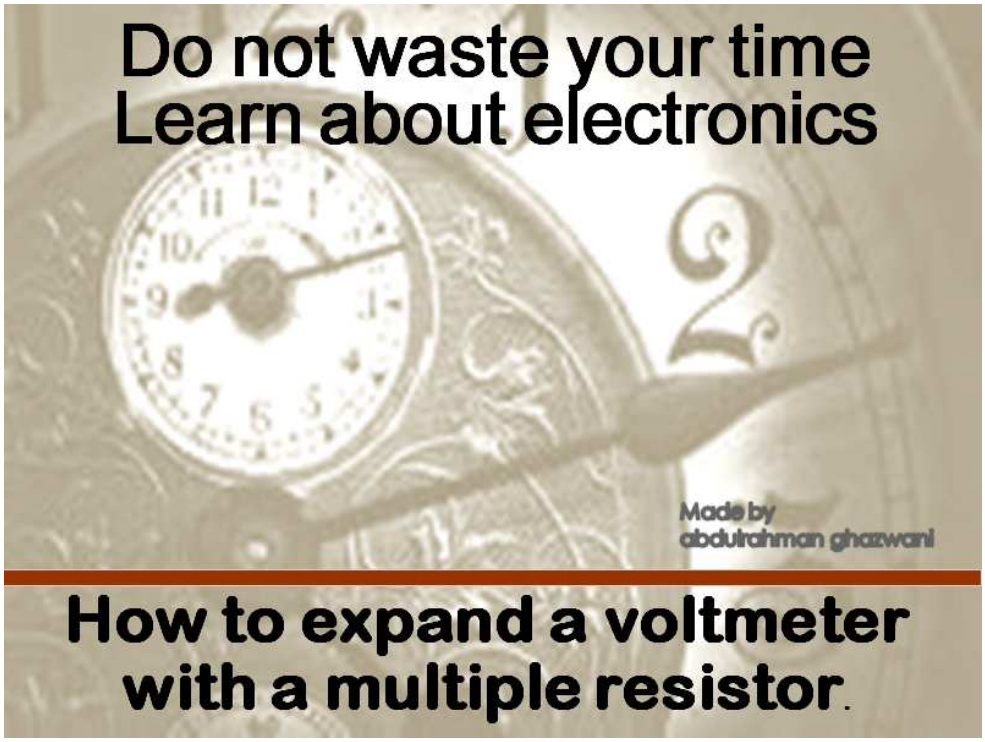


Created by Dulrahman, TTC Riyadh, Kingdom of Saudi Arabia

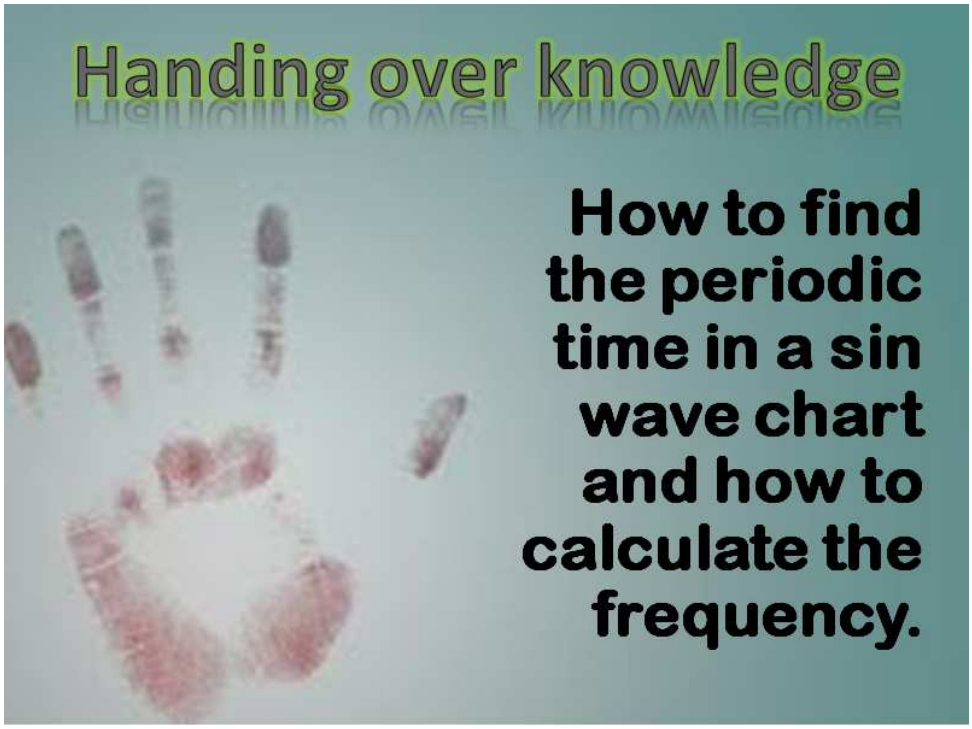
The cover page - examples



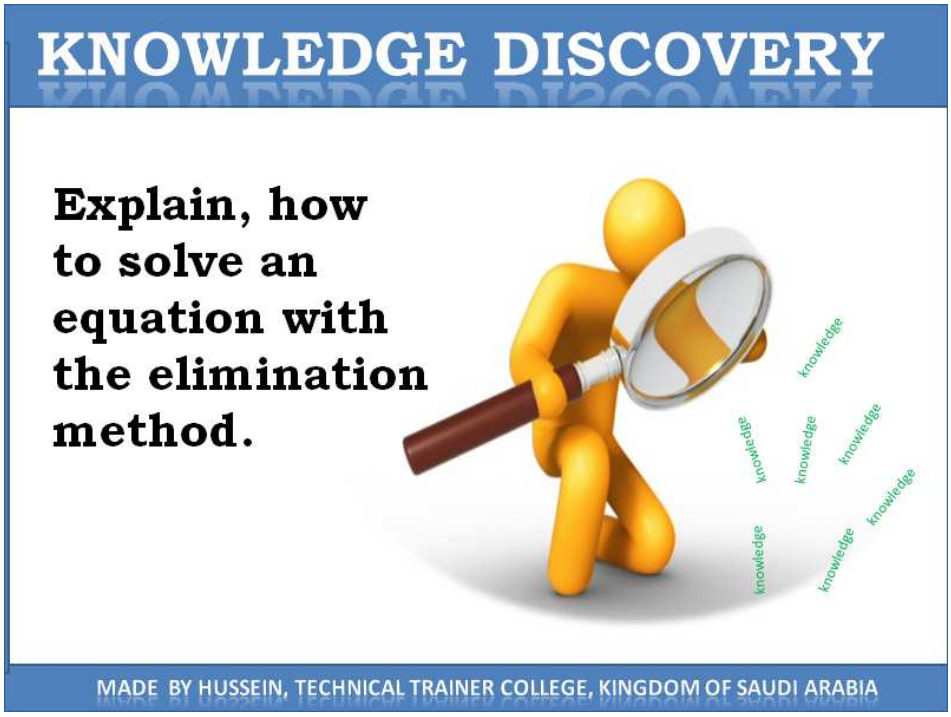
The cover page - examples



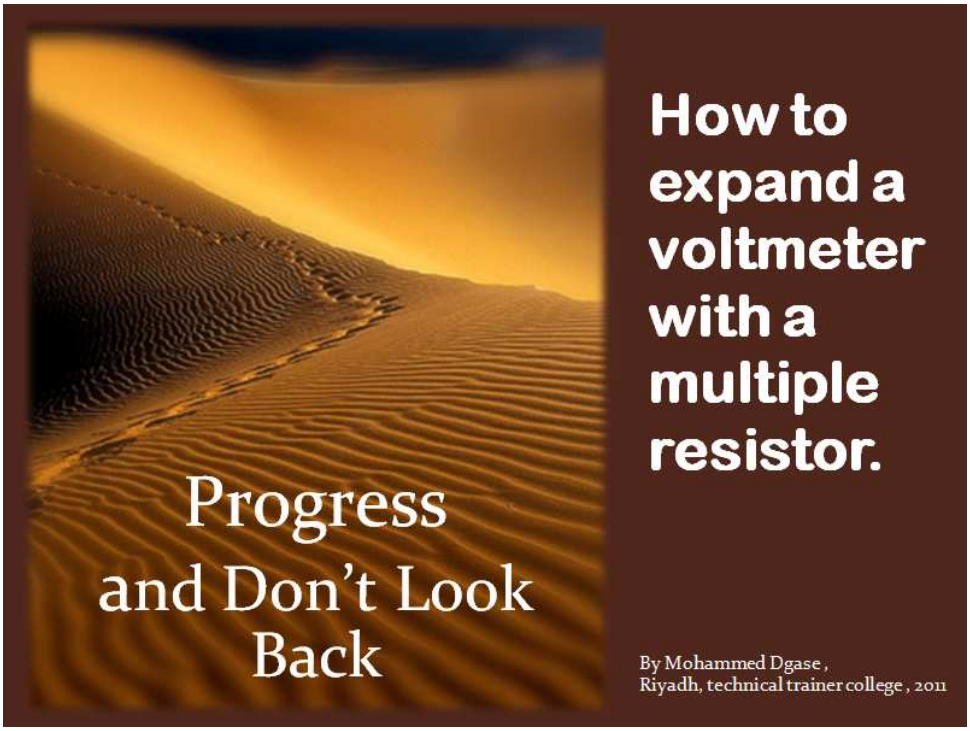
The cover page - examples



The cover page - examples



The cover page - examples



The cover page - examples

How to solve an equation with the elimination method.

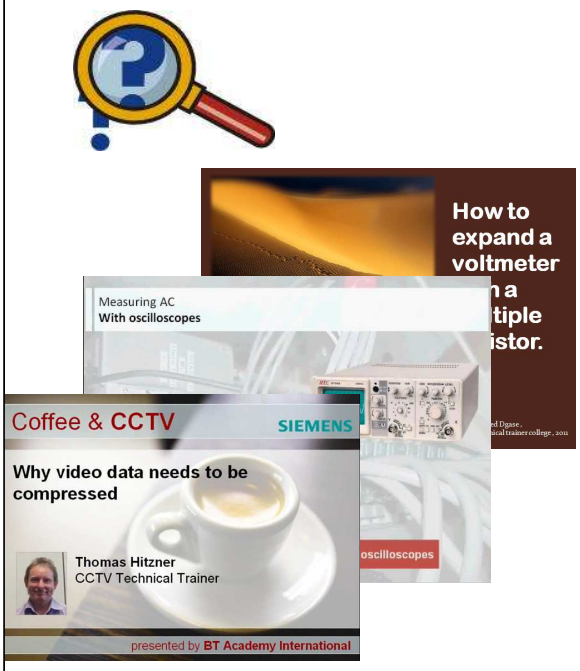
Examples for the main title

- **The virtual teacher**
- **From students to students**
- **TTC – tech talk collection**
- **Ne(x)t generation of learning**
- **The electronic brain**
- **TTC online – digital teaching**
- **Basic Electronic for students**
- **increase your knowledge**
- **Learning? Do it your self!**
