### DA-IICT

**IE4XX – Digital Image Processing**

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<tr>
<td><strong>1. Course Title</strong></td>
<td>Digital Image Processing</td>
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| **2. Credit Structure** | Lecture hours per week: 3  
Tutorial hours per week: 0  
Practical hours per week: 2  
Total Credits: 4 |
| **3. Course Code** | IE4XX |
| **4. Program/Semester** | B Tech (ICT and CS) SEM VII |
| **5. Category** | ICT Elective |
| **6. Prerequisite Courses** | Programming Experience |
| **7. Course Description** | This course is an introduction to the fundamental concepts and techniques in basic digital image processing and their applications to solve real life problems. The topics covered include Digital Image Fundamentals, Image Transforms, Image Enhancement, Restoration and Compression, Morphological Image Processing, Nonlinear Image Processing, and Image Analysis. Application examples are also included. Upon completion of this course, students will be familiar with basic image processing techniques for solving real problems. Student will also have sufficient expertise in both the theory of two-dimensional signal processing and its wide range of applications, for example, image restoration, image compression, and image analysis. |
**Detailed Course Contents**

**Introduction and Digital Image Fundamentals**
Digital Image Fundamentals, Human visual system, Image as a 2D data, Image representation – Gray scale and Color images, image sampling and quantization

**Image enhancement in Spatial domain:**
Basic gray level Transformations, Histogram Processing Techniques, Spatial Filtering, Low pass filtering, High pass filtering

**Filtering in the Frequency Domain:**
Preliminary Concepts, Extension to functions of two variables, Image Smoothing, Image Sharpening, Homomorphic filtering

**Image Restoration and Reconstruction:**
Noise Models, Noise Reduction, Inverse Filtering, MMSE (Wiener) Filtering

**Color Image Processing:**
Color Fundamentals, Color Models, Pseudo color image processing

**Image Compression:**
Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, LZW coding, JPEG Compression standard

**Morphological Image Processing:**
Erosion, dilation, opening, closing, Basic Morphological Algorithms: hole filling, connected components, thinning, skeletons

**Image Segmentation:**
point, line and edge detection, Thresholding, Regions Based segmentation, Edge linking and boundary detection, Hough transform

**Object Recognition and Case studies**
Object Recognition- patterns and pattern classes, recognition based on decision – theoretic methods, structural methods, case studies – image analysis.

Application of Image processing in process industries

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**Grading Policy**

Classroom attendance and participation: 10 %

Two to Three assignments (assignment evaluation will be performed in lab): 25%

- 2nd In-Sem Exam: 25%
- Final Exam: 40 %