



INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

Dundigal, Hyderabad - 500 043

COMPUTER SCIENCE AND ENGINEERING (Data Science)

DEFINITION AND TERMINOLOGY

Course Title	IMAGE PROCESSING AND ANALYSIS				
Course Code	ACDC08				
Program	B.Tech				
Semester	V	CSE (DS)			
Course Type	Professional Elective-I				
Regulation	IARE - UG20				
Course Structure	Theory			Practical	
	Lecture	Tutorials	Credits	Laboratory	Credits
	3	-	3	-	-
Course Coordinator	Dr. G.Ganapahi Rao, Asst. Professor				

COURSE OBJECTIVES:

The students will try to learn:

I	Image processing concepts, analysis and techniques.
II	The image analysis and its classifications.
III	Visualization of different kinds of images.

COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	Understand the principles of image processing and techniques for describing the Digital Imaging System (DIS).	Understand
CO 2	Analyze various techniques for for image enhancement and develop image restoration models.	Analyze
CO 3	Apply image segmentation methos for transforming the image and conduct Image Morphology.	Apply
CO 4	Apply the image segmentation techniques for the classification of image registration.	Apply
CO 5	Understand the different techniques for image registration.	Understand
CO 6	Analyze the visualization methods and apply them for 2D and 3D images.	Analyze

DEFINITION AND TERMINOLOGY:

S.No	DEFINITION	CO's
MODULE I		
IMAGE PROCESSING FUNDAMENTALS		
1	State Pixel	CO 1
	Pixel is the smallest element of an image .	
2	Define picture element	CO 1
	Picture element is the smallest discrete component of an image.	
3	What is an image.	CO 1
	An image is an array, or a matrix, of square pixels arranged in columns and rows.	
4	What is image processing	CO 1
	Image processing is a method to perform some operations on an image.	
5	Define region	CO 1
	A region in an image is a group of connected pixels with similar properties.	
6	What is meant by Image acquisition	CO 1
	Image acquisition is the creation of a digitally encoded representation of the visual characteristics of an object	
7	What is Dynamic Range	CO 1
	The range of values spanned by the gray scale is called dynamic range of an image .	
8	Recall 2D and 3D images?	CO 1
	2D is defined as having two axes to plot, usually the x-axis and y-axis., 3D indicates three aspects, which are plotted on the x-axis, y-axis and the z-axis..	
9	Define high contrast	CO 1
	When in an Image an appreciable number of pixels exhibit high dynamic range, the image will have high contrast. .	
10	State Grid	CO 1
	The sampling points are ordered in the Plane and their relation is called a Grid.	

11	Recall Contrast	CO 1
	It is defined as the difference in intensity between the highest and lowest intensity levels in an image	
12	What is meant by Gray level?	CO 1
	Gray level refers to a scalar measure of Intensity that ranges from black to white.	
13	Outline Sensor Strips?	CO 1
	The sensors for image acquisition/Sensor strips are commonly used for in-Line arrangement in imaging geometry.	
14	What do you meant by Color model	CO 1
	A Color model is a specification of 3D- Coordinates system and a subspace within that system where each color is represented by a single point.	
15	Define Filter.	CO 2
	Filtering is a technique for modifying or enhancing an image	
16	Define scanner.	CO 1
	Scanner is a device that optically scans images, printed text, handwriting or an object and converts it to a digital image.	
17	What is digitization process?	CO 1
	The digitization process i.e. the digital image has M rows and N columns, requires decisions about values for M, N, and for the number, L, of gray levels allowed for each pixel.	
18	Define analog image with examples	CO 1
	Analog image is a continuous variation Examples of analog images are television images, photographs, paintings, and medical images.	
19	What is a booster stage?	CO 1
	The first stage lifts off the entire rocket vehicle system, therefore it is the most powerful stage and is known as the booster stage.	
20	Define Interpretation	CO 1
	The interpretation is called the assigning to recognize object.	
21	Outline sensor	CO 1
	A sensor is a device that detects and responds to some type of input from the physical environment.	
22	Define acquisition	CO 1
	It is defined as the action of retrieving an image from some source.	

