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EC543 - DIGITAL IMAGE & VIDEO PROCESSING (Elective I)

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Course Objectives:

- By taking this course, learners will learn proper image representation, enhancement, filtering, restoration, analysis, reconstruction from projection.
- This course will build proficiency in terms of Understanding the mathematical and signal principles forming the basis for methods of image processing.
- By taking this course, students will learn advanced digital image processing techniques, including various image transformations, image reconstruction from incomplete information, image segmentation and recognition.
- Understand the fundamentals of digital video processing.
- Understand the basic principles and techniques for motion analysis.
- Understand the basic principles and techniques for video filtering, noise reduction, interpolation, deinterlacing, and superresolution.
- Understand the basic video processing techniques for compression and communication
- Apply the acquired knowledge to specific video processing related problems and projects at work.

Course Learning Outcomes:

- A learner will be able to apply knowledge of modeling, designing, and developing and prototyping methods of image processing for various engineering applications.
- A course learner will get know- how to Implement basic image processing algorithms using different tools such as MATLAB
- A learner will gain a competency like spatial filtering techniques, including linear and nonlinear methods can be thought.
- A student earns ability to interpret and analyze 2D signals in the frequency domain through the Fourier transforms.

. In the global scenario, sharing the knowledge is the need to reach to solution. In this rapid technology growing era, expertise of individuals and opportunities available in providing solutions are clubbed together across the globe, hence global, economic and social dimensions have been fulfilled.

- A learner will always feel a need to learn, conduct independent study and analysis of image processing problems and techniques tool developments in the domain.
- 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.
- Possess advanced knowledge within the area of media technology, with emphasis on representing, analyzing, compressing and processing video.
- Be able to use relevant and suitable methods when carrying out further research and development activities in the area of video analyzes
- Be able to critically review relevant literature when solving the assigned problem or topic
- Be able to give a presentation and demo about their findings

UNIT - I (9 hours) Fundamentals steps of Image processing: Components of an Image processing system, Image sampling and quantization, relationship between the pixels. Gray level transformation, Histogram processing, Smoothing and sharpening spatial filters, Smoothing and sharpening frequency domain filters.

UNIT - II (7 hours) Image compression and segmentation: Compression models, Error free coding, lossy coding, compression standards. Image segmentation: Edge linking and boundary detection, Thresholding, Region based segmentation.

UNIT - III (9 hours)

Video Representation : Video formation, perception and representation: Color perception and specification, Video capture and display, Analog video raster, Analog color TV systems, Digital VideoVideo Sampling: Basics of lattice theory, sampling over lattice, Sampling of video signals, filtering operations, Conversion of signals sampled on different lattices, Sampling rate conversion of video signals.

UNIT - IV (9 hours) Video Modeling: Camera model, illumination model, object model. Scene model, Two dimensional motion models 2-D motion estimation: Optical flow, General methodologies, Pixel based motion estimation, Block matching algorithm, Mesh-based motion estimation, Global motion estimation. Application of motion estimation in video coding

UNIT - V (7 hours) Video Coding: Information theory, Binary encoding, Scalar quantization, Vector quantization, Waveform based video coding: Block based transform coding, Predictive coding, Object based scalability, Wavelet Transform based coding

TEXT BOOKS:

1.Digital Image processing – Gonzaleze and woods2.
2.Video processing and communication – Yao Wang, Joern Ostermann and Ya-Qin Zhang, Prentice Hall3.

REFERENCES:

1.Digital video processing – M. Tekalp.
2.Handbook of Image and Video Processing - Alan C. Bovik