## 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**<br>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 | 8 |
| **Unit 2: Image Enhancement**<br>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<br>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 | 12 |
| **Unit 3: Image Restoration**:<br>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, | 9 |
| **Unit4: Image coding and compression**<br>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. | 9 |
| **Unit 5: Image segmentation and feature extraction**<br>Image Segmentation: Thresholding, Region based segmentation, edges, line and curve detection, edge operators, Image Features and Extraction ,Types | 10 |

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 | 100 |
| 20 | 20 (3 Hrs.) | 60 (3 Hrs.) | - | |

**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