23	What is 4 adjacency	CO 1
	Two pixels p and q with values from V are 4-adjacent if q is in the set $N_4(p)$.	
24	Define Digital image	CO 1
	Digital image can be defined by a two-dimensional array specifically arranged in rows and columns.	
25	Define Brightness	CO 2
	Brightness refers to the overall lightness or darkness of the image.	
26	Define gray level resolution	CO 1
	Gray Level Resolution can be defined as the total number of pixels in an image.	
27	What 8 adjacency	CO 1
	Two pixels p and q with values from V are 8-adjacent if q is in the set $N_8(p)$.	
28	What are the steps Involved in DIP?	CO 1
	1. Image Acquisition 2. Preprocessing 3.Segmentation 4. Representation and Description 5. Recognition and Interpretation	
29	What is Sampling?	CO 1
	Sampling is the process of converting continuous time signal into a discrete time signal.	
30	What is Quantization?	CO 2
	To convert a continuous sensed data into Digital form.	
31	Define encoding	CO 1
	Encoding is the process of converting data from one form to another	
32	What is mean by Coordinates?	CO 1
	To convert a continuous sensed data in to Digital form.	
33	What is Quantization?	CO 1
	An image may be continuous in the x-and y-coordinates or in amplitude, or in both.	
34	Define adjacency	CO 1
	Two pixels are connected if they are. Neighbors and their gray levels satisfy some specified criterion of similarity is called adjacency.	
35	What is intensity value of a pixel	CO 1
	A pixel is a small block that represents the amount of gray intensity to be displayed for that particular portion of the image.	
36	Write the difference between sampling and quantization	CO 1
	Sampling: It determines the spatial resolution of the digitized images. Quantization: It determines the number of grey levels in the digitized images.	
37	What is mean by pixel connectivity	CO 1
	Pixel connectivity is the way in which pixels in 2-dimensional 3-dimensional images relate to their neighbors.	

38	What is scanner	CO 1
	A scanner is a device that captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display	
39	Define m- adjacency	CO 1
	m-adjacency is a combination of 4 and 8 adjacency	
40	Define image geometry	CO 1
	The geometric shape which appears after a transformation has been applied to the pre image.	
MODULE II		
IMAGE ENHANCEMENT AND RESTORATION		
1	What is Spatial Domain?	CO 3
	The section of the real plane spanned by the coordinates of an image is called the Spatial Domain	
2	Define Contrast	CO 3
	The difference is intensity between the highest and the lowest intensity levels inan image is Contrast.	
3	Specify the objective of image enhancement technique	CO 3
	The objective of enhancement technique is to process an image so that the result is more suitable than the original image for a particular application.	
4	Define additivity	CO 3
	TThe property indicating that the output of a linear operation due to the sum of two inputs is same as performing the operation on the inputs individually and then summing the results is called/ This Property is called additivity.	
5	Define two categories of Image enhancement	CO 3
	i)direct manipulation of picture image.ii) Frequency domain methods based on modifying the image by FourierTransform.	
6	Write properties of Haar Transform	CO 3
	Image result for properties of haar transform The Haar transform is the simplest of the wavelet transforms. This transform cross-multiplies a function against the Haar wavelet with various shifts and stretches, like the Fourier transform cross-multiplies a function against a sine wave with two phases and many stretches.	
7	What is contrast stretching?	CO 3
	Contrast stretching reduces an image of higher contrast than the original by darkening the levels below m and brightening the levels above m in the image.	
8	Define Mask mode radiography	CO 3
	A commercial use of Image Subtraction is called Mask mode radiography.	