- **TTC – the technical teaching collection**
- **The electronic mind**
- **Introduction to electronics**
- **TPC - technical podcast collection**
- **Working together to learn electronic**
- **Electronics world**
- **Working together – students for students**
- **Sewing the knowledge**
- **Explore electronics**
- **Easy way to since**
- **The clear explaining**
- **10 minutes learning**
- **Lets talk about electronics**
- **TTC podcasts - better than books**

The cover page - examples

Here another example of a cover page. What do you think?

The cover page - exercise



Create your own start page. Insert following content:

oa good name for TTC created podcasts

oThe topic of this video podcast

oThe owner and programmer of the video podcast

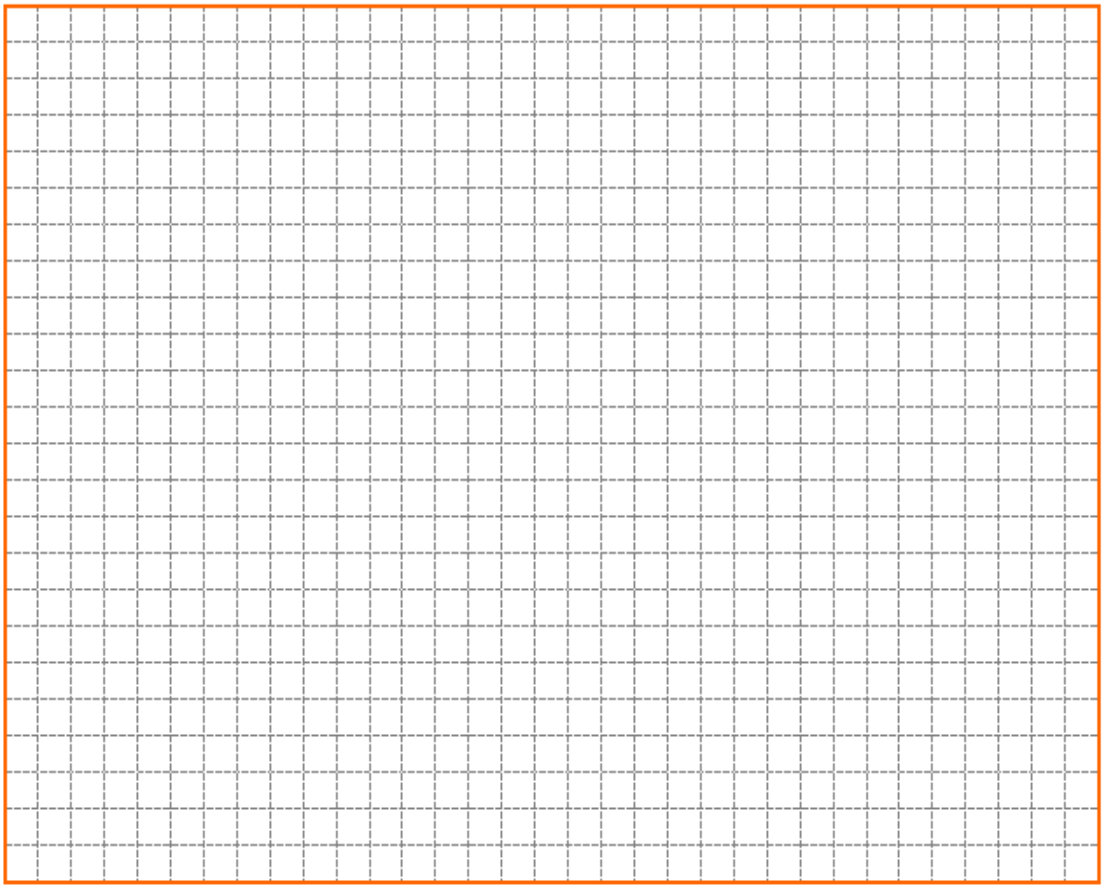
oA background picture as you like.

