

|                              |                                                                      |
|------------------------------|----------------------------------------------------------------------|
| <b>Branch Name:</b>          | Signal Processing and Communication                                  |
| <b>Program Code:</b>         | ET214                                                                |
| <b>Course Name:</b>          | Signal Compression                                                   |
| <b>Course Code:</b>          | 2ET2140302T                                                          |
| <b>Pre-requisite Course:</b> | Knowledge of basic image processing, linear algebra ,vector calculus |

### Course Objectives:

1. The goal of digital signal compression is to compute various techniques and standards used for compression of data, image and video.
2. Acquire a solid understanding of Audio and Video Compression.
3. Understanding of Various encoding technique for audio and image.

### Teaching and Examination Scheme:

| Credit | Teaching Scheme<br>Hours per week |   |   |       | Evaluation Scheme (Marks) |      |      |      |                   |      |      |      | Total<br>(Marks) |
|--------|-----------------------------------|---|---|-------|---------------------------|------|------|------|-------------------|------|------|------|------------------|
|        |                                   |   |   |       | Theory (Marks)            |      |      |      | Practical (Marks) |      |      |      |                  |
|        | L                                 | T | P | Total | SEE                       |      | CCA  |      | SEE               |      | CCA  |      |                  |
|        |                                   |   |   |       | Min.                      | Max. | Min. | Max. | Min.              | Max. | Min. | Max. |                  |
| 3      | 3                                 | - | - | 3     | 24                        | 60   | 16   | 40   | -                 | -    | -    | -    | 100              |

### Course Contents:

| Sr.<br>No | Topic                                                                                                                                                                                                                                                                              | Total<br>Hours | Weight<br>(%) |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------|
| 1         | <b>Differential Encoding:</b><br>Basic algorithm, Prediction in DPCM, Adaptive DPCM, Delta Modulation, Speech coding–G.726, Image coding.                                                                                                                                          | 5              | 13            |
| 2         | <b>Transform Coding:</b><br>Transforms–KLT, DCT, DST, DWHT; Quantization and coding of transform Coefficients, Application to Image compression–JPEG, Application to audiocompression.                                                                                             | 5              | 16            |
| 3         | <b>Sub-band Coding:</b><br>Filters, Sub-band coding algorithm, Design of filter banks, Perfect reconstruction using two channel filter banks, M-band QMF filter banks, Poly- phase decomposition, Bit allocation, Speech coding–G.722, Audiocoding– MPEG audio, Image compression. | 8              | 20            |
| 4         | <b>Wavelet Based Compression:</b><br>Wavelets, Multi resolution analysis & scaling function, Implementation using filters, Image compression–EZW, SPIHT, JPEG2000.                                                                                                                 | 6              | 16            |
| 5         | <b>Analysis/ Synthesis Schemes:</b><br>Speech compression– LPC-10, CELP, MELP, Image Compression– Fractalcompression.                                                                                                                                                              | 6              | 13            |
| 6         | <b>Video Compression:</b><br>Motion compensation, Video signal representation, Algorithms for video Conferencing & video phones–H.261, H.263, Asymmetric applications– MPEG1, MPEG2, MPEG4, MPEG7, Packet video.                                                                   | 6              | 16            |
| 7         | <b>Compressive sensing:</b><br>Introduction, application of compressive sensing for signal compression                                                                                                                                                                             | 3              | 6             |

**List of Reference Books:**

1. K.Sayood, "Introduction to Data Compression", Harcourt India Pvt. Ltd. & Morgan Kaufmann Publishers, 1996.
2. N. Jayant and P. Noll, "Digital Coding of Waveforms: Principles and Applications to Speech and Video", Prentice Hall, USA, 1984.
3. D.Salomon, "Data Compression: The Complete Reference", Springer, 2000.

**Course Learning Outcomes (CLO): On completion of this course, the students will be able to:**

| CLO  | Description                                                                              | Bloom's Taxonomy Level           |
|------|------------------------------------------------------------------------------------------|----------------------------------|
| CLO1 | Understand classification/ types of compression techniques.                              | 1 Remembering<br>2 Understanding |
| CLO2 | Acquire Knowledge of Transform Coding and its Application to audio compression.          | 2 Understanding<br>3 Applying    |
| CLO3 | Analyze various existing standards for the compression of data, image and video.         | 4 Analyze                        |
| CLO4 | Understand Various method of Wavelet based Compression and Implementation using filters. | 5 Evaluate<br>6 Create           |
| CLO5 | Analysis and Synthesis of Speech Compression Technique.                                  | 4 Analyze                        |
| CLO6 | Acquire knowledge of Video compression and its Asymmetrical Application.                 | 2 Understanding<br>3 Applying    |

**Mapping of CLOs with POs & PSOs:**

| Course Learning Outcomes | Program Outcomes (POs) |     |     |     |     |     |     |     |     |      |      |      | Program Specific Outcomes(PSOs) |      |      |      |
|--------------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|---------------------------------|------|------|------|
|                          | PO1                    | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1                            | PSO2 | PSO3 | PSO4 |
| CLO1                     |                        |     |     |     | L   | M   |     |     |     |      |      | H    | H                               | M    | L    |      |
| CLO2                     |                        | H   | M   | M   | L   |     |     |     |     | L    |      | H    |                                 | M    | L    |      |
| CLO3                     |                        | M   | H   |     | L   |     |     |     |     |      |      |      |                                 | H    |      | L    |
| CLO4                     |                        | M   | H   |     | L   |     |     | L   |     |      |      |      | L                               |      | M    | H    |
| CLO5                     | H                      | M   | H   |     | L   |     |     |     | L   |      |      | H    | L                               |      | M    | H    |
| CLO6                     | H                      | M   | H   |     | L   |     |     |     |     |      |      | M    | L                               |      | M    | H    |

H: High, M: Medium, L: Low