



Lesson Plan No. 1	Course Name: Digital Image Processing Topic Name: Basic Concepts and Applications of Digital Image Processing	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Understand the basic concepts of digital image processing. b. Recognize the fundamental steps in image processing..
Teaching Aids (if any)	a. Chalk and talk b. PPT
Teaching Development	Introduction (5 minutes) Engagement: <ul style="list-style-type: none">• Use real-time examples of image processing applications in daily life, such as photo editing apps, medical imaging (e.g., MRI, CT scans), and satellite imagery.• Explain that many of the visual enhancements and analyses they see daily operate on principles of digital image processing. Development (30 minutes) <ul style="list-style-type: none">• Basic Concepts in Image Processing: Define digital image processing and its applications. Explain the fundamental steps in image processing: Image Sensing, Acquisition, Sampling, Quantization, Spatial and Intensity resolution. Discuss the impact of reducing spatial resolution and image gray levels.• Show a video from NPTEL on image processing fundamentals: Introduction to Digital Image Processing (youtube.com)



	<p>.Exercise (5 minutes)</p> <ul style="list-style-type: none">• Provide different example problems for students to solve:<ul style="list-style-type: none">○ Compare images with different resolutions and discuss the visible differences.
Closure	<p>Summarize key concepts learned about the basics of digital image processing. Preview the next lesson on more advanced image processing techniques.</p> <ul style="list-style-type: none">- Reference video for the next lesson: Application of Digital Image Processing (youtube.com)
Evaluation	<p>Evaluate student understanding through a brief quiz or Q&A session at the end of the lesson.</p>

Lesson Plan No. 2	Course Name: Digital Image Processing Topic Name: Intensity Transformation Functions – Image Negative	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: Define image negative transformation. Apply the image negative transformation to a grayscale image.
TeachingAids (if any)	PPT Graphical examples of negative transformation
TeachingDevelopment	<ul style="list-style-type: none"> <input type="checkbox"/> Introduction (5 minutes) • Explain the concept of intensity transformation in images. Introduce the idea of negative transformation, which inverts the pixel intensity values. <input type="checkbox"/> Development (30 minutes) • Image Negative Transformation: <ul style="list-style-type: none"> ○ Formula: $T(x, y) = L - 1 - I(x, y)$, where $I(x, y)$ is the intensity of the pixel at position (x, y) and L is the maximum pixel value (e.g., 255 for an 8-bit image). ○ Demonstrate how the negative transformation flips the intensity values. • Visual Example: <ul style="list-style-type: none"> ○ Show an example image and apply the negative transformation. • Application: <ul style="list-style-type: none"> ○ Discuss practical uses of image negative, such as improving visibility of features in dark areas.



	<p>Exercise (5 minutes)</p> <ul style="list-style-type: none">• Provide students with a set of grayscale images and ask them to apply the image negative transformation using a simple code.
Closure	<ul style="list-style-type: none">• Recap the image negative transformation and its effects on image intensity. <p>□</p>
Evaluation	<p>A quiz on the theory behind image negative transformation and its applications.</p>



Lesson Plan No. 3	Course Name: Digital Image Processing Topic Name: Image Sampling and Quantization	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: Define sampling and quantization. Explain their effects on image quality.
Teaching Aids (if any)	PPT Graphical simulations

<p>Teaching Development</p>	<p>Introduction (5 minutes)</p> <ul style="list-style-type: none">• Engagement: Introduce the concept of sampling by comparing it with audio signals (e.g., how audio is sampled in digital music). Draw parallels with how images are sampled to create digital representations. <p>Development (30 minutes)</p> <ul style="list-style-type: none">• Define Sampling and Quantization:<ul style="list-style-type: none">○ Sampling: The process of selecting specific pixel values from an image at fixed intervals.○ Quantization: The process of mapping a range of values (like colors or intensities) to a finite set of discrete levels.• Discuss Spatial and Intensity Resolutions:<ul style="list-style-type: none">○ Spatial resolution: How much detail the image holds, affected by the sampling rate.○ Intensity resolution: The number of gray levels that can be represented, influenced by quantization.• Effects on Image Quality:<ul style="list-style-type: none">○ Demonstrate how changing the sampling rate impacts the clarity and detail of an image.○ Show how lower quantization levels reduce the depth of color or intensity in the image, leading to visual artifacts.• Simulations:<ul style="list-style-type: none">○ Show graphical simulations to illustrate how different sampling rates and quantization levels affect image quality (e.g., pixelated images with low resolution, banding with low quantization).
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	<p>Exercise (5 minutes)</p> <p>Display images with different sampling rates and quantization levels. Ask students to analyze and discuss the quality differences observed.</p>
Closure	<p>Recap the key concepts of sampling and quantization and their effects on image quality. Highlight the trade-off between image size and image quality.</p>
Evaluation	<p>A brief quiz to assess understanding of the definitions and effects of sampling and quantization on image quality.</p>

Lesson Plan No. 4	Course Name: Digital Image Processing Topic Name: Pixel Relationships and Adjacency	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: Describe pixel adjacency and connectivity. Explain their significance in image processing.
Teaching Aids (if any)	PPT Image examples
Teaching Development	<ul style="list-style-type: none"> • Engagement: Introduce the concept of pixels as the smallest unit of an image. Explain how digital images are made up of a grid of pixels, each representing a color or intensity value. • Development (30 minutes) • Pixel Adjacency: <ul style="list-style-type: none"> ○ 4-connected adjacency: Pixels that share an edge (up, down, left, right). ○ 8-connected adjacency: Pixels that share an edge or a corner (including diagonal neighbors). • Significance in Image Processing: <ul style="list-style-type: none"> ○ Explain how pixel adjacency is used in segmentation to group similar pixels. ○ Discuss its role in feature extraction, where pixel relationships help identify patterns or structures within an image (e.g., identifying boundaries, shapes, etc.). • Image Examples: <ul style="list-style-type: none"> ○ Show visual examples of images with 4-connected and 8-connected pixel relationships. Highlight how adjacency is identified in different regions of the image.