oA background music, if you like

The Color table

Yellow	Orange	Red	Green	Blue	Black
153/102/0	153/51/0	153/0/0	0/102/0	0/51/153	51/51/51
Yellow 87.5%	Orange 87.5%	Red 87.5%	Green 62.5%	Blue 87.5%	Black 62.5%
204/153/0	204/102/0	204/51/0	102/153/51	51/102/153	102/102/102
Yellow 75%	Orange 75%	Red 75%	Green 37.5%	Blue 75%	Black 37.5%
255/204/0	255/153/0	255/102/51	153/204/102	102/153/204	153/153/153
Yellow 62.5%	Orange 62.5%	Red 62.5%	Green 25%	Blue 62.5%	Black 25%
255/255/102	255/204/102	255/153/102	204/255/153	153/204/255	204/204/204

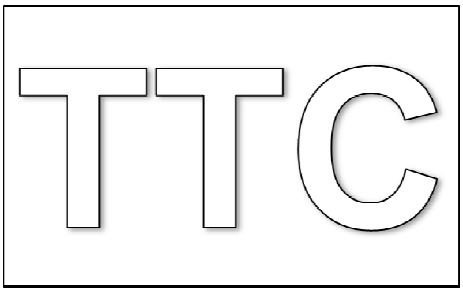
Primary colors: White and Cool Gray	White	Cool Gray	Cool Gray 55%	Cool Gray 30%
	255/255/255	148/158/170	175/180/190	208/211/218



The Color table

What is the RGB code? Explain it.

The Color table



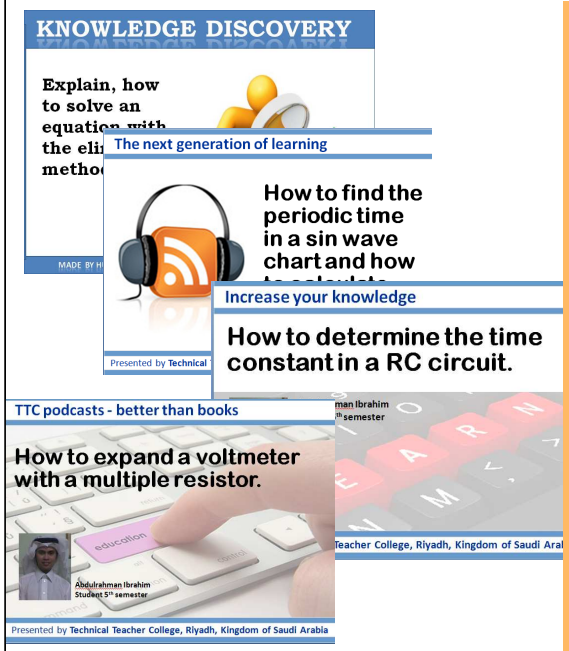
Design a TTC logo with word art letters and format the letters with following instruction:

1.The color of the text outline (boarder) of each letter must be to 100% black.

2.The color inside the letter must be as follows:

- T : RGB (204, 51, 0)
- T : RGB (255, 204, 0)
- C : RGB (102, 153, 51)

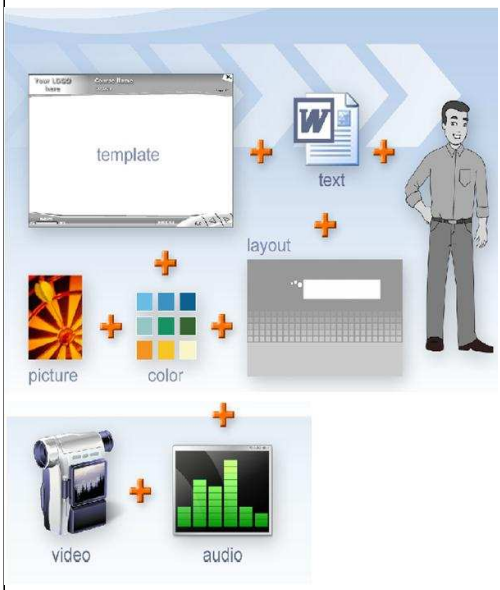
The Color table



Format your own start page with the right colors. Add:

- ❑Title of this podcast collection in blue, RGB (0,51,153), font calibri (body), size 23
- ❑The special topic of this video podcast in 100% black, font arial rounded, size 48
- ❑The owner and programmer of the video podcast as you like
- ❑A background picture as you like.
- ❑A background music, if you like

How to produce the podcast



Step 1 - Rough concept

- ❑ Target definition, target group
- ❑ How many parts
- ❑ Small description

review

Step 2 - Fine concept, story

- ❑ Concrete content per page
- ❑ Module title per page
- ❑ Headings per page
- ❑ Concrete text per page

review

Step 3 – Final design

- ❑ Pictures, graphic design
- ❑ Animations
- ❑ Audio files

review

Rough concept to produce the own podcast.

