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| **ECx524** | **Digital Image Processing** | **L-T-P: 3-0-0; Credit: 3; Total 42 Lectures** |

***Prerequisites:***(i) Digital Signal Processing, (ii) Signals and Systems and (iii) Linear Algebra

***Objectives:***

1. To introduce the origin and formation of digital imaging.
2. To develop the understanding of different types of imaging techniques for different purposes.
3. To equip the students with various possible applications of the image analysis.

***Topics Covered:***

1. **Digital Image Fundamentals:** Image modeling, Sampling and Quantization, Imaging Geometry, Digital Geometry, Image Acquisition Systems, Different types of digital images.
2. **Bi-level Image Processing:** Basic concepts of digital distances, distance transform, medial axis transform, component labeling, Histogram of grey level images, Optimal thresh holding.
3. **Images Enhancement:** Point processing, enhancement in spatial domain, enhancement in frequency domain.
4. **Detection of edges and lines in 2D images:** First order and second order edge operators, multi-scale edge detection, Canny's edge detection algorithm, Hough transform for detecting lines and curves.
5. **Color Image Processing:** Color Representation, Laws of color matching, chromaticity diagram, color enhancement, color image segmentation, color edge detection.
6. **Image compression:** Lossy and lossless compression schemes, prediction based compression schemes, vector quantization, sub-band encoding schemes, JPEG compression standard.
7. **Segmentation:** Segmentation of grey level images, Watershed algorithm for segmenting grey level image.
8. **Morphology:** Dilation, erosion, opening, closing, hit and miss transform, thinning, extension to grey scale morphology.
9. **Feature Detection:** Fourier descriptors, shape features, object matching/features.

***Texts Books:***

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, Pearson Education, 2008.
2. A. K. Jain, Fundamentals of Digital Image processing, Pearson Education, 2009.

***References Books:***

1. W. K. Pratt, Digital Image Processing, John Wiley & Sons, 2006.
2. S.J. Solari, Digital Video and Audio Compression, McGraw-Hill, 1997

***Course Outcome:***

1. Ability to enhance image in spatial and frequency domain.
2. Ability to implement various aspects of image segmentation and compression.