Elective Courses

Course Title: Image Processing (3 Cr.)
Course Code: CACS404
Year/Semester: IV/VII
Class Load: 5 Hrs. / Week (Theory: 3Hrs. Practical: 2Hrs.)

Course Description
This course presents introduction to several topics on image processing techniques and their applications. It also explores the students to real-world applications of image processing.

Course objectives
Upon completion of this course, students should be able to 1. Explain the basic concepts of digital image processing and various image transforms. 2. Develop a broad range of image processing techniques and their applications. 3. To familiarize the with the image enhancement, image restoration and image segmentation techniques.

Course Contents

Hours

Unit 1: Fundamental of Image processing
Image representation, basic relationship between pixels, elements of DIP system, elements of visual perception-simple image formation model, Sampling and Quantization, Color fundamentals and models, File Formats, Image operations. Brightness, contrast, hue, saturation, Mach band effect

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Unit 2: Image Enhancement
Image Transforms, Fourier Transform and Discrete Fourier Transform, Fast Fourier Transform. Cosine Transform, Frequency domain image enhancement, low pass filtering, high pass filtering, homomorphic filter, Gaussian filter

Spatial domain image enhancement, point processing, contrast stretching, clipping and thresholding, digital negative, intensity level slicing. Histogram processing: equalization, modification, Spatial filtering – averaging, Smoothing and sharpening, median filtering, spatial low, high and band pass filters

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Unit 3: Image Restoration:
Image Restoration - Image degradation model - Noise modeling – Blur, Inverse filtering- removal of blur caused by uniform linear motion, Weiner filtering, Morphological operation, erosion and dilation,

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Unit4: Image coding and compression
Need for compression, redundancy, pixel coding, run length coding, Huffmancoding, Elements of information theory, Error free compression, Lossy compression, Image compression standards- JPEG& MPEG, wavelet based image compression.

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Unit 5: Image segmentation and feature extraction
Image Segmentation: Thresholding, Region based segmentation, edges, line and curve detection, edge operators, Image Features and Extraction ,Types

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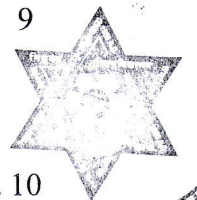
of features, feature extraction , Texture , Feature reduction algorithms, Image classification, clustering techniques,
Case Studies in Image Security, Steganography and Digital watermarking,
Visual effects, Case studies in Medical Imaging and remote sensing.

Evaluation

Evaluation Scheme				
Internal Assessment		External Assessment		Total
Theory	Practical	Theory	Practical	
20	20 (3 Hrs.)	60 (3 Hrs.)	-	100

Laboratory Work

Laboratory work should be done covering all the topics listed above and a small project work should be carried out using the concept learnt in this course using software like matlab, python.

Text Books:

1. Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009.
2. S.Sridhar, Digital Image Processing, Oxford University Press, 2011

Reference Books:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing, Analysis and Machine Vision, Second Edition, Thompson Learning, 2007