9	What is grey level slicing?	CO 3
	Highlighting a specific range of grey levels in an image is called grey level slicing.	
10	Define Masking	CO 3
	Region of Interest (ROI) operations is Commonly called as Masking.	
11	Define image subtraction.	CO 3
	The difference between 2 images	
12	Define Walsh and transform	CO 3
	The Walsh-transform is and orthogonal transformation that decomposes a signal into a set of orthogonal, rectangular waveforms called Walsh functions.	
13	What is image averaging?	CO 3
	Image averaging is a technique that is often employed to enhance video images that have been corrupted by random noise.	
14	Define image multiplication.	CO 3
	The difference between 2 images .	
15	What is meant by masking?.	CO 3
	Mask is the small 2-D array in which the values of mask co-efficient determine the nature of process.	
16	Define Single Pixel Operation.	CO 3
	The procedure done on a digital image to alter the values of its individual pixels.	
17	Define histogram.	CO 3
	The histogram of a digital image with gray levels in the range	
18	Define Tie points	CO 3
	Geometric Special Transformation, points whose locations are known Tie points of a images.	
19	Define sine wave	CO 3
	Electromagnetic waves can be visualized as a/Electromagnetic waves are visualized as sinusoidal wave..	
20	What is a Median filter?	CO 3
	The median filter replaces the value of a pixel by the median of the gray levels in the neighborhood of that pixel.	
21	What is Soft X-Rays?	CO 3
	Soft X-Rays (low energy) are used for Dental and chest scans.	
22	Name the different types of derivative filters	CO 3
	1. Perwitt operators 2. Roberts cross gradient operators 3. Sobel operators	
23	Define Brightness	CO 3
	Brightness is subjective descriptor of light perception that is impossible to measure.	

24	What are the types of noise models?	CO 3
	1. Guassian noise 2. Rayleigh noise 3. Erlang noise 4. Exponential noise 5. Uniform noise 6. Impulse noise	
25	Define Photon	CO 3
	Mass less particle containing a certain amount of energy is called/ Each bundle of mass less energy is called a Photon.	
26	What is Monochromatic light	CO 3
	Light of a single wavelength is known as monochromatic light. .	
27	What are brightness bodies?	CO 3
	Brightness embodies the achromatic notion of intensity and is a key factor in describing color sensation.	
28	What is smoothing filter	CO 3
	Mass less particle containing a certain amount of energy is called/ Each bundle of mass less energy is called a Photon.	
29	What is Average of pixels	CO 3
	The output or response of a smoothing, linear spatial filter is simply the average of the pixels contained in the neighborhood of the filter mask.	
30	What is smoothing, linear spatial filter?	CO 3
	Smoothing linear spatial filter is the average of the pixels contained in the neighborhood of the filter mask.	
31	Define averaging filter	CO 3
	Since the smoothing spatial filter forms the average of the pixels, it is also called as averaging filter.	
32	Define Sharp transitions of gray levels	CO 3
	Smoothing filter replaces the value of every pixel in an image by the average value of the gray levels. So, this helps in removing the sharp transitions in the gray levels between the pixels.	
33	Define Blur edges	CO 3
	Edges, which almost always are desirable features of an image, also are characterized by sharp transitions in gray level.	
34	What are the disadvantage of using smoothing filter?	CO 3
	The disadvantage of using smoothing filter is Blur the edges.	
35	Define smoothing spatial filters?	CO 3
	Smoothing filter is used for blurring and noise reduction in the image.	
36	Define sharpening filters	CO 3
	Sharpening filter can help emphasize details and enhance the edges of objects in an image.	
37	Define Box filter	CO 3
	A spatial averaging filter or spatial smoothing filter in which all the coefficients are equal is also called as box filter..	