	<p>Exercise (5 minutes)</p> <p>Provide an image and ask students to identify connected pixels using 4-connected and 8-connected rules. Encourage them to highlight regions of connected pixels.</p>
Closure	<p>Summarize the key points: the concept of pixel adjacency, the difference between 4-connected and 8-connected relationships, and their significance in image segmentation and feature extraction.</p>
Evaluation	<p>Engage the students in a short class discussion on the importance of pixel relationships in real-world image processing tasks, such as object detection or image compression.</p>

Lesson Plan No. 5	Course Name: Digital Image Processing Topic Name: Intensity Transformation Functions	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Describe various intensity transformation functions. b. Apply transformations to images.
Teaching Aids (if any)	PPT Image examples
Teaching Development	<ul style="list-style-type: none"> • Engagement: Introduce the concept of pixels as the smallest unit of an image. Explain how digital images are made up of a grid of pixels, each representing a color or intensity value. <p style="text-align: center;">Development (30 minutes)</p> <ul style="list-style-type: none"> • Pixel Adjacency: <ul style="list-style-type: none"> ○ 4-connected adjacency: Pixels that share an edge (up, down, left, right). ○ 8-connected adjacency: Pixels that share an edge or a corner (including diagonal neighbors). • Significance in Image Processing: <ul style="list-style-type: none"> ○ Explain how pixel adjacency is used in segmentation to group similar pixels. ○ Discuss its role in feature extraction, where pixel relationships help identify patterns or structures within an image (e.g., identifying boundaries, shapes, etc.). • Image Examples: <ul style="list-style-type: none"> ○ Show visual examples of images with 4-connected and 8-connected pixel relationships. Highlight how adjacency is identified in different regions of the image.



	<p>Exercise (5 minutes)</p> <p>Provide an image and ask students to identify connected pixels using 4-connected and 8-connected rules. Encourage them to highlight regions of connected pixels.</p>
Closure	<p>Review Key Concepts: Summarize the key intensity transformation functions discussed: Image Negative: Inverts pixel intensities to highlight dark regions. Log Transformation: Expands low intensity values to improve visibility of dark areas. Power Law Transformation: Adjusts contrast and brightness, based on gamma values. Preview Next Class: Briefly mention that in the next class, students will learn about Histogram Equalization, a technique that improves image contrast by redistributing pixel intensities.</p>
Evaluation	<p>Engage students in a short class discussion on the importance of pixel relationships (such as pixel adjacency) in real-world image processing tasks.</p>



Lesson Plan No. 6	Course Name: Digital Image Processing Topic Name: Piecewise-Linear Transformation Functions	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Explain piecewise-linear transformation functions. b. Apply contrast stretching and intensity level slicing.
Teaching Aids (if any)	PPT Software for practical demonstration
Teaching Development	<p>Introduction (5 minutes):</p> <p>Show images with poor contrast and ask the students how they would improve them.</p> <p>Introduce contrast stretching and intensity level slicing as methods to enhance image contrast and highlight specific features.</p> <p>Briefly explain the purpose of the lesson and how these transformations can make images clearer.</p> <p>Development (30 minutes):</p> <p>Contrast Stretching (15 minutes):</p> <p>Explain that contrast stretching improves image contrast by expanding the pixel intensity range between the minimum and maximum values.</p> <p>Demonstrate this transformation using software, showing how pixel values are stretched to improve image clarity.</p> <p>Discuss common use cases such as improving low-contrast medical or satellite images.</p> <p>Intensity Level Slicing (15 minutes):</p> <p>Define intensity level slicing as a technique for highlighting specific intensity ranges in an image to emphasize certain features.</p>



	<p>Exercise (5 minutes)</p> <p>Provide students with a sample low-contrast image and ask them to apply both contrast stretching and intensity level slicing</p>
Closure	<p>Recap the importance of contrast stretching and intensity level slicing in improving image visibility and extracting meaningful features. Summarize how these transformations are applied in real-world tasks like medical imaging, satellite analysis, and image recognition.</p>
Evaluation	<p>In the next class, engage students in a discussion about the results of their transformations and how the adjustments affected the image quality.</p> <p>Ask students to reflect on how contrast stretching and intensity level slicing can be used in object detection or image compression.</p>



Lesson Plan No. 7	Course Name: Digital Image Processing Topic Name: Intensity Transformation Functions – Log Transformation	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: Understand the concept of log transformation. Apply the log transformation to enhance image details in dark regions.
Teaching Aids (if any)	PPT Graphical simulations
Teaching Development	<p>Introduction (5 minutes)</p> <ul style="list-style-type: none">Introduce the log transformation concept, which is commonly used to enhance the visibility of darker areas in an image. <p>Development (30 minutes)</p> <ul style="list-style-type: none">Log Transformation Function:<ul style="list-style-type: none">Formula: $T(x, y) = c * \log(1 + I(x, y))$, where $I(x, y)$ is the intensity value at pixel (x, y) and c is a constant.Explain how it compresses the dynamic range of pixel values, making darker regions more visible.Application:<ul style="list-style-type: none">Show a before-and-after comparison of an image before and after log transformation.



	Exercise (5 minutes) <ul style="list-style-type: none">Students apply log transformation to an image using a provided code.
Closure	Recap the log transformation and its effect on image enhancement.
Evaluation	A quick quiz to test understanding of the log transformation.



Lesson Plan No. 7	Course Name: Digital Image Processing Topic Name: Intensity Transformation Functions – Log Transformation	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: Understand the concept of log transformation. Apply the log transformation to enhance image details in dark regions.
Teaching Aids (if any)	PPT Graphical simulations
Teaching Development	<p>Introduction (5 minutes)</p> <ul style="list-style-type: none">Introduce the log transformation concept, which is commonly used to enhance the visibility of darker areas in an image. <p>Development (30 minutes)</p> <ul style="list-style-type: none">Log Transformation Function:<ul style="list-style-type: none">Formula: $T(x, y) = c * \log(1 + I(x, y))$, where $I(x, y)$ is the intensity value at pixel (x, y) and c is a constant.Explain how it compresses the dynamic range of pixel values, making darker regions more visible.Application:<ul style="list-style-type: none">Show a before-and-after comparison of an image before and after log transformation.



