

Subject Name: Data Compression

Subject Code: IT 702

Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					Total
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
04	00	02	06	5	3	70	30	20	30	150

Learning Objectives:

The main objectives for offering the course Data Compression are:

- To introduce students to basic applications, concepts, and techniques of Data Compression.
- To develop skills for using recent data compression software to solve practical problems in a variety of disciplines.
- To gain experience doing independent study and research.

Outline of the Course:

Sr. No	Title of the Unit	Minimum Hours
1	Introduction, Mathematical Preliminaries	10
2	Simple lossless encoding, Run length encoding	10
3	Fundamentals of Information Theory	10
4	Lossless Compression standards	10
5	Image & Video compression, Real world applications	10
6	Wavelet based compression	10

Total hours (Theory): 60

Total hours (Lab): 30

Total hours: 90

Detailed Syllabus

Sr. No	Topic	Lecture Hours	Weight age(%)
1	Introduction Mathematical Preliminaries, Lossy and Lossless compression, Application of compression	10	20
2	Simple lossless encoding, Run length encoding Huffman coding, LZW coding, Run length encoding, Arithmetic coding	10	16
3	Fundamentals of Information Theory Concepts of entropy, probability models, markov models, Fundamentals of coding theory, Algorithmic information theory & Minimum description,	10	16
4	Lossless Compression standards zip, gzip, bzip, unix compress, GIF, JBIG.	10	16
5	Image & Video compression Basis functions and transforms from an intuitive point, JPEG, MPEG, Vector Quantization, case study of WinZip, WinRar	10	16
6	Wavelet based compression Fundamentals of wavelets, Various standard wavelet bases, Multi resolution analysis and scaling function, JPEG 2000	10	16
	Total	60	100

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Students will be able to understand important of data compression
- Student will be able to develop a reasonably sophisticated data compression application.
- Student is able to select methods and techniques appropriate for the task
- Student is able to develop the methods and tools for the given task

Text Books:

- Introduction to Data Compression, 3rd Edition, Khalid Sayood, Morgan Kauffman

List of experiments:

Sr. No	Name of Experiment
1	Write a program to count the occurrences of different letters by reading the given text file and also find the probability of each letter with number of bits required for them using the formula: $No. \text{ of bits} = 1/\log_2 prob_i$
2	Write a Program to check whether the given code is prefix or not.
3	Write a program to determine whether the set of given codes is uniquely decodable or not.
4	Write a program to implement Shannon-Fano Compression Algorithm
5	Write a program to compress and decompress the given input string
6	Write a program to implement Arithmetic Coding Compression and Decompression Algorithm
7	Write a program to implement a Huffman Coding
8	Write a program to implement LZ77 and LZ78 algorithm.
9	Write a program to implement LZSS algorithm
10	Speech Compression.
11	JPEG Compression.
12	Write a program in C/C++ to read the Binary Bitmap File (.BMP) (monochrome image) and compress the using Run Length Coding and save to a file .also write a program to decompress the compressed file and recover the Binary Image File.