38	Write about hotelling transform	CO 3
	The Hotelling transform is a linear transformation of a set of n dimensional vectors that correlates the n coordinates.	
39	Write about haar transform	CO 3
	The Haar transform can be used for image compression. The basic idea is to transfer the image into a matrix in which each element of the matrix represents a pixel in the image.	
40	What is a nonlinear smoothing filter?	CO 3
	Order static filters are nonlinear smoothing spatial filters whose response is based on the ordering or ranking the pixels.	
MODULE III		
IMAGE SEGMENTATION AND MORPHOLOGY		
1	Define Image enhancement	CO 4
	Image enhancement is the procedure of improving the quality and information content of original image	
2	What are the primary and secondary colors	CO 4
	Three Primary Colours (Ps): Red, Yellow, Blue. Three Secondary Colours (S'): Orange, Green, and Violet.	
3	What is spatial domain	CO 4
	The spatial domain is the normal image space, in which a change in position in I directly projects to a change in position in S.	
4	Define point processing	CO 4
	Point processing -where f (x, y) is the input image, g (x, y) is the processed image and T is point operator defined over some neighborhood of (x, y).	
5	What are the two properties in Linear Operator?	CO 4
	A function f is called a linear operator if it has the two properties: f(x+y)=f(x)+f(y) for all x and y; f(cx)=cf(x) for all x and all constants c.	
6	How many numbers of steps are involved in image processing?	CO 4
	Steps in image processing: Image acquisition-Image enhancement-Image restoration- Color image processing-Wavelets and multi resolution processing- Compression- Morphological processing-Segmentation- Representation &description- Object recognition.	
7	What is concept algebraic approach?	CO 4
	The concept of algebraic approach is to estimate the original image which minimizes a predefined criterion of performances.	
8	Define object recognition	CO 4
	Recognition is the process that assigns a label to an object based on its descriptors. We conclude our coverage of digital image processing with the development of methods for recognition of individual objects	

9	What is contrast stretching	CO 4
	The transformation becomes a thresholding function that creates a binary image i.e ., In contrast stretching, if $r1=r2$, $s1=0$ and $s2=L-1$	
10	What are the two methods of algebraic approach?	CO 4
	1. Unconstraint restoration approach 2. Constraint restoration approach	
11	What is transformation- linear function	CO 4
	The locations of points $(r1,s1)$ and $(r2,s2)$ control the shape of the transformation function. If $r1=s1$ and $r2=s2$ then the transformation is a linear function that produces no changes in gray levels.	
12	How transformation becomes a thresholding function	CO 4
	The transformation becomes a thresholding function that creates a binary image i.e ., In contrast stretching, if $r1=r2$, $s1=0$ and $s2=L-1$	
13	Define Gray-level interpolation	CO 4
	Gray-level interpolation deals with the assignment of gray levels to pixels in the spatially transformed image	
14	How to create a binary image	CO 4
	If $r1=r2$, $s1=0$ and $s2=L-1$, the transformation becomes a thresholding function that creates a binary image.	
15	What is meant by Noise probability density function	CO 4
	The spatial noise descriptor is the statistical behavior of gray level values in the noise component of the model.	
16	Define Gray-level slicing	CO 4
	Highlighting a specific range of graylevels in an image often is desired in gray-level slicing.	
17	Define sharpening of an image?	CO 4
	Image sharpening refers to any enhancement technique that highlights edges and fine details in an image.	
18	What is image translation and scaling?.	CO 4
	Image translation means reposition the image from one co-ordinate location to another along straight line path.	
19	What is Image sharpening process	CO 4
	Image sharpening is an effect applied to digital images to give them a sharper appearance.	

