SUBJECT DESCRIPTION FORM

Subject Title: Image and Audio Processing  Subject Code: EIE435

Number of Credits: 3  Hours Assigned: Lecture/tutorial 42 hours
          Laboratory 9 hours

Pre-requisite: Linear Systems (EIE312)  Co-requisite: Nil  Exclusion: Nil

Objectives:

To provide a broad treatment of the fundamentals image and audio processing.

Student Learning Outcomes:

1. To understand the fundamentals of image and audio signal processing and associated techniques.
2. To be able to solve practical problems with some basic image and audio signal processing techniques.
3. To be able to design simple systems for realizing some multimedia applications with some basic image and audio signal processing techniques.

Syllabus:

1. Image processing
   1.1 Fundamentals of digital image: Digital image representation and visual perception, image sampling and quantization.
   1.2 Image enhancement: Histogram processing; Median filtering; Low-pass filtering; High-pass filtering; Spatial filtering; Linear interpolation, Zooming.
   1.3 Image coding and compression techniques: Scalar and vector quantizations; Codeword assignment; Entropy coding; Transform image coding; Wavelet coding; Codec examples.
   1.4 Image analysis and segmentation: Feature extraction; Histogram; Edge detection; Thresholding.
   1.5 Image representation and description: Boundary descriptor; Chaincode; Fourier descriptor; Skeletonizing; Texture descriptor; Moments.

2. Audio processing
   2.1 Fundamentals of digital audio: Sampling; Dithering; Quantization; psychoacoustic model.
   2.2 Basic digital audio processing techniques: Anti-aliasing filtering; Oversampling; Analog-to-digital conversion; Dithering; Noise shaping; Digital-to-analog Conversion; Equalisation.
   2.3 Digital Audio compression: Critical bands; threshold of hearing; Amplitude masking; Temporal masking; Waveform coding; Perceptual coding; Coding techniques: Subband coding and Transform coding.
2.4 Case Study of Audio System/Codecs: MP3; MP3-Pro; CD; MD; DVD-Audio; AC-3; Dolby digital; Surround; SRS Surround system; Digital Audio Broadcasting, etc.

Laboratory Experiments:

1. Image processing techniques
2. Image compression
3. Audio compression
4. Psychoacoustic behavior

Method of Assessment:

Continuous assessment: 40%  
Examination: 60%

The continuous assessment will consist of a number of assignments, laboratory reports, and two tests.

Textbooks:


Reference books: