**3/3 MCA First Semester**

**CA5T3C** **IMAGE PROCESSING** **Credits : 4**

Lecture Hours : 4 periods / week Internal assessment : 30 Marks

Semester and Examination: 70 Marks

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**Course Description:**

Visual information plays an important role in many aspects of our life. Much of this information is represented by digital images. Digital image processing is ubiquitous, with applications including television, tomography, photography, printing, robot perception, and remote sensing. It emphasizes general principles of image processing, rather than specific applications. We expect to cover the following topics: image acquisition and display, color representations, image sampling and quantization, point operations, linear image filtering and correlation, image transforms and sub-band decompositions, contrast and color enhancement, image restoration, and image compression.

**Course Objectives:**

- At the end of the course the student should have a clear impression of the breadth and practical scope of digital image processing and have arrived at a level of understanding that is the foundation for most of the work currently underway in this field.
- Implement basic image processing algorithms using different tools such as MATLAB, Java, Octave/Scilab and other open source tools.
- Explore advanced topics of Digital Image Processing.
- Make a positive professional contribution in the field of Digital Image Processing

**UNIT-I:**

**Introduction:** Origin of Digital Image Processing, Fundamentals in Steps in Digital Image Processing, Components of an Image Processing System, Digital Image Fundamentals**-**Introduction, Image Sensing and Acquisition, Image Sampling and quantization, Some basic relations between pixels, Linear and Non-Linear Operations.

**UNIT-II:**

**Image Transformations:** Introduction to fourier Transforms, the descrete fourier transform, some properties of the 2D-fourier transform, the fast fourier transform, other separate image transform-walsh and hough.

**UNIT-III:**

**Image Enhancement:** Background- Spatial Domain Method, Frequency Domain Models, Grey level Transformations, Histogram Processing, Enhancement using arithmetic operators, Image Smoothening-Neighborhood averaging median Filters, Lowpass Filters, Highpass Filters

**UNIT-IV:**

**Image Restoration:** Introduction, Degradation Model, Noisy Models, Degradation Models for Continuous Functions, Invariant Degredations, Inverse Filtering, Constrained Least Squares Filtering, Geometric Transformations.

**UNIT-V:**

**Color Image Processing:** Fundamentals, Color Models, Pseudo Color Image Processing, Color Transformations, Smoothening and Sharpening, Color Segmentation.

**UNIT-VI:**

**Image Compression:** Fundamentals, Compression Models, Statistical Compression, Spatial Compression, Contour Coding, Quantizing Compression.

**UNIT-VII:**

**Morphological Image Processing**: Preliminaries, Dilation and Erosion, Opening and Closed Operations, Morphological Transformations, Some Basic Morphological Algorithms,

**UNIT VIII:**

**Image Encoding:** Introduction, The Encoding Process, Image Segmentation- The Deduction of discontinuities, Edge linking and Boundary Detection, Thresholding, Region-Based Segmentation.

## Learning Resources

**Text Books:**


1. Digital Image Processing, Rafael C. Gonzalez, Richard E. Woods, 2/e, 2002.
2. Fundamentals of Digital Image Processing, A.K Jain, Prentice Hall India, 2/e, 2007.


**Reference Books:**


1. Digital Image Proceessing using MATLAB, Rafael C. Gonzalez, Richard E. Woods, and Steven L. Eddins, Pearson Education, 2/e, 2007.
2. Digital Image Processing, An Algorithm Introduction using Java, Wilhelm Burger and Mark J.Burge, Springer, 1/e, 2008.
3. Digital Image Processing, William K. Pratt, Pearson Education, 3/e, 2004.
4. Image Processing Analysis and Machine Vision, Millan Sonka, Vaclav Hlavac, Rogar Boyle, Thomson Learning, 2/e, 2001.