20	Define The second order derivative of a digital function	CO 4
	Must be zero in the flat areas i.e. areas of constant grey values. Must be nonzero at the onset of a gray- level step or ramp discontinuities.	
21	What is meant by unconstrained restoration?	CO 4
	The noise n a meaningful criterion function is to seek an f such that H f approximates of in a least square sense by assuming the noise term is as small as possible. It is also known as least square error approach.	
22	Define Differentiation	CO 4
	As sharpening is the process perform differentiation on the pixels to Sharpen the image.	
23	What is Image differentiation?	CO 4
	Image differentiation enhances the edges, discontinuities and deemphasizes the pixels with slow varying gray levels.	
24	What are the three methods of estimating the degradation function?	CO 4
	1. Observation 2. Experimentation 3. Mathematical modeling .	
25	Define Enhancement and write examples	CO 4
	Enhancement technique is based primarily on the pleasing aspects it might present to the viewer. For example: Contrast Stretching.	
26	Define Butterworth filter	CO 4
	The Butterworth filter is a type of signal processing filter designed to have a frequency response as flat as possible in the pass band.	
27	Define BPF	CO 4
	A band-pass filter or BPF is a device that passes frequencies within a certain range and rejects frequencies outside that range	
28	Define LPF	CO 4
	A low-pass filter (LPF) attenuates content above a cutoff frequency, allowing lower frequencies to pass through the filter.	
29	Define HPF	CO 4
	A high-pass filter (HPF) attenuates content below a cutoff frequency, allowing higher frequencies to pass through the filter.	
30	What is Image negatives?	CO 4
	The negative of an image with gray levels in the range $[0, L-1]$ is obtained by using the negative transformation, which is given by the expression. $s=L-1-r$ Where s is output pixel r is input pixel	
31	Define Intensity	CO 4
	The principle objective of Sharpening, to highlight transitions is called intensity/ The principle objective of Sharpening, to highlight transitions is Intensity.	

32	Give the formula for negative and log transformation	CO 4
	Negative: $S = L - 1 - r$; $Log :S = c \log(1+r)$ Where c-constant and greater than are equal to zero	
33	Define bit plane slicing?	CO 4
	Bit plane slicing is a method of representing an image with one or more bits of the byte used for each pixel	
34	Why blur is to be removed from images?	CO 4
	The blur is caused by lens that is improper manner, relative motion between camera and scene and atmospheric turbulence. It will introduce bandwidth reduction and make the image analysis as complex. To prevent the Issues, blur is removed from the images	
35	What is meant by Image Restoration?	CO 4
	Restoration attempts to reconstruct or recover an image that has been degraded by using a clear knowledge of the degrading phenomenon.	
36	What are the two properties in Linear Operator?	CO 4
	Additivity and Homogeneity.	
37	How a degradation process is modeled?	CO 4
	A system operator H, which together with an additive white noise term (x,y) a operates on an input image f(x,y)to produce a degraded image g(x,y).	
38	Define homogeneity property in Linear Operator	CO 4
	The homogeneity property says that ,the response to a constant multiple of any input is equal to the response to that Input multiplied by the same constant.	
39	Define circular matrix?	CO 4
	A square matrix, in which each row is a circular shift of the preceding row and the first row is a circular shift of the last row, is called circular matrix.	
40	What is concept algebraic approach?	CO 4
	The concept of algebraic approach is to estimate the original image which minimizes a predefined criterion of performances.	
MODULE IV		
IMAGE ANALYSIS AND CLASSIFICATION		
1	What is the segmentation?	CO 5
	Segmentation procedures partition an image into its constituent parts or objects.	
2	What role does the segmentation play in image processing?	CO 5
	Deals with partitioning an image into its constituent parts or objects	

3	What is segmentation?	CO 5
	Segmentation is the process of portioning an image into its constituted regions or objects based on certain criteria. Image segmentation algorithms are based on either discontinuity principle or Similarity principle.	
4	What is object?.	CO 5
	Object in image processing is an identifiable portion of an image that can be interpreted as a single unit.	
5	What is Zero in flat segments	CO 5
	The derivations of digital functions are Defined in terms of differences. The definition we use for first derivative should be zero in flat segments.	
6	Write the applications of segmentation	CO 5
	1. Detection of isolated points. 2. Detection of lines and edges in an image.	
7	Define Nonzero response at onset of gray level line?	CO 5
	The derivations of digital functions are defined in terms of differences. The definition we use for second derivative should be zero in flat segments, zero at the onset of a gray level step or ramp and nonzero along the ramps.	
8	What are the three types of discontinuity in digital image?	CO 5
	Points, lines and edges	
9	Applications of image segmentation	CO 5
	Content-based image retrieval. Machine vision. Medical imaging, including volume rendered images from computed tomography and magnetic resonance imaging, Object detection, Recognition Tasks, Traffic control systems. Video surveillance.	
10	How the derivatives are obtained in edge detection during formulation?	CO 5
	The first derivative at any in an image is obtained by using the magnitude of the gradient at that point. Similarly the second derivatives are obtained by using the laplacian.	
11	Define noise point.	CO 5
	Image noise is random variation of brightness or color information in images, and is usually an aspect of electronic noise. It can be produced by the image, Isolated point is also called as noise point.	
12	Write about linking edge points.	CO 5
	The approach for linking edge points isto analyze the characteristics of pixels in a small neighborhood (3x3 or 5x5) about every point (x,y)in an image that has undergone edge detection.	
13	Define Thicker	CO 5
	The first order derivatives produce thicker edges and the second order derivatives produce much finer edges.	