	Exercise (5 minutes) <ul style="list-style-type: none">Students apply log transformation to an image using a provided code.
Closure	Recap the log transformation and its effect on image enhancement.
Evaluation	A quick quiz to test understanding of the log transformation.



Lesson Plan No. 9	Course Name: Digital Image Processing Topic Name: Order statistic filters.	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Describe order statistic filters. b. Apply median and max/min filters to images.
TeachingAids (if any)	PPT Software for practical demonstration

Teaching Development

Introduction (5 minutes):

Engagement: Start with the importance of image filtering in removing noise and enhancing features in images.

Discuss how filters can smooth or sharpen an image.

Relate the concept of spatial filters to everyday tasks, such as blurring a photo or highlighting edges.

Development (30 minutes):

Spatial Filtering Overview (10 minutes):

Define spatial filtering as the process of modifying an image using a filter that operates on the pixel neighborhood.

Explain the difference between convolution and correlation in spatial filtering.

Show visual examples of both concepts using software and real-time image adjustments.

Smoothing Filters (10 minutes):

Define smoothing filters (e.g., mean filter and Gaussian filter) and explain how they reduce noise in an image by averaging pixel values.

Discuss how Gaussian filters are more effective in preserving edges while reducing noise compared to the mean filter.

Demonstrate their application on an image and show the effect of blurring or noise reduction.

Sharpening Filters (10 minutes):

Define sharpening filters (e.g., Laplacian and Sobel filters) and explain how they enhance edges and fine details.

Discuss how Laplacian filters highlight regions of rapid intensity change, and Sobel filters can detect edges in an



	Exercise (5 minutes) Hands-On Practice: Provide students with an image that requires both smoothing and sharpening.
Closure	Recap the key concepts: Smoothing filters: Used for noise reduction and image blurring (e.g., mean, Gaussian). Sharpening filters: Used for enhancing image details and detecting edges (e.g., Laplacian, Sobel).
Evaluation	Conduct a quiz on spatial filtering techniques in the next class, covering the differences between smoothing and sharpening filters.



Lesson Plan No. 10	Course Name: Digital Image Processing Topic Name: Image Restoration Concepts	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Explain the model of image degradation and restoration. b. Identify different noise models and their effects on images.
Teaching Aids (if any)	PPT: For visual aids and conceptual explanations. Case Studies: For practical examples of image degradation and restoration.

Teaching Development

Introduction (5 minutes):

Engagement: Start by showing images that have undergone degradation, such as a blurry or noisy image.

Discuss how real-world conditions (e.g., camera motion, transmission errors) lead to image degradation.

Briefly introduce image restoration as a process to recover the original image from degraded versions.

Development (30 minutes):

Image Degradation/Restoration Process (15 minutes):

Define image degradation as the process by which an image loses its quality due to various factors like noise, blurring, or distortion.

Explain the restoration model, focusing on the degradation function (e.g., noise, blur) and how restoration aims to reverse the degradation process.

Illustrate the concept with a simple degradation example, showing the effect of noise or blur, and then discuss methods for image restoration.

Discuss key concepts like inverse filtering, Wiener filtering, and their role in improving degraded images.

Noise Models (10 minutes):

Explain different noise models:

Gaussian Noise: Random variations in pixel intensity values, often due to sensor imperfections.

Salt-and-Pepper Noise: Random occurrences of black and



	Exercise (5 minutes) Hands-On Practice: Provide students with images affected by different types of noise (e.g., Gaussian, salt-and-pepper).
Closure	Recap: Summarize the key concepts: Image degradation and restoration: The process of recovering a degraded image to its original quality. Noise models: Various types of noise, such as Gaussian, salt-and-pepper, and periodic, and their impact on image quality.
Evaluation	Conduct a quiz in the next class on image degradation, restoration models, and noise types.



Lesson Plan No. 11	Course Name: Digital Image Processing Topic Name: Image Restoration Concepts	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Explain the model of image degradation and restoration. b. Identify different noise models and their effects on images.
Teaching Aids (if any)	PPT: For visual aids and conceptual explanations. Case Studies: For practical examples of image degradation and restoration.

<p>Teaching Development</p>	<p style="text-align: center;">Introduction (5 minutes):</p> <ul style="list-style-type: none"> • Engagement: Show an image that is degraded due to noise or blur. • Discussion: Introduce the concept of image degradation (e.g., caused by transmission errors, motion blur) and how restoration techniques are used to recover the original image. • Briefly explain the objective of image restoration as a process of reversing degradation. <p style="text-align: center;">Development (30 minutes):</p> <ul style="list-style-type: none"> • Degradation/Restoration Model (15 minutes): <ul style="list-style-type: none"> ○ Define the image degradation model as the process by which an image is altered (e.g., noise or blur). ○ Introduce the restoration model, focusing on methods used to recover the image. ○ Discuss common degradation factors like blur, noise, and distortion, and introduce techniques for image restoration (e.g., inverse filtering, Wiener filtering). ○ Illustrate the degradation-restoration process with a simple example using a blurred or noisy image. • Noise Models (10 minutes): <ul style="list-style-type: none"> ○ Introduce various noise models that affect image quality: <ul style="list-style-type: none"> ▪ Gaussian Noise: Random variations in pixel intensity, often due to sensor imperfections. ▪ Salt-and-Pepper Noise: Random black and white pixels typically from transmission errors. ▪ Poisson Noise: Noise related to low-light conditions or sensor limitations. ○ Discuss the effect of noise on image clarity and how
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	<p>Exercise (5 minutes)</p> <p>Hands-On Practice: Provide students with images affected by different types of noise (e.g., Gaussian, salt-and-pepper).</p>
Closure	<p>Recap: Summarize the key points: Degradation and restoration: How images degrade and how restoration can recover the original quality. Noise models: Different types of noise (Gaussian, salt-and-pepper, Poisson) and their effects on images.</p>
Evaluation	<p>In the next class, conduct a quiz on image degradation, restoration models, and noise types.</p>



Lesson Plan No. 12	Course Name: Digital Image Processing Topic Name: Advanced Restoration Techniques	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Describe advanced image restoration techniques. b. Apply adaptive filters to degraded images.
Teaching Aids (if any)	<ul style="list-style-type: none">PPT: For introducing and explaining advanced restoration techniques. <p><i>Software: Experimental demonstration of sampling filter</i></p>

Teaching Development

Introduction (5 minutes):

- **Engagement:** Begin by discussing the limitations of traditional restoration techniques (like Wiener and inverse filters).
- Highlight the need for **advanced restoration techniques** in situations where images have severe noise or degradation that basic methods cannot handle.
- Introduce **adaptive filters** and **alpha-trimmed mean filters** as solutions to these challenges.

