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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code**  **20CSY/20ITY-310** | **Fundamentals of Image Processing: NTPP** | | | **L** | **T** | **P** | **S** | **C** | |
| **Total Contact Hours : 45 Hours** | | | **3** | **0** | **0** | **0** | **3** | |
|  | | | | | | | | |
| **Pre-requisites:** | **Digital Signal Processing, Transform techniques – 22ECH-101, 22,** | | | | | | | | |
| **Co-requisites** | **Digital Image Processing 22CSH-311,22CSH-256,22CST-251** | | | | | | | | |
| **Anti-Requisites** | **Video Processing- 22CST-3\*\*** | | | | | | | | |
| **Marks-100** | | | | | | | | |
| Internal-40 | | | External-60 | | | | | |
| **Course Objectives** | | | | | | | | |
| 1. Provide the student with the fundamentals of digital image processing. 2. Give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions. 3. Introduce the students to some advanced topics in digital image processing. 4. Give the students a useful skill base that would allow them to carry out further study should they be interested and to work in the field. | | | | | | | | |
| **Course Outcomes** | | | | | | | | |
| CO-1 | | Understand image formation and the role human visual system plays in perception of gray and color image data. | | | | | | |
| CO-2 | | Get broad exposure to and understanding of various applications of image processing in industry, medicine, and defense. | | | | | | |
| CO-3 | | Learn the signal processing algorithms and techniques in image enhancement and image restoration. | | | | | | |
| CO-4 | | Acquire an appreciation for the image processing issues and techniques and be able to apply these techniques to real world problems. | | | | | | |
| CO-5 | | Be able to conduct independent study and analysis of image processing problems and techniques | | | | | | |

**c. Syllabus**

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| --- | --- |
| **Unit-1** | **Contact Hours:15** |
| **Chapter-1(Fundamentals)**  Introduction, Origin, Areas of Image Processing, steps in Digital Image Processing, Components of Image Processing System, Image Sensing, Sampling and Quantization, Neighboring of Pixels, human visual system model, image signal representation, imaging system specification building image quality, role of computers, image date formats. | |
| **Unit-2** | **Contact Hours:15** |
| **Chapter -2(Image Enhancement and Restoration)**  Enhancement: Spatial Filtering, Introduction to Fourier Transformation, Restoration: A model of the Image Degradation/ Restoration Process.  **Chapter -3(Hardware architecture for image processing)**  Color image signal representation, color system transformations, extension of processing techniques to color domain.  **Chapter -3 (Wavelets)**  Wavelet functions, Wavelet transformations in one and two dimensions, fast wavelet transform. | |
| **Unit-3** | **Contact Hours:15** |
| **Chapter -4 (**Image Compression)  Image compression models, Error free compression, Lossy compression. Image segmentation: Line detection, Edge Detection, Edge linking and Boundary Detection, and Region-based segmentation  **Chapter -5 (**Object Recognition)  Pattern and pattern classes, Recognition based on Decision Theoretic Methods, Structural Methods.  **Chapter -6 (**Applications of Image processing)  Picture data archival, machine vision, medical image processing. | |

**TEXT BOOKS**

1. Gonzalez, R.C., and Woods, R.E., Digital Image Processing, Dorling Kingsley (2009) 3rd ed.
2. Jain A.K., Fundamentals of Digital Image Processing, Prentice Hall (2007).
3. Sonka M., Image Processing and Machine Vision, Prentice Hall (2007) 3rd ed.
4. D. Forsyth and J. Ponce, Computer Vision - A modern approach, Prentice Hall.
5. E. Trucco and A. Verri, Introductory Techniques for 3D Computer Vision, Prentice Hall.
6. Richard Szeliski, Computer Vision: Algos and Applications, Springer.

**REFERENCE BOOKS**

1. Tekalp A.M., Digital Video Processing, Prentice Hall (2015).

2. Ghanbari M., Standard Codecs: Image Compression to Advanced Video Coding, IET Press (2003).

# Mode of Evaluation: The performance of students is evaluated as follows:

|  |  |  |
| --- | --- | --- |
|  | **Theory** | |
| **Components** | **Continuous Internal Assessment (CAE)** | **Semester End Examination (SEE)** |
| **Marks** | **40** | **60** |
| **Total Marks** | **100** | |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | -- | – | 3 | – | – | – | – | – | – | – | – | – | – | - |
| **CO2** | 3 | – | – | – | – | – | -- | – | – | – | – | – | – | – |
| **CO3** | -- | 3 | - | – | -- | – | – | -- | – | – | – | – | – | – |
| **CO4** | -- | -- | -- | – | – | – | – | - | -- | – | – | 3 | – | -- |
| **CO5** | --- | -- | -- | -- | 3 | – | – | – | – | – | – | – | – | - |