**UNIT – I**

**DIGITAL IMAGE FUNDAMENTALS**

SESSION INPUT – 1

1. Introduction to Digital Image Processing - Brain Storming.

<https://engineering.purdue.edu/~malcolm/pct/CTI_Ch02.pdf>

Brainstorming is carried out by posing different questions and by showing some

pictures relate to the one dimensional and two dimensional signals.

How is an image defined?

What is meant by a digital image?

Depending on the responses from the learners, the concept of digital image

processing can be explained.

1. Image types: PPT

Illustrates the different types of images.

 <http://www.comp.dit.ie/bmacnamee>

1. Examples of field that use Image processing.PPT

Various applications of image processing in different field are explained.

www.utsa.edu/lrsg/Teaching/GEO5053.../L5\_image%20processing.ppt‎

1. Aspects of Image processing.PPT

www.comp.dit.ie/.../ImageProcessing2-ImageProcessingFundamentals.ppt...‎

We can show some pictures and ask the learners to identify and to discuss

digital image processing, which play a very important role in many fields. Then

we can explain the learner, the same.

1. Conclusion: See and Tell

We can show some pictures and ask the learners to identify what is a pixel,resolution of image and its importance in the clarity of image.

**SESSION – 2**

1. Recap – Tit for tat

One from each group asks questions. Group – I will ask question to Group – II

and group – II to group – III so on.

1. Sample question

What is digital image processing?

Define sampling

Say some examples of digital image processing?

1. Vidicon camera – working principle :

Video show and PPT presentation.It describes the types of camera tube and

working of vidicon camera tube in detail.

<http://www.youtube.com/watch?v=ekUrfQyEtdg>

112.196.5.130/edusat/poly/Electrical/sem-5/camera%20tubes.ppt‎

Student can log on to the above website to see the video show for the working

principle of vidicon camera.

1. Digital camera – video show to explain the working principle of digital camera.

<http://www.youtube.com/watch?v=iE6Pnga8AIY>

<http://www.youtube.com/watch?v=jX0gIWU49iI>

<http://www.youtube.com/watch?v=qSY4iWmccQk>

1. Conclusion – Question and Answer

In this section we can ask the learners different questions based on the

discussed topic.

Sample questions are given below:

List the parts of vidicon camera tube. Differentiate vidicon and digital camera.

**SESSION INPUT– 3**

1. Recap – Rapid fire

Assign group of learners and instruct them to list the function of Videocon and

Digital camera. One member from each group narrates the requirements.

Photo conductivity, solid state array charge coupled array, light scan sensor.

1. Introduction to Human Visual System – Question and answer

We can ask the learners different question based on the human nature of eye.

Retina, Choroid, Blind spot, Ciliary bodies, Lens and Iris.

1. Structure of Human Eye-Power point presentation.

The structure of human eye and its characteristics are described with the help of

PPT.

1. Image Formation in Eye and Camera-Chalk and Talk.

Concept of Image formation is explained with the help of structure of eye

1. Brightness, Adaption and Discrimination: Chalk and talk.

Characteristics of colour is explained.

1.Hue

2.Saturation

3.Brightness.

1. Conclusion and Summary - Questions and answers

How many numbers of rods and cones are present in the human eye?

What is photopic and scotopic vision?

How the image is formed in human eye?

**SESSION – 4**

1. Recap – Questions and answers

Can you compare the construction of a human eye with that of camera lenses?

How are the two related? [Hint: Both produce the image of an object.]

Differentiation the human visual system from the camera.

[Hint; Human visual system is ideal, whereas camera is practical.

1. Color image fundamentals – Questions and answer

 We can ask the learners different question based on the color, Sample questions

are about basic color, color TV fundamentals.

1. Brightness Hue and Saturation -Chalk and Talk

.The characteristics of colour and its importance in Image processing is

explained.

1. Additive and subtractive mixing – Chalk and Talk

.The applications of Additive and subtractive mixing are explained.

1. RGB color models.Chalk and Talk.

Different colour models and its various applications are described.