14	What are the two properties used for establishing similarity of edge pixels?	CO 5
	1 .The strength of the response of the gradient operator used to produce the edge pixel. (2) The direction of the gradient.	
15	What is mean by Edges and discontinuities?	CO 5
	Image Differentiation enhances Edges and other discontinuities.	
16	What is edge?	CO 5
	Edges are significant local changes in the image and are important features for analyzing images.	
17	Define Pixel Density	CO 5
	Pixel density is a calculation that returns the number of physical pixels per inch on a screen or display of a device.	
18	Give the properties of the second derivative around an edge	CO 5
	The sign of the second derivative can be used to determine whether an edge pixel lies on the dark or light side of an edge. It produces two values for every edge in an image	
19	Define Gradient Operator	CO 5
	The gradient of an image $f(x,y)$ at location (x,y) is defined as the vector Magnitude of the vector	
20	Define object point and background point?	CO 5
	To execute the objects from the Background is to select a threshold T that separates these modes. Then any point (x,y) for which $f(x,y) \geq T$ is called an object point. Otherwise the point is called background point	
21	What is global threshold?	CO 5
	When Threshold T depends only on $f(x,y)$ then the threshold is called global.	
22	Define region growing	CO 5
	Region growing is a procedure that Groups pixels or sub regions in to layer regions based on predefined criteria.	
23	Specify the steps involved in splitting and merging	CO 5
	Split into 4 disjoint quadrants any region R_i for which $P(R_i)=FALSE$. Merge any adjacent regions R_j and R_k for which $P(R_j \cup R_k)=TRUE$. Stop when no further merging or splitting is positive.	
24	What is Local threshold?	CO 5
	If Threshold T depends both on $f(x,y)$ and $p(x,y)$ is called local.	
25	What is dynamic or adaptive threshold?	CO 5
	If Threshold T depends on the spatial coordinates x and y the threshold is called dynamic or adaptive where $f(x,y)$ is the original image	

26	How edges are linked through hough transform?	CO 5
	The edges are linked through hough transform by using intersecting of 2 lines equations. The straight line equation is $y = mx + b$.	
27	What is object recognition in image processing	CO 5
	Object recognition consists of recognizing, identifying, and locating objects within a picture with a given degree of confidence	
28	What are the factors affecting the accuracy of region growing?	CO 5
	The factors affecting the accuracy of region growing are like lightning variations, pixel's intensity value	
29	Define region splitting and merging	CO 5
	Region splitting and merging is a segmentation process in which an image is initially subdivided into a set of arbitrary ,disjoint regions and then the regions are merger and /or splitted to satisfy the basic conditions.	
30	What is Image segmentation?	CO 5
	The segmentation algorithms can be Divided into two broad categories based on the two important properties, namely, discontinuity and Similarity.	
31	What are the Image Segmentation Techniques	CO 5
	The various segmentation techniques based on (1) gray level discontinuity and (2) gray level similarity are well depicted in a graph	
32	What is the cause of ringing effect?	CO 5
	If your sampling rate does not include all frequencies in your image, ringing effect occurs.	
33	What problem occurs when the histogram has only one lobe?	CO 5
	When the image histogram has only one lobe then a threshold cannot be found.	
34	What problem occurs when the Image has low luminance?	CO 5
	Then the histogram of the image is restricted to a small region of luminance Intensity and uniform thresholding does not give good results.	
35	What are the advantages of the non-uniform thresholding?	CO 5
	Non-uniform thresholding solves the Above mentioned problem, since it first modifies the histogram in order to be better distributed in all luminance values.	
36	What is the definition of the pixel neighborhood?	CO 5
	In many applications, it is important to check the connectedness of a region, something that it is done using the neighborhood definition.	
37	What is the definition of region connectedness?	CO 5
	A region R is called connected if any two pixels (x_A, y_A) , (x_B, y_B) belonging to R.	

