

# **GUJARAT TECHNOLOGICAL UNIVERSITY**

## **MASTER OF COMPUTER APPLICATIONS (MCA)**

### **Semester: IV**

**Subject Name: Elective I – Data Compression (DC2)**

**Subject Code: 640007**

---

#### **Learning Objectives:**

- ✓ To be able to perform compression using various algorithm and decompress the data.
- ✓ To be able to measure the loss of data if compression is lossy.

**Prerequisites:** Knowledge of C programming

#### **Contents:**

- 1. Introduction To Data Compression (1 Lect.)**  
The Audience, Why C?, Which C?, Keeping Score, The Structure
- 2. The Data Compression Lexicon, With A History (2 Lect.)**  
The Two Kingdoms, Data Compression = Modeling + Coding, The Dawn Age, Coding An Improvement Modeling, Statistical Modeling, Ziv & Lempel LZ77 LZ78, Lossy Compression, Programs to Know
- 3. The Dawn Age: Minimum Redundancy Coding (4 Lect.)**  
The Sahnnon-Fano Algorithm, The Huffman Algorithm, Huffman in C, BITIO.C, A Reminder about Prototypes, MAIN-C.C & MAIN-E.C, MAIN-C.C, ERRHAND.C, Into the Huffman Code, Counting the Symbols, Saving the Counts, Building the Tree, Using the Tree
- 4. A Significant Improvement: Adaptive Huffman Coding (4 Lect.)**  
Adaptive Coding, Updating the Huffman Tree, What swapping Does, The Algorithm, An Enhancement, The Escape Code, The Overflow Bonus, A Rescaling Bonus, The Code, Initialization of the Array, The Compress Main Program, The Expand Main Program, Encoding the Symbol, Decoding The Symbol
- 5. Huffman One Better: Arithmetic Coding (2 Lect.)**  
Difficulties, Arithmetic Coding: A Step Forward, Practical Matters, A Complication, Decoding, Where's the Beef
- 6. Dictionary-Based Compression (3 Lect.)**  
An Example, Static vs. Adaptive, Adaptive Methods
- 7. Sliding Window Compression (5 Lect.)**  
The Algorithm, Problems with LZ77, An Encoding Problem, LZSS compression, Data structures, A balancing Act Greedy vs. Best Possible, The Expansion Routine, Improvements.

### 8. LZ78 Compression

(5 Lect.)

Can LZ77 improve?, Enter LZ78, LZ78 Details, An Effective Variant Decompression, The Catch, LZW Implementation, Tree Maintenance and Navigation Compression, Decompression

### 9. Speech Compression

(7 Lect.)

Digital Audio Concepts, Fundamentals, Sampling Variables, PC-Based sound, Lossless Compression of Sound, Problems and Results, Loss compression, Silence Compression, Other Techniques

### 10. Lossy Graphics Compression

(10 Lect.)

Enter Compression, Statistical And Dictionary Compression Methods, Lossy Compression Differential Modulation Adaptive Coding, A Standard That Works: JPEG, JPEG Compression, The Discrete Cosine Transform, DCT Specifics, Why Bother?, Implementing The DCT, Matrix Multiplication, Continued Improvements, Output Of The DCT, Quantization, Selecting A Quantization Matrix, The Sample Program, Input Format, Initialization, The Forward DCT Routine, Write DCT Data(), File Expansion, Read DCT Data(), The Inverse DCT

### Text Books:

- ✓ Mark Nelson, Jean-Loup Gailly, “Data Compression Book”, 2<sup>nd</sup> Edition, BPB

### Other Reference Books:

1. Khalid Shayood, “Introduction to Data Compression”, 3<sup>rd</sup> Edition, Morgan Kaufmann Publishers
2. David Saloman, “Data Compression : The Complete Reference”, Springer

### Chapter wise Coverage from the Text Books:

| Book | Chapters                                                                                                                                                                                     |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | 1, 2, 3 (upto page no. 59), 4, 5 (upto page no. 122), 7 (upto page no. 204), 8 (upto page no. 227 & 242 to 244), 9 (upto page no. 259 & 262 to 273), 10, 11 (upto page no. 340 & 345 to 356) |