Development (30 minutes):

- **Alpha-Trimmed Mean Filters (15 minutes):**
 - Define the **alpha-trimmed mean filter** as a non-linear filter that removes outliers (extreme pixel values) by averaging the remaining pixel values within a given window.
 - Explain how this filter is particularly effective for **salt-and-pepper noise** and **impulse noise**.
 - **Demonstration:** Show how to apply the **alpha-trimmed mean filter** to an image using software. Compare the result with an image filtered using a median filter.
 - Discuss the advantages of this filter over traditional methods in terms of noise suppression and edge preservation.
- **Adaptive Filters (15 minutes):**
 - Explain the concept of **adaptive filtering**, where the filter adjusts its behavior based on local image characteristics (e.g., pixel intensity variations, noise levels).
 - Discuss the two main types of adaptive filters:
 - **Adaptive Mean Filter:** Adjusts its window size based on local variance.
 - **Wiener Filter:** Adjusts based on local image variance



	<p>Exercise (5 minutes)</p> <p>Hands-On Practice: Provide students with images affected by salt-and-pepper noise and Gaussian noise.</p>
Closure	<p>Recap: Summarize the key concepts:</p> <p>Alpha-trimmed mean filters: Useful for removing impulse noise while preserving edges.</p> <p>Adaptive filters: Adjust based on local image characteristics, making them highly effective for non-stationary noise (e.g. Gaussian noise).</p>
Evaluation	<p>In the next class, engage students in a class discussion about the performance of the filters they applied.</p>



Lesson Plan No. 12	Course Name: Digital Image Processing Topic Name: Advanced Restoration Techniques	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Describe advanced image restoration techniques. b. Apply adaptive filters to degraded images.
Teaching Aids (if any)	<ul style="list-style-type: none">PPT: For introducing and explaining advanced restoration techniques. <p><i>Software: Experimental demonstration of sampling filter</i></p>

Teaching Development

Introduction (5 minutes):

- **Engagement:** Begin by discussing the limitations of traditional restoration techniques (like Wiener and inverse filters).
- Highlight the need for **advanced restoration techniques** in situations where images have severe noise or degradation that basic methods cannot handle.
- Introduce **adaptive filters** and **alpha-trimmed mean filters** as solutions to these challenges.

Development (30 minutes):

- **Alpha-Trimmed Mean Filters (15 minutes):**
 - Define the **alpha-trimmed mean filter** as a non-linear filter that removes outliers (extreme pixel values) by averaging the remaining pixel values within a given window.
 - Explain how this filter is particularly effective for **salt-and-pepper noise** and **impulse noise**.
 - **Demonstration:** Show how to apply the **alpha-trimmed mean filter** to an image using software. Compare the result with an image filtered using a median filter.
 - Discuss the advantages of this filter over traditional methods in terms of noise suppression and edge preservation.
- **Adaptive Filters (15 minutes):**
 - Explain the concept of **adaptive filtering**, where the filter adjusts its behavior based on local image characteristics (e.g., pixel intensity variations, noise levels).
 - Discuss the two main types of adaptive filters:
 - **Adaptive Mean Filter:** Adjusts its window size based on local variance.
 - **Wiener Filter:** Adjusts based on local image variance



	<p>Exercise (5 minutes)</p> <p>Hands-On Practice: Provide students with images affected by salt-and-pepper noise and Gaussian noise.</p>
Closure	<p>Recap: Summarize the key concepts:</p> <p>Alpha-trimmed mean filters: Useful for removing impulse noise while preserving edges.</p> <p>Adaptive filters: Adjust based on local image characteristics, making them highly effective for non-stationary noise (e.g. Gaussian noise).</p>
Evaluation	<p>In the next class, engage students in a class discussion about the performance of the filters they applied.</p>



Lesson Plan No. 13	Course Name: Digital Image Processing Topic Name: Color Model Conversion	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Convert between different color models (RGB, HSI, CMY, CMYK). b. Apply color conversion techniques in image processing.
Teaching Aids (if any)	PPT: For explaining the theory behind color model conversion. Software Demonstration: To showcase real-time color model conversions and practical applications.

Teaching Development

Introduction (5 minutes):

- **Engagement:** Start by discussing the importance of **color model conversion** in various fields such as digital imaging, printing, and computer vision.
- Explain that color models like **RGB, HSI, and CMY** are used for different purposes, and converting between them allows for optimal results in specific image processing tasks (e.g., improving segmentation or color correction).
- Briefly introduce the goal of the lesson: learning how to convert between **RGB, HSI, and CMY/CMYK** models.

Development (30 minutes):

- **Converting RGB to HSI (10 minutes):**
 - Explain the **RGB to HSI conversion** process and why HSI is more aligned with human color perception, which makes it useful for tasks like **image segmentation**.
 - **Demonstration:** Convert a sample image from **RGB to HSI** using image processing software. Highlight how the hue, saturation, and intensity components are separated and can be modified independently.
 - Discuss practical applications such as **color-based filtering** and **feature extraction** using the HSI model.
- **Converting RGB to CMY/CMYK (10 minutes):**
 - Introduce the **RGB to CMY** and **RGB to CMYK** conversion process.
 - Explain that CMY/CMYK is commonly used in **printing** because it represents subtractive color mixing (as opposed to the additive mixing in RGB).
 - **Demonstration:** Show how an image in **RGB** can be converted into **CMY** and **CMYK** models using software.



