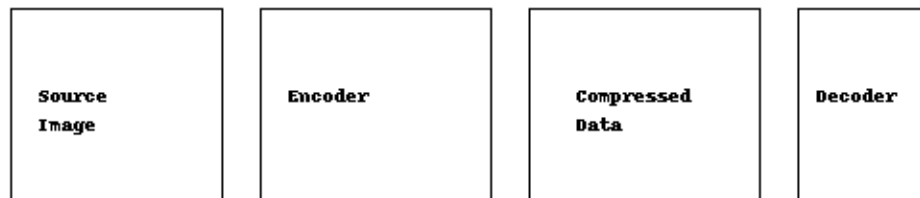


**UNIT 5 – IMAGE COMPRESSION (Digital Image Processing)** This PDF explains Unit 5 in a clear teacher-like manner, with supportive diagrams.

1. What is Image Compression? Image Compression reduces the amount of data required to represent a digital image. It removes redundancies while trying to preserve important information.
2. Types of Redundancies
  - Coding Redundancy – Using variable-length codes like Huffman.
  - Interpixel Redundancy – Strong correlation between neighboring pixels.
  - Psychovisual Redundancy – Human eye cannot perceive all information.
3. Classification of Compression
  - Lossless Compression (No information lost) Examples: Huffman, Arithmetic, LZW, PNG.
  - Lossy Compression (Some information lost) Examples: JPEG, JPEG2000, Transform-based compression.
4. Image Compression Model



5. Huffman Coding (Lossless) A variable-length coding technique.
  - More frequent symbols    shorter codes
  - Less frequent symbols    longer codes
6. Arithmetic Coding (Lossless) Encodes whole message into a single number between 0 and 1. More efficient than Huffman.
7. Predictive Coding Predicts next pixel using neighbors: Prediction Error = Actual – Predicted Used in JPEG-LS.
8. Transform-based Compression (Lossy) Most widely used technique. Steps:
  - Divide image into blocks
  - Apply DCT (Discrete Cosine Transform)
  - Quantize coefficients
  - Encode using entropy coding
9. JPEG Compression Standard
  - Uses DCT
  - $8 \times 8$  blocks
  - Quantization table controls quality
  - Achieves high compression
10. JPEG2000 Standard
  - Uses Discrete Wavelet Transform (DWT)
  - Better quality at high compression
  - Supports progressive coding