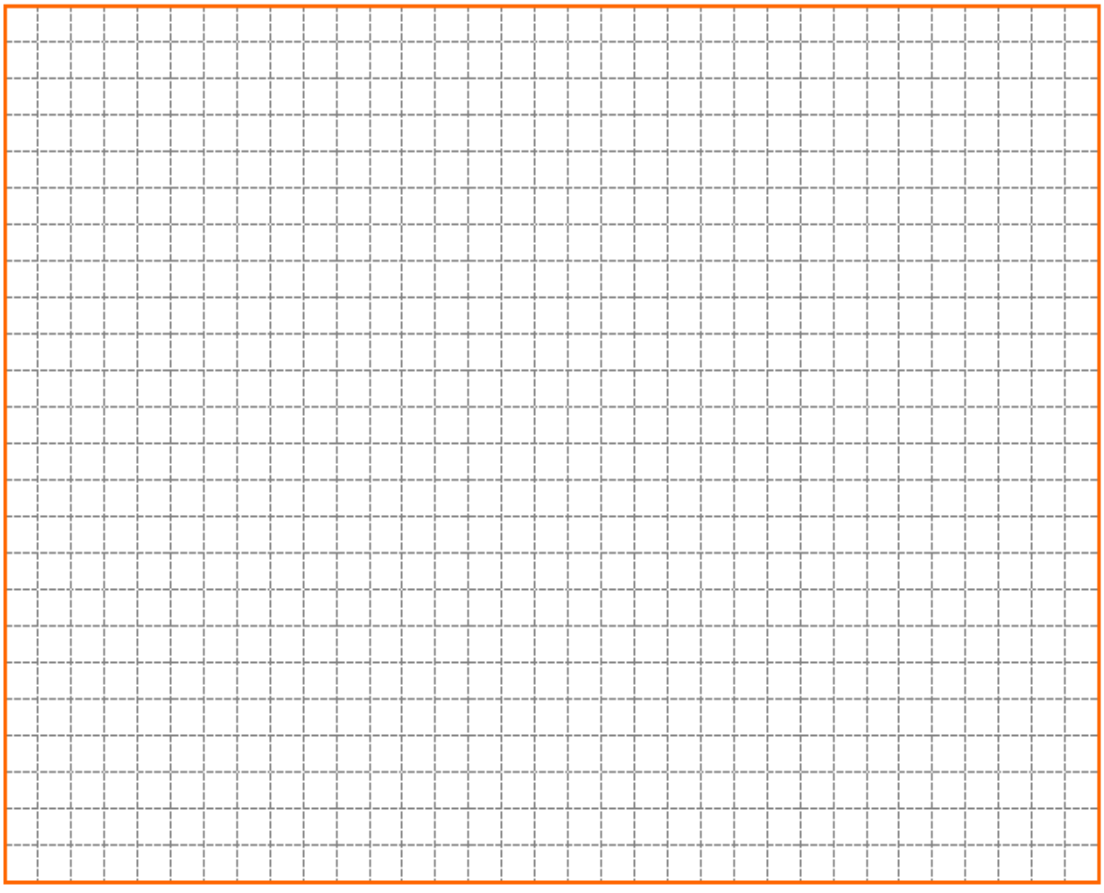
Student name and ID	
Subject and Task Nr.	
Target definition, what to learn	
Target group (pre knowledge)	

Part (module)	**title**	**Small description**

Podcast rough concept

Student name and ID	**Example**
Subject and Task Nr.	How to convert a binary number to decimal Task Nr. 134
Target definition, what to learn	After watching this podcast the student is able to convert binary number to decimal.
Target group (pre knowledge)	Students 2nd semester Pre Knowledge from 1st semester mathematics necessary.

		Small description
		▪ Welcoming ▪ Subject today ▪ What to learn ▪ Time for podcast ▪ Made by
2	Number systems	▪ Short explain of different number systems (BIN, DEC, HEX) ▪ What's the difference
3	Binary number system	▪ Where to use ▪ Properties (base, applications) ▪ Advantages, disadvantages
4	Converting	▪ Explain on the method on example 1101
5	Exercise	▪ Repeat step 4 with example 101011
6	Conclusion	▪ Repeat step 2 – 5 (short form) ▪ Where additional information ▪ Good bye



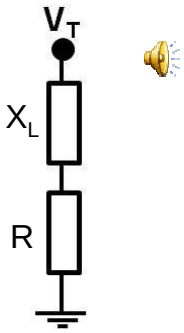
Podcast fine concept

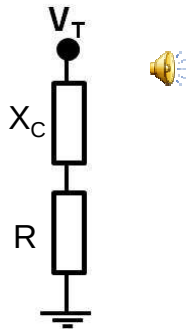
***What is the impedance?**
Is the ratio of V total to I total , is measured in ohms and the symbol Z, the impedance also causes a phase different between the total current and the source voltage.

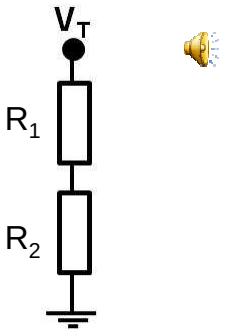
***resistance**
symbol= R
unit= Ω
RT=R1+R2+R3
Circuit

Here you can see a part of a fine concept. Improve it!

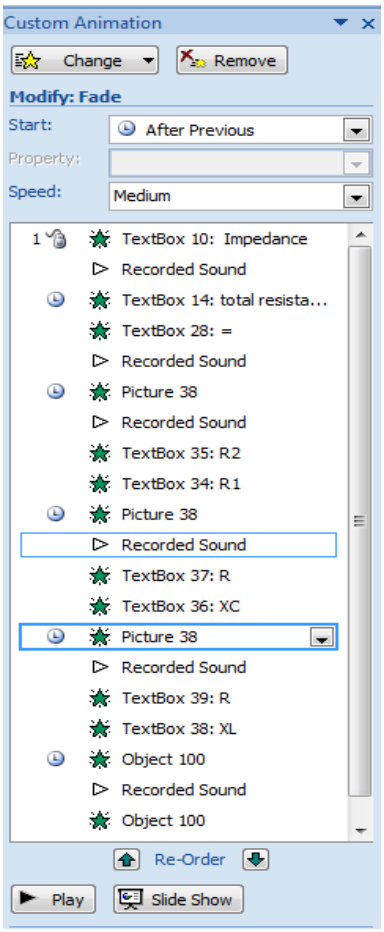
Impedance = total resistance







$$Z = \frac{V_T}{I_T} \qquad Z = \frac{V_T}{I_T} \qquad R_T = \frac{V_T}{I_T}$$



Part of the fine concept

<>
What is impedance?
<>
It is only an other word for the total resistance
<>
The word total resistance is used in circuits with only resistors
<>
The word Impedance is used in circuits with different units, like capacitor and resistor
<>
Or inductor and resistor
<>
If you use the Ohms law, for both circuits you can use the same formula.

Podcast fine concept

*The impedance of a series RL circuit is determine by the resistance and the inductive reactance. inductive reactance is expressed as a pharos quantity in rectangular form as XL=jXL
*In the series RL circuit the total impedance is the pharos sum or
R and jXL and is expressed as Z=R+jXL

Here you can see a part of a fine concept. Improve it! Design a PowerPoint sheet with all the animations.

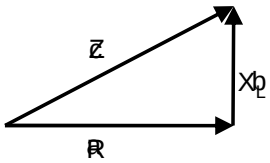
Impedance
in circuits with different units

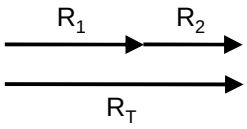
=

total resistance
in circuits with same units

$Z^2 = R^2 + X_L^2$

$R_T = R_1 + R_2$





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- As you know impedance is the same like the total resistance in circuits with same units
- For example in this series circuit the total resistance is the sum of the two resistors:
- R total equals R one plus R two.
- It is easy because all voltages, all currents, all resistances have the same direction.
- If we convert the inductivity L to reactance XL, then also this circuit contains 2 resistors, R and XL.
- But the voltages of this two units have different directions, like in a triangle.
- To calculate the impedance as the sum of R and XL, we have to consider the rule of Pythagoras. In mathematics C squared equals A squared plus B squared.
- In electronics Z squared equals R squared plus XL squared.

fine concept to produce the own podcast.