	<p>Exercise (5 minutes):</p> <ul style="list-style-type: none">• Hands-On Practice: Provide students with sample images in RGB format and ask them to convert these images to HSI and CMY/CMYK models using the software.• Instruct students to modify the saturation in the HSI model and observe the
Closure	<p>Recap: Summarize the key points covered in the lesson:</p> <ul style="list-style-type: none">• The importance and uses of RGB, HSI, and CMYK models.• The process of color model conversion and its significance in image processing tasks such as color segmentation, image enhancement, and printing.
Evaluation	<p>In the next class, engage students in a discussion about their conversion results, focusing on:</p>



Lesson Plan No. 15	Course Name: Digital Image Processing Topic Name: Pseudo Coloring of Images	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Understand the concept of pseudo coloring. b. Apply pseudo coloring techniques to grayscale images for enhanced visualization.
TeachingAids (if any)	<ul style="list-style-type: none">• PPT: For explaining the concept and techniques of pseudo coloring.

<p>Teaching Development</p>	<p style="text-align: center;">Introduction (5 minutes):</p> <ul style="list-style-type: none"> • Engagement: Start by showing grayscale images and discussing how important information may be lost in a single channel. • Objective: Introduce the idea of pseudo coloring as a technique to map grayscale intensities to a color scale, making patterns or features more visible. • Explain that pseudo coloring helps improve contrast and highlights specific regions or features, which is especially useful in medical imaging, satellite imaging, and scientific visualization. <p style="text-align: center;">Development (30 minutes):</p> <ul style="list-style-type: none"> • Concept of Pseudo Coloring (10 minutes): <ul style="list-style-type: none"> ○ Define pseudo coloring as a method of mapping grayscale intensities to colors. ○ Explain how this technique can enhance details, especially in areas where differences in intensity are subtle. ○ Discuss the role of color maps (e.g., rainbow, jet) in assigning colors to pixel intensities, and the importance of choosing the appropriate color map for the task (e.g., for distinguishing between features or highlighting certain areas in the image). ○ Applications: Mention where pseudo coloring is commonly used: <ul style="list-style-type: none"> ▪ Medical imaging (e.g., CT scans, MRI images), ▪ Remote sensing (e.g., satellite imagery), ▪ Scientific data visualization (e.g., temperature maps, topography).
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	<p>Exercise (5 minutes):</p> <p>Hands-On Practice: Provide students with a grayscale image and ask them to apply pseudo coloring using software.</p> <ul style="list-style-type: none">• Ask them to experiment with different color maps and adjust color
Closure	<p>Recap: Summarize the key points:</p> <ul style="list-style-type: none">• Pseudo coloring is a powerful technique for enhancing the visibility of patterns in grayscale images.• It helps to highlight important features that might otherwise be hard to
Evaluation	<p>In the next class, have a discussion on the results of the students' exercises, focusing on:</p>



Lesson Plan No. 15	Course Name: Digital Image Processing Topic Name: Pseudo Coloring of Images	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Understand the concept of pseudo coloring. b. Apply pseudo coloring techniques to grayscale images for enhanced visualization.
TeachingAids (if any)	<ul style="list-style-type: none">• PPT: For explaining the concept and techniques of pseudo coloring.

<p>Teaching Development</p>	<p style="text-align: center;">Introduction (5 minutes):</p> <ul style="list-style-type: none"> • Engagement: Start by showing grayscale images and discussing how important information may be lost in a single channel. • Objective: Introduce the idea of pseudo coloring as a technique to map grayscale intensities to a color scale, making patterns or features more visible. • Explain that pseudo coloring helps improve contrast and highlights specific regions or features, which is especially useful in medical imaging, satellite imaging, and scientific visualization. <p style="text-align: center;">Development (30 minutes):</p> <ul style="list-style-type: none"> • Concept of Pseudo Coloring (10 minutes): <ul style="list-style-type: none"> ○ Define pseudo coloring as a method of mapping grayscale intensities to colors. ○ Explain how this technique can enhance details, especially in areas where differences in intensity are subtle. ○ Discuss the role of color maps (e.g., rainbow, jet) in assigning colors to pixel intensities, and the importance of choosing the appropriate color map for the task (e.g., for distinguishing between features or highlighting certain areas in the image). ○ Applications: Mention where pseudo coloring is commonly used: <ul style="list-style-type: none"> ▪ Medical imaging (e.g., CT scans, MRI images), ▪ Remote sensing (e.g., satellite imagery), ▪ Scientific data visualization (e.g., temperature maps, topography).
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	<p>Exercise (5 minutes):</p> <p>Hands-On Practice: Provide students with a grayscale image and ask them to apply pseudo coloring using software.</p> <ul style="list-style-type: none">• Ask them to experiment with different color maps and adjust color
Closure	<p>Recap: Summarize the key points:</p> <ul style="list-style-type: none">• Pseudo coloring is a powerful technique for enhancing the visibility of patterns in grayscale images.• It helps to highlight important features that might otherwise be hard to
Evaluation	<p>In the next class, have a discussion on the results of the students' exercises, focusing on:</p>



Lesson Plan No. 16	Course Name: Digital Image Processing Topic Name: Introduction to Image Compression	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Understand the concept of pseudo coloring. b. Apply pseudo coloring techniques to grayscale images for enhanced visualization.
TeachingAids (if any)	<ul style="list-style-type: none">• PPT: For explaining the concept and techniques of pseudo coloring.