1. Conclusion – Rapid Fire – Assign group of learners and instruct them to list different models of color.

Sample questions:

Define Hue and Saturation.

 What is brightness adaption?

**SESSION – 5**

1. Recap - Questions and answers

What are primary colors?

Draw the chromaticity diagram

Differentiate Hue and Saturation

1. YIQ model -Chalk and Talk.

The characteristics of YIQ model is explained in detail.

1. CMY model – Chalk and Talk

The characteristics of YIQ model is explained in detail.

1. HIS model – Chalk and Talk

The characteristics of YIQ model is explained in detail.

1. Converting HIS to RGB model - Chalk and Talk

The characteristics of YIQ model is explained in detail.

1. Conclusion – Questions and answers

What is the purpose of color model?

Draw the diagram of RGB color model.

What are the application of RGB, YIQ, CMY and HIS color models?

**Session – 6**

1. Recap: Quiz

The first group will frame questions on Color fundamentals. The second group

will frame questions on color models and the other group will frame questions

on applications of color models.

What are primary colors?

List the type of color models.

Convert RGB to YIQ

Convert CMY to RGB.

List the application of HIS color model.

1. Image sampling- Chalk and Talk.

Definition and the types of sampling are described.

1. Quantization – Chalk and Talk

The role of quantization in digitizing an image is explained.

1. Relationship between pixels neighbors of pixels.PPT.

Basics of location of pixel and its importance is explained.

1. Connectivit, Adjacency, Moore pattern.PPT.

The concept of aliasing and its effects are described using Moore’s pattern.

1. Conclusion Recalling Keywords.

We can ask the learners to recall the keywords discussed during the session. These can be listed on the board and used to summarize the session by the facilitator.

The learners may come up with the following keywords.

* Sampling
* Quantization
* Digital image formats
* Spatial resolution
* Gray level resolution
* Aliasing
* Moiré pattern
* White noise
* Gaussian noise

SESSION – 7

1. Recap – Crossword.

 Review of the previous class image sampling technique can be had by asking

questions through crossword.

1. Two – dimensional Fourier transforms mathematical preliminaries.Do and explain

Take a bar chocolate, asks the learner to make as many pieces as he likes

but at equal time interval say 1sec. Now explain bar chocolate is the

continuous time signal and pieces taken are the infinite no. of samples for

which Fourier transform is taken. This is the discrete time Fourier transform.

Instead of this, if we take only finite no. of pieces i.e. samples like 4,8,16 then

finding Fourier transform for that is called discrete Fourier transform. By

doing so, analysis of the signal will be easier than DTFT.

1. One dimension Discrete Fourier transforms – Chalk and Talk
2. Conclusion and Summary – Pick and tell

Students are asked to answer for one dimensional and two dimensional DFT.

SESSION – 8

1. Recap – Brain storming –

List of ideas contributed by the students on different types of transformation. They can also asked to write the equation for one dimensional and two dimensional FFT.

1. Discrete Fourier transforms Properties of DFT – Chalk and Talk.

The different properties of DFT are described.

1. Discrete cosine transforms and its properties -PPT.

The definition and properties of cosine transform are given

1. Conclusion and Summary – Group discussion –

 We can divide the learners into group of seven each. The group can be asked to discuss and analyze the various Transformations. They can also ask to explain. Each group can then b asked to summarize their analysis and present the same to the class. The key points can be noted on the board and finally the facilitator can consolidate and enhance the perspectives.

SESSION – 9

1. Recap – Questions and answers

Give the expression for I-D DFT

List the properties of DFT

List the properties of DCT

1. Karhunen and Loeve Transforms and it Properties – Chalk and Talk

The importance of KLT and its properties are described.

1. Singular value decomposition –PPT.

The significance of SVD and its properties are explained

1. Conclusion and Summary – Cross word

Across

 3. Rod vision

 8. Digitalization of gray levels

 9. Color model used for TV broadcast

Down

1. Color model used for image processing
2. Cone vision
3. Digitization or spatial coordinates
4. Hue and saturation
5. One of image processing transforms
6. One of the primary color
7. Image element