Student name and ID	
Subject and Task Nr.	
Target definition, what to learn	
Target group (pre knowledge)	

Module	Page	Page title	text

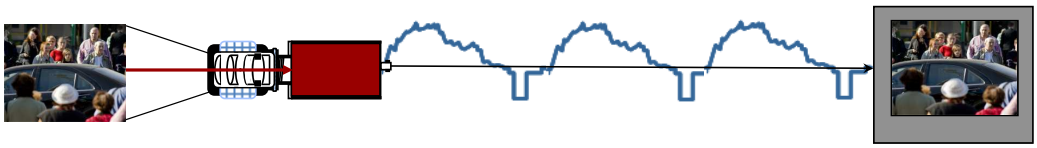
Podcast fine concept

Student name and ID	**Example**
Subject and Task Nr.	How to convert a binary number to decimal Task Nr. 134
Target definition, what to learn	After watching this podcast the student is able to convert binary number to decimal.
Target group (pre knowledge)	Students 2nd semester Pre Knowledge from 1st semester mathematics necessary.

Module	Page	Page title	Small description
1	1	welcoming	<animation step 1> Welcome to the podcast series discovering knowledge. <animation step 2> The subject today: How to convert a binary number to decimal. After watching this video the student is able to convert binary figures to decimal. <animation step 3> This podcast is made by Mohammed Dgase, student of 5th semester at technical trainer college in Riyadh, Kingdom of Saudi Arabia.

Podcast page design

Design your pages with PowerPoint and add the animations related to the fine concept.



The camera converts optical information to electrical

Transmission from camera to monitor

The monitor converts electrical to optical information

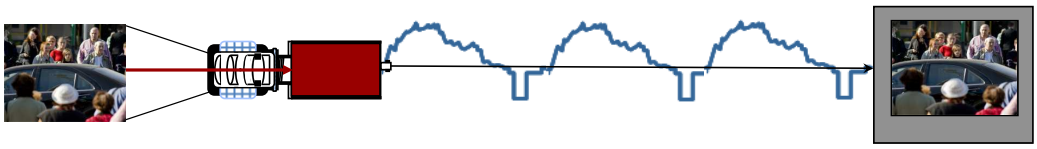
<animation 1>
The light comes through the lens to the image senor of the camera. The camera converts this optical information to an electrical signal.

<animation 2>
Via a cable the electrical signal is transmitted to the monitor.

<animation 3>
The monitor converts the electrical information back to optical information and displays it on the screen.

Podcast page design

Record the audio related to the text who is written in your fine concept.



The camera converts optical information to electrical

Transmission from camera to monitor

The monitor converts electrical to optical information

<animation 1>
The light comes through the lens to the image senor of the camera. The camera converts this optical information to an electrical signal.

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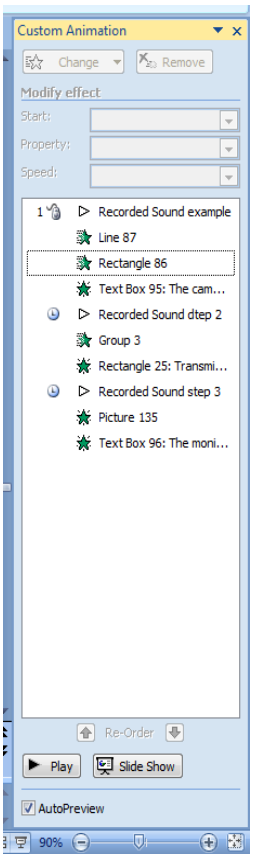
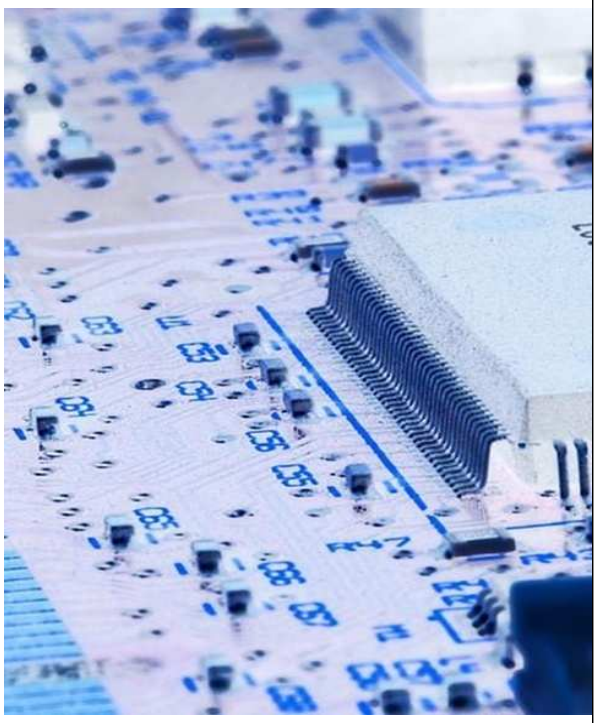
<animation 3>
The monitor converts the electrical information back to optical information and displays it on the screen.



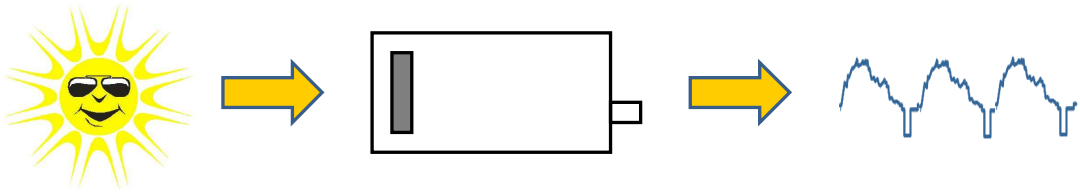
AS – 10 Audio and Video

- ✓Knowledge transfer methods
- ✓How to make the own podcast?
- Camera characteristics
- Compression codes



Light sensitivity

- The image sensor as the most important unit into a video camera converts light to electrical information.
- Depending on his light sensitivity the conversion is more or less effectively
- The produced picture is only good, if the light outside has the same intensity like the sensors light sensitivity.



Light information	Image sensor	Electrical information

Light sensitivity

- The produced picture is only good, if the light outside has the same intensity like the sensors light sensitivity.
- More light outside than the sensor sensitivity will produce a white picture
- less light outside than the sensor sensitivity will produce a black picture

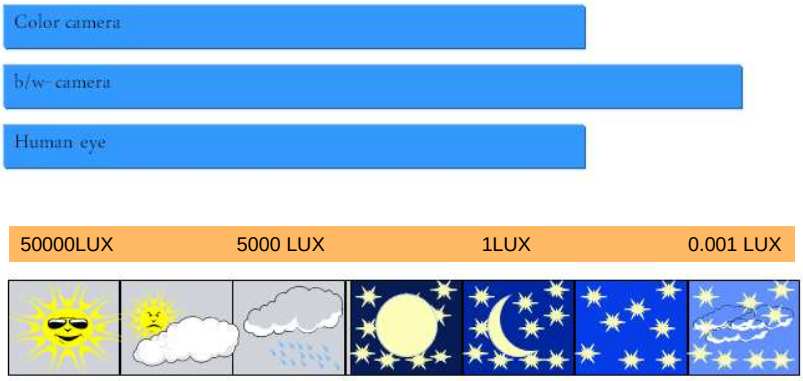
1 LUX outside	1 LUX camera sensitivity	good picture
		

10 LUX outside	1 LUX camera sensitivity	white picture
		

0.1 LUX outside	1 LUX camera sensitivity	black picture
		

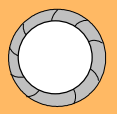
Light sensitivity

- Minimum illumination = maximum sensitivity
- Unit of light is LUX (old unit: candle)
- Wide range in nature from more than 50000 LUX per day to 0,001 LUX per night

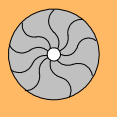


Light sensitivity

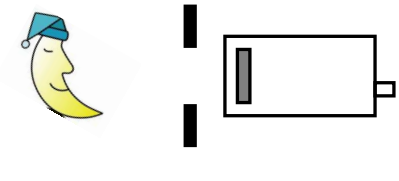
- To reduce the light from outside to the same level like the image sensor sensitivity a aperture is used. It is the same like the iris at human eyes
- If the aperture wide open, the complete light from outside can pass it.