38	Segmentation is usually not perfect due to number of factors such as	CO 5
	Noise, Bad illumination	
39	What are the two approaches to segmentation?	CO 5
	Region based segmentation & edge segmentation	
40	Define closing	CO 5
	Dilation followed by erosion is called closing.	
MODULE V		
IMAGE REGISTRATION AND VISUALIZATION		
1	What is the expanded form of JPEG?	CO 6
	Image compression is familiar (perhaps inadvertently) to most users of computers in the form of image file extensions, such as the jpg file extension used in the JPEG (Joint Photographic Experts Group) image compression standard.	
2	What is image compression?	CO 6
	Image compression refers to the process of redundancy amount of data required to represent the given quantity of information for digital image.	
3	What are two main types of Data compression?	CO 6
	Lossless compression can recover the exact original data after compression. It is used mainly for compressing database records, spreadsheets or word processing files, where exact replication of the original is essential.	
4	What is the need for compression?	CO 6
	In terms of storage, the capacity of a storage device can be effectively increased with methods that compress a body of data on its way to a storage device and decompress it when it is retrieved.	
5	What is Data compression?	CO 6
	Data compression requires the identification and extraction of source Redundancy. In other words, data compression seeks to reduce the number of bits used to store or transmit information.	
6	What are different Compression Methods?	CO 6
	Run Length Encoding (RLE) Arithmetic coding Huffman coding and Transform coding	
7	Define is coding redundancy	CO 6
	If the gray level of an image is coded in a way that uses more code words than necessary to represent each gray level, then the resulting image is said to contain coding redundancy.	

8	Define inter pixel redundancy	CO 6
	The value of any given pixel can be predicted from the values of its Neighbors. The information carried by is small. Therefore the visual contribution of a single pixel to an image is redundant. Otherwise called as spatial redundant geometric redundant or inter pixel redundant. Eg: Run length coding	
9	What is run length coding?	CO 6
	Run-length Encoding, or RLE is a Technique used to reduce the size of a repeating string of characters. This repeating string is called a run; typically RLE encodes a run of symbols into two bytes, a count and a symbol.	
10	Define compression ratio.	CO 6
	Compression Ratio = original size /compressed size	
11	Define psychovisual redundancy	CO 6
	In normal visual processing certain information has less importance than other information. So this information is said to be psycho visual redundant..	
12	Define encoder	CO 6
	Source encoder is responsible for Removing the coding and interpixel redundancy and psycho visual redundancy. There are twocomponentsA) Source Encoder B) Channel Encoder	
13	Operation of source encoder	CO 6
	Source encoder performs three operations 1) Mapper -this transformstheInput data into non-visual format. It reduces the interpixel redundancy.	
14	What is channel encoder	CO 6
	The channel encoder reduces the Impact of the channel noise by inserting redundant bits into the source encoded data.	
15	What are the types of decoder?	CO 6
	ASource decoder- has two components a) Symbol decoder- b)Inverse mapping- c) Channel decoder	
16	What operations are performed by error free compression?	CO 6
	Devising an alternative representation of the image in which its inter pixel redundant are reduced. Coding the representation to eliminate coding redundancy	
17	What is Variable Length Coding?	CO 6
	Variable Length Coding is the simplestapproach to error free compression. It reduces only the coding redundancy. It assigns the shortest possible codeword to the most probable gray levels.	
18	Define Huffman coding and mention its limitation	CO 6
	Huffman coding is a popular technique for removing coding redundancy.	

