MCA317: Data Compression	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Examination Scheme Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: -

1. Computer Fundamentals
2. Principles of computer programming
3. Basic mathematical knowledge
4. Operating Systems

Course Objectives:

The objective of this course is to:

1. Gain a fundamental understanding of data compression methods for text, images, and videos.
2. Understand the concept of lossy and lossless compression.
3. Understand Huffman coding and Arithmetic coding.
4. Illustrate the concepts of various algorithms for text, images and video compression.
5. Understand how to select the best algorithm/ approach for compression given a situation.
6. Understand vector quantization.

Detailed Syllabus:

UNIT I (10 Hours) **Compression Techniques:** Lossless compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, **Models:** Physical models, Probability models, Markov models, composite source model, **Coding:** uniquely decodable codes, Prefix codes.
UNIT II (10 Hours) **The Huffman coding algorithm:** Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, **Applications of Hoffman coding:** Lossless image compression, Text compression, Audio Compression.
UNIT III (10 Hours) **Arithmetic Coding:** Introduction, Coding a Sequence, Generating a Tag, Deciphering the Tag, Generating a Binary Code, Uniqueness and Efficiency of the Arithmetic Code, Algorithm Implementation, Integer Implementation, Comparison of Huffman and Arithmetic Coding, Adaptive Arithmetic Coding
UNIT IV(12 Hours) Bi-level image compression-The JBIG standard, JBIG2, Image compression. **Dictionary Techniques:** Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary, The LZ77 Approach, The LZ78 Approach, **Applications**: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Moveto-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markov Compression.
UNIT V (6 Hours) Mathematical Preliminaries for Lossy Coding, Distortion criteria, Models, The Quantization Problem, Uniform Quantizer, Adaptive Quantization, Forward Adaptive Quantization, Backward Adaptive Quantization, Nonuniform Quantization

UNIT VI (4 Hours)

Vector Quantization, Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.

Text and Reference Books

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression,Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition, KhalidSayood,The Morgan aufmannSeries
4.Data Compression: The Complete Reference 4th Edition byDavid Salomon, Springer
5.Text Compression 1st Edition by Timothy C. Bell Prentice Hall

Course Outcomes:

On completion of this course, the students will be able to:

1. Understand and apply various coding techniques for data compression.
2. Differentiate between lossy and lossless compression.
3. Program, Analyze Huffman coding: Loss less image compression, Text compression, Audio Compression.
4. Demonstrate conceptually various popular algorithms used for text, image and video compression.
5. Compare the algorithms used for text, image and video compression.
6. Illustrate the concept of vector quantization and its advantage.