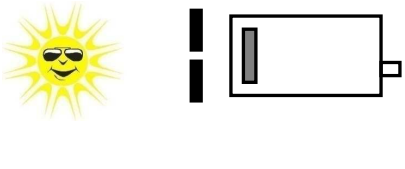
- If the aperture closed, less light will reach the image sensor



1 LUX outside	1 LUX after the aperture to the 1 LUX sensor	good picture



1000 LUX outside	1 LUX after the aperture to the 1 LUX sensor	good picture



Light sensitivity

- To amplifier the light from outside to the same level like the image sensor sensitivity different exposure times are used
- If a longer exposure time is used, the picture is more bright, same result as more light
- If a shorter exposure time is used, the picture is more black, same result as less light

0.1 LUX outside exposure time 10 times longer is the same like 1 LUX good picture



1000 LUX outside exposure time 1000 times shorter is the same like 1 LUX good picture



What controls the amount of light that is focused on the image sensor?

A	f-stop
B	aperture
C	focal length
D	sharpness range

Video equipment

It is a sunny day in Saudi Arabia again. The light outside is 25000 LUX. But the image sensor needs only 2.5 LUX at a exposure time for 1/50 s to produce a good picture. The aperture is closed and has a ratio for 100:1.

Determine the necessary exposure time to produce a good picture.

Video equipment

It is a sunny day in Saudi Arabia again. The light outside is 50000 LUX. For the used camera see the properties at the datasheet below. The aperture is set to a ratio 500:1. Determine the necessary exposure time to produce a good color picture.

Lenses	22 to 135 mm format, horizontal angle 90° to 15°, CS lenses can also be used (see CS adapter)
Sensitivity	Color: 1 lux (t=1/60 s), 0.05 lux (t=1/1 s) B/W: 0.1 lux (t=1/60 s), 0.005 lux (t=1/1 s)
Sensor	1x or 2 x 1/2" CMOS, progressive scan
Max. image resolution	Color: 2048 x 1536 (3Mega), Black/white: 1280 x 960 (Mega)
Image format	2048 x 1536, 1280 x 960, 1024 x 768, 800 x 600, 768 x 576 (D1), 704 x 576 (TV-PAL), 640 x 480, 384 x 288, 352 x 288, 320 x 240, 160 x 120, Free image format selection (e.g. 1000 x 200 for skyline)
Max frame rate (M-JPEG) (Live/Recording)	VGA: 16 fps, TV-PAL: 12 fps, Mega: 6 fps, 3Mega: 4 fps
Video stream (MxPEG) (Live/Recording/Audio)	VGA: 30 fps, TV-PAL: 24 fps, Mega: 14 fps, 3Mega: 10 fps
Image compression	MxPEG, M-JPEG, JPG, H.263 (Video-VoIP-Telephony)

Video equipment

It is dark night in Saudi Arabia again. The light outside is only 0.01 LUX. For the used camera see the properties at the datasheet below. The aperture is wide open and is set to a ratio 1:1. Determine the necessary exposure time to produce a good black/white picture.

Lenses	22 to 135 mm format, horizontal angle 90° to 15°, CS lenses can also be used (see CS adapter)
Sensitivity	Color: 1 lux (t=1/60 s), 0.05 lux (t=1/1 s) B/W: 0.1 lux (t=1/60 s), 0.005 lux (t=1/1 s)
Sensor	1x or 2 x 1/2" CMOS, progressive scan
Max. image resolution	Color: 2048 x 1536 (3Mega), Black/white: 1280 x 960 (Mega)
Image format	2048 x 1536, 1280 x 960, 1024 x 768, 800 x 600, 768 x 576 (D1), 704 x 576 (TV-PAL), 640 x 480, 384 x 288, 352 x 288, 320 x 240, 160 x 120, Free image format selection (e.g. 1000 x 200 for skyline)
Max frame rate (M-JPEG) (Live/Recording)	VGA: 16 fps, TV-PAL: 12 fps, Mega: 6 fps, 3Mega: 4 fps
Video stream (MxPEG) (Live/Recording/Audio)	VGA: 30 fps, TV-PAL: 24 fps, Mega: 14 fps, 3Mega: 10 fps
Image compression	MxPEG, M-JPEG, JPG, H.263 (Video-VoIP-Telephony)

Video equipment

Remember and see the two pictures below. How was the aperture in each of them? Opened or closed?

Light sensitivity

- Long shutter speed
- Disadvantage: blurry moving objects
- Advantage: more brightness during time with less light (night).

- Short shutter speed
- Disadvantage: needs more light than normal to produce a good picture
- Advantage: shart and readable picture from moving objects.

fast shutter speed

slow shutter speed

Light sensitivity

- With a very very long shutter speed cameras can produce good pictures during nighttime with illumination close to 0 LUX.
- But moving objects are not readable.
- The example shows a picture with exposure time of 30 seconds.

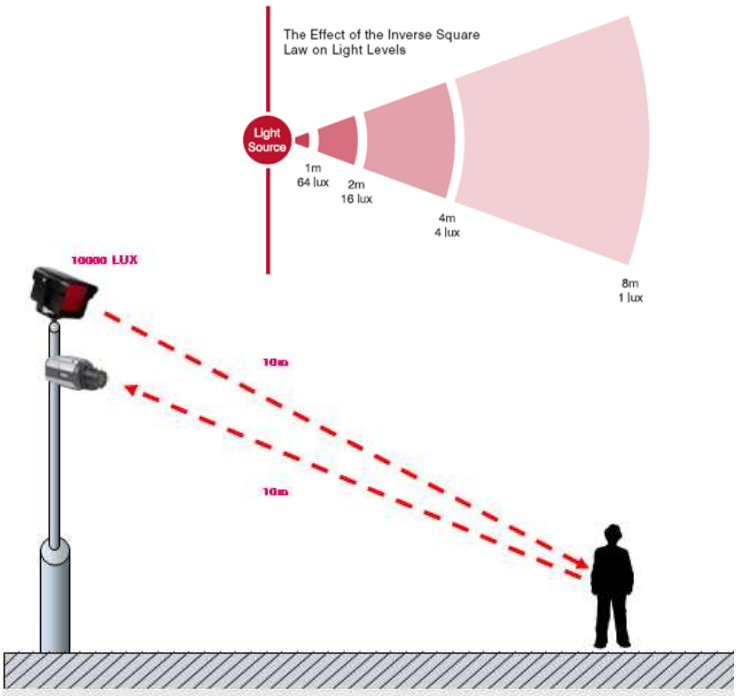
Calculate the distance, which the car drives during every shutter phase. Do we get a sharp picture?