<p>Teaching Development</p>	<p style="text-align: center;">Introduction (5 minutes):</p> <ul style="list-style-type: none"> • Start with real-world examples of image compression to capture students' attention. <ul style="list-style-type: none"> ○ Show how JPEG images are used in social media, websites, and smartphones. ○ Show a video or animated comparison of large vs. compressed images to highlight storage differences. • Define the term Image Compression: Reducing the size of an image file to save space while retaining essential quality for its intended purpose. <p style="text-align: center;">2. Development (30 minutes):</p> <ul style="list-style-type: none"> • Define Image Compression (10 minutes): <ul style="list-style-type: none"> ○ Introduce the concept of Image Compression and its importance in reducing storage space and enhancing the efficiency of data transmission. ○ Discuss the basic principles behind compression: reducing redundancies, simplifying image data, and maintaining image quality. ○ Differentiate between Lossy (e.g., JPEG) and Lossless (e.g., PNG, TIFF) compression techniques, with examples of where each might be used. • Types of Redundancy (15 minutes): <ul style="list-style-type: none"> ○ Coding Redundancy: Explain how certain image data patterns can be encoded more efficiently. ○ Spatial Redundancy: Describe how similar pixels in an image can be represented in a more compact form. ○ Temporal Redundancy: In video compression, explain how successive frames contain similar data and how this
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	<p>Exercise (5 minutes):</p> <p>Show side-by-side examples of the same image before and after compression, with both quality and size clearly indicated.</p> <p>Ask students to analyze the effects of compression on image quality and file</p>
Closure	<ul style="list-style-type: none">• Summarize the key points:<ul style="list-style-type: none">○ Image compression is vital for efficient storage and transmission.○ Different redundancies exist in images and videos, which can be exploited to reduce file sizes.○ Lossy and lossless compression techniques have different uses.
Evaluation.	<p>Quiz (5 minutes):</p>



Lesson Plan No. 18	Course Name: Digital Image Processing Topic Name: Spatial and Temporal Redundancy	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Explain spatial and temporal redundancy in images. b. Describe methods to address these redundancies.
TeachingAids (if any)	<ul style="list-style-type: none">• PPT• Case studies



Teaching Development

1. Introduction (5 minutes)

- Briefly introduce spatial and temporal redundancy with real-world examples.
- Define spatial redundancy (similar pixel values in an image) and temporal redundancy (similar frames in a video).

2. Development (25 minutes)

- **Spatial Redundancy (10 minutes):**
 - Explain spatial redundancy and techniques like JPEG (DCT) and RLE to reduce it.
- **Temporal Redundancy (10 minutes):**
 - Discuss temporal redundancy and methods like H.264 (inter-frame compression) and motion compensation.
- **Case Study Discussion (5 minutes):**
 - Show an image and a video, ask students to identify and suggest compression methods for redundancy.



	<p>Exercise (5 minutes)</p> <ul style="list-style-type: none">• Students analyze an image or video sequence in pairs to identify spatial and temporal redundancy.• Share their findings and suggest appropriate compression techniques.
Closure	<p>Summarize spatial and temporal redundancy concepts.</p> <p>Quick Q&A to clarify any doubts..</p>
Evaluation	<ul style="list-style-type: none">• Quiz (5 minutes):<ul style="list-style-type: none">○ A brief quiz on redundancy definitions, examples, and reduction techniques.• Feedback: Provide quick feedback on quiz responses.



Lesson Plan No. 18	Course Name: Digital Image Processing Topic Name: Spatial and Temporal Redundancy	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Explain spatial and temporal redundancy in images. b. Describe methods to address these redundancies.
TeachingAids (if any)	<ul style="list-style-type: none">• PPT• Case studies



Teaching Development

1. Introduction (5 minutes)

- Briefly introduce spatial and temporal redundancy with real-world examples.
- Define spatial redundancy (similar pixel values in an image) and temporal redundancy (similar frames in a video).

2. Development (25 minutes)

- **Spatial Redundancy (10 minutes):**
 - Explain spatial redundancy and techniques like JPEG (DCT) and RLE to reduce it.
- **Temporal Redundancy (10 minutes):**
 - Discuss temporal redundancy and methods like H.264 (inter-frame compression) and motion compensation.
- **Case Study Discussion (5 minutes):**
 - Show an image and a video, ask students to identify and suggest compression methods for redundancy.



	<p>Exercise (5 minutes)</p> <ul style="list-style-type: none">• Students analyze an image or video sequence in pairs to identify spatial and temporal redundancy.• Share their findings and suggest appropriate compression techniques.
Closure	<p>Summarize spatial and temporal redundancy concepts.</p> <p>Quick Q&A to clarify any doubts..</p>
Evaluation	<ul style="list-style-type: none">• Quiz (5 minutes):<ul style="list-style-type: none">○ A brief quiz on redundancy definitions, examples, and reduction techniques.• Feedback: Provide quick feedback on quiz responses.



Lesson Plan No. 20	Course Name: Digital Image Processing Topic Name: Models of Image Compression	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Explain different models of image compression. b. Discuss their applications.
TeachingAids (if any)	PowerPoint Presentation (PPT) Case studies or examples of compressed images (lossy vs.

Teaching Development

1. Introduction (5 minutes)

- Introduce the concept of image compression and its importance in digital image processing.
- Briefly outline the two main types of compression: lossy and lossless.

2. Development (30 minutes)

- **Lossy vs. Lossless Compression Models (15 mins)**
 - Explain the difference between lossy (e.g., JPEG) and lossless (e.g., PNG, TIFF) compression.
 - Discuss the trade-offs between file size and image quality in each model.
 - Show visual examples comparing images before and after compression (both lossy and lossless).
- **Applications of Compression Models (10 mins)**
 - Discuss where each compression model is typically used (e.g., lossy for web images, lossless for medical imaging, archiving).
 - Highlight real-world scenarios and industry applications for both types of compression.
- **Case Study or Example (5 mins)**
 - Show a case study or example demonstrating the practical use of both compression types (e.g., compressing images for web use vs. medical imaging).



	<p>Exercise (5 minutes)</p> <ul style="list-style-type: none">• Activity: Compare images compressed with different models.<ul style="list-style-type: none">○ Students will analyze and compare two versions of the same image: one compressed with a lossy model and the other with a lossless model.
Closure	<p>Summarize the key differences between lossy and lossless compression models.</p> <p>Reiterate their respective advantages and ideal use cases.</p>
Evaluation	<p>Quiz: Quick quiz on the types of compression models, their advantages, and appropriate applications.</p> <ul style="list-style-type: none">• Sample questions could include:<ul style="list-style-type: none">○ What is the main difference between lossy and lossless



Lesson Plan No. 21	Course Name: Digital Image Processing Topic Name: Models of Image Compression	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Explain different models of image compression. b. Discuss their applications.
TeachingAids (if any)	PowerPoint Presentation (PPT) Case studies or examples of compressed images (lossy vs.