19	Define Block code	CO 6
	Each source symbol is mapped into fixed sequence of code symbols or code words. So it is called as block code	
20	Define instantaneous code	CO 6
	A code word that is not a combination of any other codeword is said to be uniquely decodable code.	
21	Define uniquely decodable code	CO 6
	A code word that is not a combination of any other codeword is said to be uniquely decodable code	
22	Define B2 code	CO 6
	Each code word is made up of continuation bit c and information bit which are binary numbers. This is called B2 code or B code. This is called B2 code because two information bits are used for continuation bits	
23	Define the procedure for Huffman shift coding	CO 6
	List all the source symbols along with its probabilities in descending order. Divide the total number of symbols into block of equal size. Sum the probabilities of all the source symbols outside the reference block.	
24	Define arithmetic coding	CO 6
	In arithmetic coding one to one corresponds between source symbols and code word doesn't exist whereas the single arithmetic code word assigned for a sequence of source symbols. A code word defines an interval of number Between 0 and 1.	
25	What is bit plane Decomposition?	CO 6
	An effective technique for reducing an image's inter pixel redundancies is to process the image's bit plane individually	
26	How effectiveness of quantization can be improved?	CO 6
	1. 1. Introducing an enlarged quantization Interval around zero, called a dead zero. 2. Adapting the size of the quantization intervals from scale to scale. In either case, the selected quantization intervals must be transmitted to the decoder with the encoded image bitstream	
27	What are the coding systems in JPEG?	CO 6
	1. A lossy baseline coding system, which is based on the DCT and is adequate for most compression application. 2. An extended coding system for greater compression, higher precision or Progressive reconstruction applications. 3. A lossless independent coding system for reversible compression.	
28	What is JPEG?	CO 6
	The acronym is expanded as "Joint Photographic Expert Group". It is an international standard in 1992.	

29	What are the basic steps in JPEG?	CO 6
	The Major Steps in JPEG Coding involve: 1. DCT 2. Quantization 3. Zigzag Scan 4. DPCM on DC component 5. RLE on AC Components 6. Entropy Coding	
30	What is MPEG?	CO 6
	The acronym is expanded as "Moving Picture Expert Group". It is an international standard in 1992. It perfectly Works with video and also used in teleconferencing	
31	Define I-frame	CO 6
	I-frame is Intraframe or Independentframe. An I-frame is compressed independently of all frames. It resembles a JPEG encoded image.	
32	Define P-frame	CO 6
	P-frame is called predictive frame. A P-frame is the compressed difference between the current frame and a prediction of it based on the previous I or P-frame	
33	Define B-frame	CO 6
	B-frame is the bidirectional frame. AB-frame is the compressed difference between the current frame and a prediction of it based on the previous I or P-frame or next P-frame.	
34	What is shift code?	CO 6
	The two variable length codes are referred to as shift codes. A shift code is generated by i)Arranging probabilities of the source symbols are monotonically decreasing.	
35	What are the types of redundancy?	CO 6
	1. Coding Redundancy 2. Interpixel Redundancy 3. Psychovisual Redundancy	
36	Define Psychovisual redundancy.	CO 6
	Certain information which has lessrelative importance than other information in normal visual processing are said to be psychovisually redundant information	
37	What is image compression?	CO 6
	Image compression refers to the process of redundancy amount of data required to represent the given quantity of information for digital image.	
38	What is Data Compression?	CO 6
	Data compression requires the Identification and extraction of source redundancy. In other words, data compression seeks to reduce the number of bits used to store or transmit information	
39	What are two main types of Data compression?	CO 6
	1. Lossless compression 2. Lossy compression	

40	What is the need for Compression?	CO 6
	In terms of communications, the bandwidth of a digital communication link can be effectively increased by compressing data at the sending end and decompressing data at the receiving end.	

Course Coordinator:
Dr. G. Ganapathi Rao, Asst. Professor

HOD CSE-DS