The Shutter speed is adjusted to 1/50
The car drives with 30 km/h

light levels

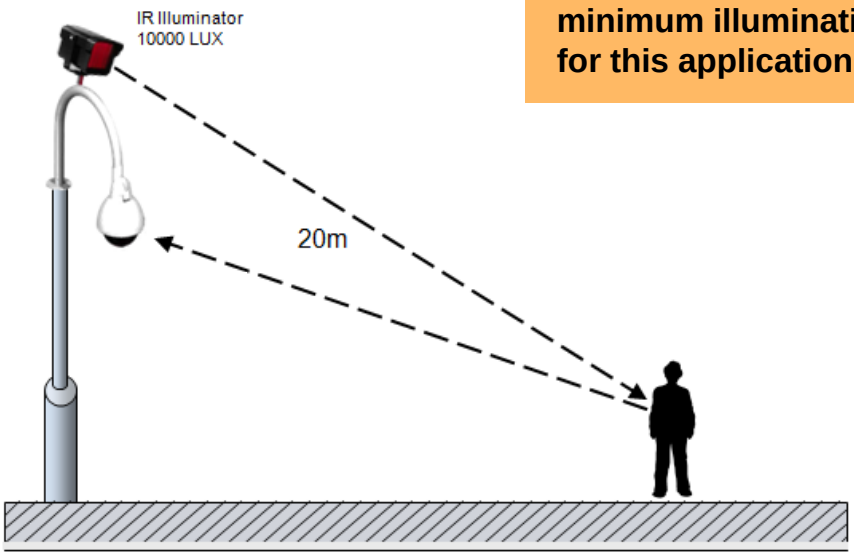
- The camera can only use reflected light from objects
- If the light travels from object to object the inverse square law on light levels has to be considered. It is possible to calculate the loss with following formula:

$$light = \frac{source\ [LUX]}{dist^2}$$

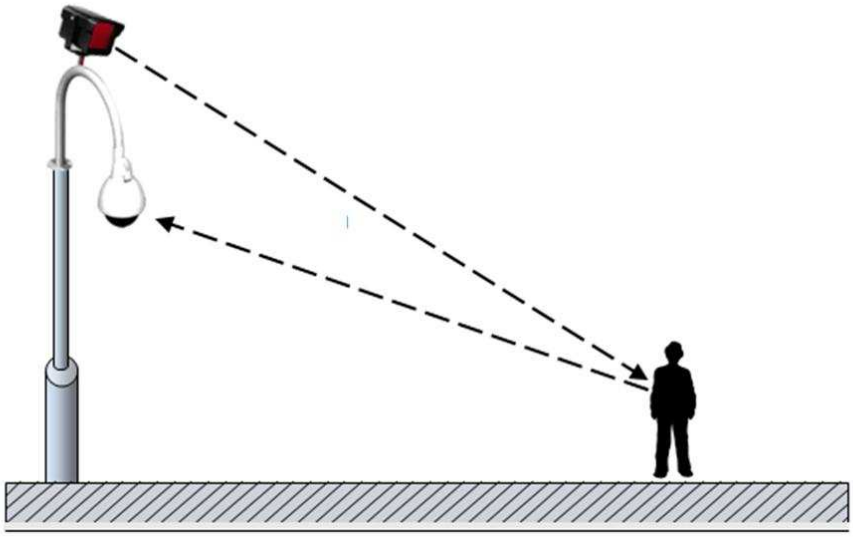


Video equipment

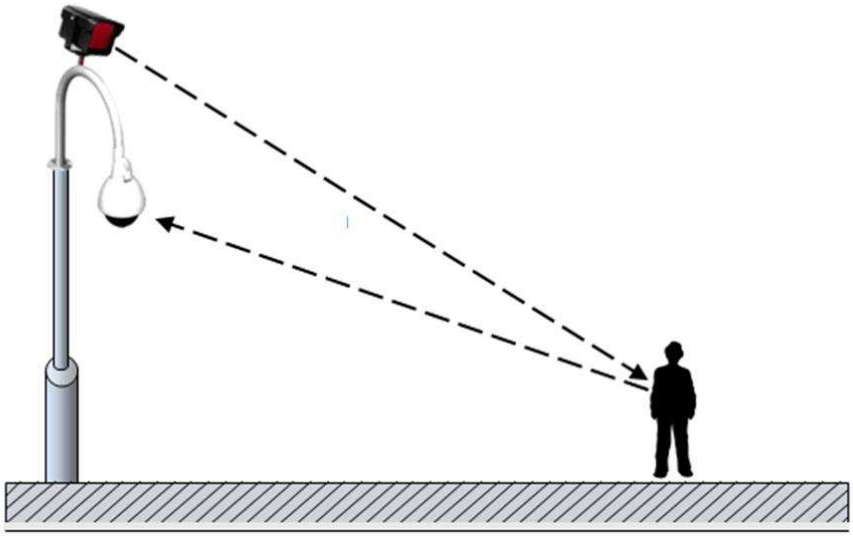
Is a camera with 0.25 LUX minimum illumination enough for this application?



A camera with minimum illumination of 1 LUX has to be observe objects in 25m distance. Determine the necessary light source by night.

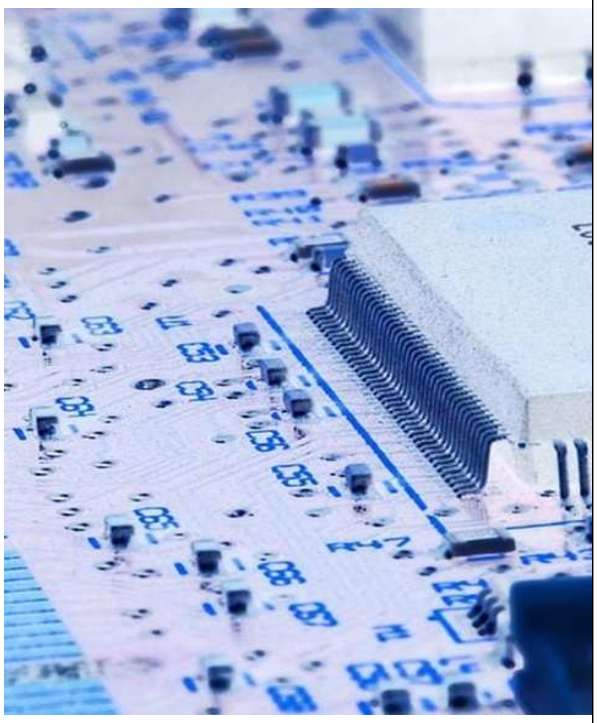


A camera with minimum illumination of 0.1 LUX has to be observe objects. Determine the maximum distance if the light source value = 100000 LUX.