Teaching Development

1. Introduction (5 minutes)

- Introduce the concept of image compression and its importance in digital image processing.
- Briefly outline the two main types of compression: lossy and lossless.

2. Development (30 minutes)

- **Lossy vs. Lossless Compression Models (15 mins)**
 - Explain the difference between lossy (e.g., JPEG) and lossless (e.g., PNG, TIFF) compression.
 - Discuss the trade-offs between file size and image quality in each model.
 - Show visual examples comparing images before and after compression (both lossy and lossless).
- **Applications of Compression Models (10 mins)**
 - Discuss where each compression model is typically used (e.g., lossy for web images, lossless for medical imaging, archiving).
 - Highlight real-world scenarios and industry applications for both types of compression.
- **Case Study or Example (5 mins)**
 - Show a case study or example demonstrating the practical use of both compression types (e.g., compressing images for web use vs. medical imaging).



	<p>Exercise (5 minutes)</p> <ul style="list-style-type: none">• Activity: Compare images compressed with different models.<ul style="list-style-type: none">○ Students will analyze and compare two versions of the same image: one compressed with a lossy model and the other with a lossless model.
Closure	<p>Summarize the key differences between lossy and lossless compression models.</p> <p>Reiterate their respective advantages and ideal use cases.</p>
Evaluation	<p>Quiz: Quick quiz on the types of compression models, their advantages, and appropriate applications.</p> <ul style="list-style-type: none">• Sample questions could include:<ul style="list-style-type: none">○ What is the main difference between lossy and lossless



Lesson Plan No. 22	Course Name: Digital Image Processing Topic Name: Huffman Coding	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Describe Huffman coding and its working principle. b. Apply Huffman coding to compress image data and evaluate its effectiveness.
TeachingAids (if any)	PowerPoint Presentation (PPT) Software tools for Huffman coding demonstration (e.g., custom

Teaching Development	<p style="text-align: center;">1. Introduction (5 minutes)</p> <ul style="list-style-type: none">• Concept of Huffman Coding<ul style="list-style-type: none">○ Introduce the concept of data compression and the role of Huffman coding in efficient encoding.○ Use a simple example (e.g., compressing a string of characters) to explain how Huffman coding assigns variable-length codes to data based on frequency of occurrence. <hr/> <p style="text-align: center;">2. Development (30 minutes)</p> <ul style="list-style-type: none">• Huffman Coding Algorithm (15 minutes)<ul style="list-style-type: none">○ Explain the steps of the Huffman coding algorithm:<ul style="list-style-type: none">▪ Frequency analysis▪ Building the binary tree▪ Generating the codebook○ Discuss the efficiency of Huffman coding in terms of minimizing average code length.○ Show how Huffman coding reduces data size compared to fixed-length encoding.○ Provide a simple example with character frequencies to illustrate the algorithm.• Image Compression Using Huffman Coding (10 minutes)<ul style="list-style-type: none">○ Demonstrate how Huffman coding can be applied to compress image data.○ Use an image processing software or tool to compress an image using Huffman coding.
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	<p>Exercise (5 minutes)</p> <p>Hands-on Exercise: Apply Huffman coding to an image dataset.</p> <ul style="list-style-type: none">• Provide students with a set of image data (or a simplified image matrix).• Ask them to perform a basic compression task using the Huffman coding
Closure	<p>Recap of Key Points</p> <ul style="list-style-type: none">• Summarize the Huffman coding algorithm, its steps, and how it is used in image compression.• Emphasize its efficiency and the scenarios where it is most beneficial
Evaluation	<p>Class Discussion/Quiz</p> <ul style="list-style-type: none">• Hold a quick discussion on the efficiency and practical applications of Huffman coding in digital image processing.• Ask questions like:



Lesson Plan No. 21	Course Name: Digital Image Processing Topic Name: Arithmetic Coding	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Explain the arithmetic coding process. b. Compare arithmetic coding to Huffman coding in terms of efficiency and application.
TeachingAids (if any)	<ul style="list-style-type: none">• PPT• Examples



Teaching Development	<p style="text-align: center;">1. Introduction (5 minutes)</p> <ul style="list-style-type: none">• Introduce arithmetic coding as an alternative to Huffman coding.• Briefly explain how arithmetic coding works by assigning a range of values to symbols instead of individual codes. <hr/> <p style="text-align: center;">2. Development (30 minutes)</p> <ul style="list-style-type: none">• Arithmetic Coding Process (15 minutes)<ul style="list-style-type: none">○ Explain the step-by-step process of arithmetic coding: probability assignment, interval division, and encoding.○ Highlight its ability to handle fractional bits per symbol for more efficient compression.• Comparison with Huffman Coding (10 minutes)<ul style="list-style-type: none">○ Compare arithmetic coding with Huffman coding in terms of efficiency, adaptability, and the ability to handle complex symbol distributions.○ Discuss the strengths and weaknesses of each method.• Performance Metrics (5 minutes)<ul style="list-style-type: none">○ Discuss compression ratios and computational efficiency, comparing how both algorithms perform in different scenarios.
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	<p>Exercise (5 minutes)</p> <ul style="list-style-type: none">• Hands-on Exercise: Apply arithmetic coding to a sample dataset.<ul style="list-style-type: none">○ Provide students with a simple dataset or string of characters and ask them to manually apply arithmetic coding.
Closure	<p>Recap the main points about arithmetic coding, its process, and how it compares to Huffman coding in terms of efficiency.</p> <p>Reiterate its benefits, especially for handling non-integral frequencies.</p>
Evaluation	<p>Quiz: Quick quiz comparing arithmetic and Huffman coding.</p> <ul style="list-style-type: none">• Questions can include:<ul style="list-style-type: none">○ What are the advantages of arithmetic coding over Huffman coding?



