Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Third Year Bachelor of Engineering (Information Technology)

(In Effect From Academic Year 2019-20)

Subject Code: IT603-N	Subject Title: Data Compression
Pre-requisite	

Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
03	00	02	05	04	03	70	30	20	30	150

Course Objective:

- 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	Compression Techniques	2
2	Mathematical Preliminaries for Lossless Compression Models	7
3	Huffman Coding	10
4	Arithmetic Coding	5
5	Dictionary Techniques	7
6	Context-Based Compression	7
7	Lossless Image Compression	5
8	Quantization	5

Total hours (Theory): 48
Total hours (Lab): 32
Total hours: 80

Detailed Syllabus

Sr. No	Topic	Lecture Hours	Weightage (%)
1	**Compression Techniques:** Lossless Compression, Lossy Compression, Measures of Performance	2	5
2	**Mathematical Preliminaries for Lossless Compression Models:** Physical Models, Probability Models, Markov Models, Composite Source Model, Coding Uniquely Decodable Codes, Prefix Codes, Algorithmic Information Theory, Minimum Description Length Principle Strings.	7	15
3	**Huffman Coding:** The Shannon Fano Coding, The Huffman Coding Algorithm, Minimum Variance Huffman Codes, Adaptive Huffman Coding, Application of Huffman Coding.	10	20
4	**Arithmetic Coding:** Overview, Introduction, Coding a Sequence, Generating a Binary Code, Comparison of Huffman and Arithmetic Coding,	5	10
5	**Dictionary Techniques:** Overview, Introduction, Static Dictionary, Adaptive Dictionary (LZ77, LZ78), LZW.	7	15
6	**Context-Based Compression:** Overview, Introduction, Prediction with Partial Match (*ppm*), Dynamic Markov Compression.	7	15
7	**Lossless Image Compression:** Overview, Introduction, CALIC, JPEG-LS, Multi resolution Approaches, Facsimile Encoding,	5	10
8	**Quantization:** The Quantization Problem, Scalar Quantization, Vector Quantization, Discrete Cosine Transform.	5	10
	Total	48	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 needs more focus on numerical examples based on exercises at the end of each chapter to aware of algorithm and theorem more precisely.

Learning Outcome:

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

e-Resources:
https://nptel.ac.in/courses/106102064/19

Reference Books:
1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. The Data Compression Book by Mark Nelson and Jean-Loup Gaily
3. David Saloman, Data Compression : The Complete Reference, Springer

List of Experiments:

Sr. No.	Name of Experiment
1.	Write a Program to check whether the given code is prefix or not.
2.	Write a program to determine whether the set of given codes is uniquely decodable or not.
3.	Write a program to implement Shannon-Fano Compression Algorithm
4.	Write a program to implement Huffman Coding Compression Algorithm
5.	Write a program to implement Arithmetic Coding Compression Algorithm
6.	Write a program to compress and decompress the given input string
7.	Write a program to implement LZ77 Compression Algorithm
8.	Write a program to implement LZ77 Decompression Algorithm
9.	Write a program to implement LZ78 Compression Algorithm
10.	Write a program to implement LZ78 Decompression Algorithm
11.	Write a program to implement LZW Compression Algorithm
12.	Write a program to implement LZW Decompression Algorithm