AS – 10 Audio and Video

- ✓Knowledge transfer methods
- ✓How to make the own podcast?
- ✓Camera characteristics
- Compression codes



Listen to the podcast and fill in the table below

Question	Answer		
List different video data compression solutions.			
What is an “I” and a “P” frame?			
How long can you record a common video stream with M-JPEG or MPEG-4 on a CD?			
Explain how does a MPEG-4 recording works.			
List advantages and disadvantages of MPEG-4 compression.			
Compare M-JPEG and MPEG-4 with bandwidth, CPU load and compatibility.		M-JPEG	MPEG-4
	Bandwidth		
	CPU load		
	compatibility		

Listen to the podcast and fill in the table below

Question	Answer
On which parameters depends the file size of a picture?	
On which parameters depends the needed HD space for video recording?	
What's the formula to estimate the needed HD space for video recording	
What's the value for the factor “a” in case for continuous recording?	
What's the formula to determine the file size of a picture at given bandwidth?	

Compression

Fill in the table and mark, what are video compression methods.

Codec	Yes, it is a video compression method	No, it is not a video compression method
MP3		
M-JPEG		
BMP		
MPEG-4		
H.264		
MPEG-4 AVC		
PPT slide		

A MPEG-4 video codec with I and P frames is working. What is a P frame?

A	A full picture on the position „P“ (A = the1st, B = 2nd ... P = the 16th picture) of the videostream.
B	A picture of the videostream with only the difference information to the previus picture.
C	A picture of the videostream with only the difference information to the subsequent picture.
D	A picture of the videostream, compressed with the „P“ (pressure) method.

A MPEG-4 video codec with I and P frames is working. What is an I frame?

A	A full picture on the position „I“ (A = the1st, B = 2nd ... I = the 9th picture) of the videostream.
B	A picture of the videostream with only the difference information to the previus picture.
C	A full picture of the videostream used as reference picture for the following P frames.
D	A picture of the videostream, compressed with the „I“ (increasing compression) method.

Fill in the table and mark, what are M-JPEG compression features

Feature	Yes, it is a M-JPEG feature	No, it is not a M-JPEG feature
Bad compatibility in different versions		
Good compatibility in different versions		
Bad compression efficiency		
Good compression efficiency		
Low CPU consumption		
High CPU consumption		

Compression

Fill in the table and mark, what are MPEG-4 compression features

Feature	Yes, it is a MPEG-4 feature	No, it is not a MPEG-4 feature
Bad compatibility in different versions		
Good compatibility in different versions		
Bad compression efficiency		
Good compression efficiency		
Low CPU consumption		
High CPU consumption		

Which video codec has the best compression efficiency and uses few storage capacity?

A	M-JPEG
B	MPEG-4 Version 9
C	MPEG-4 SP/ASP
D	H.264

Compression

A video recorder is working with M-JPEG compression. Determine the storage space to record continuous one camera for 24 hours with 25 pictures per second. Each picture is 35 Kbyte large.

A About 51 MByte

B About 875000 Byte

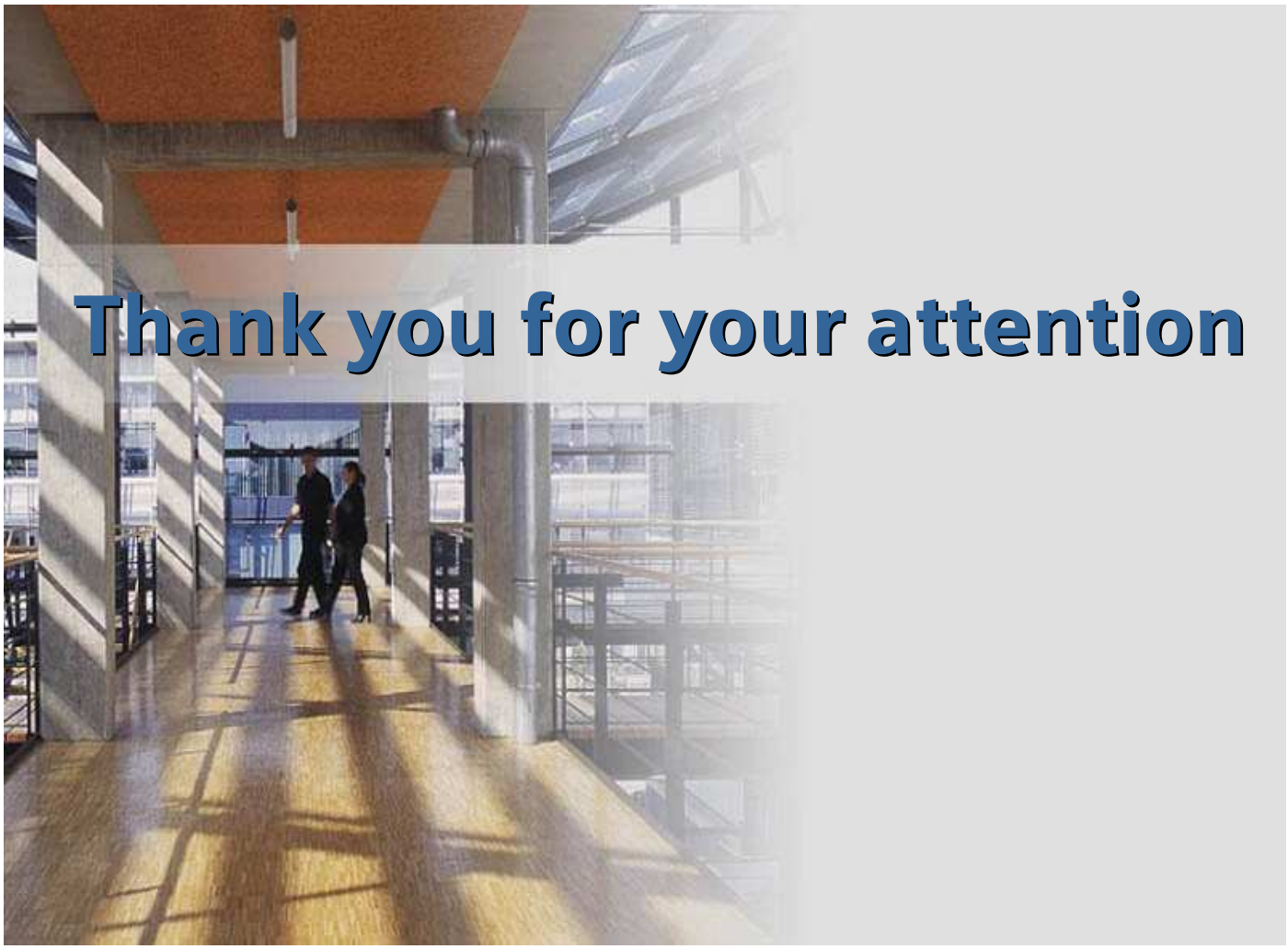
C About 3 GByte

D About 72 GByte

Compression

A video recorder is working with M-JPEG compression. The used bandwidth for one camera is 4.79 Mbit/s. Determine the needed HD space for 3 cameras and 2 days continuous recording .

A	About 303 GByte
B	About 151 GByte
C	About 101 GByte
D	About 3 GByte



Thank you for your attention

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