Lesson Plan No. 23	Course Name: Digital Image Processing Topic Name: LZW Coding	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Describe the LZW coding process. b. Implement LZW coding for image compression.
TeachingAids (if any)	<ul style="list-style-type: none">• PowerPoint Presentation (PPT)• Software demonstration (e.g., LZW compression tool or code)



Teaching Development	<ul style="list-style-type: none">○ 1. Introduction (5 minutes)○ Introduce LZW coding with practical examples, such as its use in GIF image compression.○ Briefly explain how LZW replaces repeated strings with shorter codes to compress data. <hr/> <ul style="list-style-type: none">○ 2. Development (30 minutes)○ LZW Algorithm Explanation (15 minutes)○ Step-by-step breakdown of the LZW algorithm:○ Initialize the dictionary with single characters.○ Find the longest match in the input data.○ Output the code for the match and update the dictionary.○ Highlight how LZW adapts dynamically to the data stream.○ LZW Compression Demonstration (10 minutes)○ Demonstrate LZW compression on a simple dataset or image using available software or coding tools.○ Show the difference in file sizes before and after applying LZW compression.○ Comparison with Other Compression Methods (5 minutes)○ Briefly discuss how LZW compares to other image compression methods (e.g., Huffman coding) in terms of performance and application.
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	<p>Exercise (5 minutes)</p> <ul style="list-style-type: none">• Hands-on Exercise: Apply LZW coding to a sample image.<ul style="list-style-type: none">○ Provide students with a sample image file or data and ask them to compress it using LZW encoding.
Closure	<p>Recap the LZW algorithm and its application in image compression (e.g., GIF files).</p> <p>Highlight its efficiency for repetitive data and how it improves compression ratios.</p>
Evaluation	<p>Class Discussion/Quiz: Discuss LZW's applications and potential challenges.</p> <ul style="list-style-type: none">• Possible questions:<ul style="list-style-type: none">○ How does LZW handle repeated data in images?○ In which scenarios is LZW particularly effective for image



Lesson Plan No. 24	Course Name: Digital Image Processing Topic Name: Run-Length Coding	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Explain run-length coding. b. Apply run-length coding to compress images.
TeachingAids (if any)	PowerPoint Presentation (PPT) Examples of images before and after run-length coding

Teaching Development	<p style="text-align: center;">Introduction (5 minutes)</p> <ul style="list-style-type: none">• Introduce run-length coding by explaining its basic concept using simple visual examples (e.g., long sequences of the same pixel value).• Show how run-length coding stores the length of repeated values to reduce data size. <hr/> <p style="text-align: center;">2. Development (30 minutes)</p> <ul style="list-style-type: none">• Run-Length Coding Process (15 minutes)<ul style="list-style-type: none">○ Explain the step-by-step process: identifying runs of identical pixels and encoding them as pairs of value and count.○ Discuss its efficiency for compressing images with large areas of uniform color.• Examples of Image Compression (10 minutes)<ul style="list-style-type: none">○ Show examples of images before and after applying run-length coding to highlight its impact on file size.○ Discuss when run-length coding is most effective (e.g., black-and-white images or simple patterns).• Efficiency of Run-Length Coding (5 minutes)<ul style="list-style-type: none">○ Discuss the strengths and weaknesses of run-length coding in different image compression scenarios.○ Compare run-length coding with other methods (e.g., Huffman or LZW) in terms of efficiency for specific types of images.
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	<p>Exercise (5 minutes)</p> <ul style="list-style-type: none">• Hands-on Exercise: Apply run-length coding to a sample image.<ul style="list-style-type: none">○ Provide a simple image or dataset and ask students to manually apply run-length coding to compress it.
Closure	<p>Recap the main points: the process of run-length coding, its applications, and efficiency for specific types of images.</p> <p>Highlight its role in image compression, especially for images with large uniform regions.</p>
Evaluation	<p>Quiz: Quick quiz on the principles of run-length coding.</p> <ul style="list-style-type: none">• Sample questions:<ul style="list-style-type: none">○ What is the primary advantage of run-length coding?○ How does run-length coding improve compression for certain



Lesson Plan No. 26	Course Name: Digital Image Processing Topic Name: Block Transform Coding	Course No: MCSE31B
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Objectives	At the end of the lesson, the student shall be able to: a. Describe block transform coding methods. b. Explain the applications of block transform coding in image compression.
TeachingAids (if any)	<ul style="list-style-type: none">• PowerPoint Presentation (PPT)• Software demonstration (e.g., image compression tool or DCT-

Teaching Development

Introduction (5 minutes)

- Discuss the prevalence of JPEG in digital media and its importance for web images, photography, and multimedia.
- Briefly introduce the role of compression in reducing file sizes for digital content.

2. Development (30 minutes)

- **JPEG Compression Algorithm (15 minutes)**
 - Explain the JPEG compression process step-by-step:
 1. Color space conversion (RGB to YCbCr)
 2. Downsampling
 3. Discrete Cosine Transform (DCT)
 4. Quantization
 5. Entropy coding (Huffman coding)
 - Discuss each step's purpose and how it reduces image data size while maintaining quality.
- **Software Demonstration (10 minutes)**
 - Demonstrate JPEG compression using software, showing the difference between the original image and a compressed JPEG file.
 - Highlight the impact of different compression levels on image quality and file size.
- **Effectiveness of JPEG Compression (5 minutes)**
 - Discuss the trade-offs between image quality and compression ratio, and explain how JPEG balances these factors.



	<p>Exercise (5 minutes)</p> <p>Hands-on Exercise: Compress a sample image using JPEG techniques.</p> <ul style="list-style-type: none">○ Students will apply JPEG compression to an image using software, experimenting with different quality settings and observing the effects on file size and image fidelity.
Closure	<p>Recap the key steps in the JPEG compression process and discuss its benefits for storing and sharing images.</p> <p>Highlight the efficiency of JPEG in achieving high compression ratios with minimal visible loss in quality.</p>
Evaluation	<p>Quiz: Short quiz on the steps in the JPEG compression process.</p> <ul style="list-style-type: none">● Example questions:<ul style="list-style-type: none">○ What is the purpose of quantization in JPEG?○ How does downsampling affect the image quality and file size?