MEDICAL IMAGE PROCESSING

OBJECTIVES:
To study the image fundamentals and image transforms
To study the image enhancement techniques
To study the image restoration procedures
To study the image compression procedures

UNIT I IMAGE FUNDAMENTALS Image perception, MTF of the visual system, Image fidelity criteria, Image model, Image sampling and quantization – two dimensional sampling theory, Image quantization, Optimum mean square quantizer, Image transforms – 2D-DFT and other transforms.

UNIT II IMAGE PREPROCESSING
Image enhancement – point operation, Histogram modeling, spatial operations, Transform operations,Image restoration – Image degradation model, Inverse and Weiner filtering. Image Compression –Spatial and Transform methods

UNIT III MEDICAL IMAGE RECONSTRUCTION
Mathematical preliminaries and basic reconstruction methods, Image reconstruction in CT scanners,MRI, fMRI, Ultra sound imaging., 3D Ultra sound imaging Nuclear Medicine Imaging Modalities-SPECT,PET, Molecular Imaging.

UNIT IV IMAGE ANALYSIS AND CLASSIFICATION
Image segmentation- pixel based, edge based, region based segmentation. Image representation and analysis, Feature extraction and representation, Statistical, Shape, Texture, feature and image classification – Statistical, Rule based, Neural Network approaches

UNIT V IMAGE REGISTRATION AND VISUALIZATION
Rigid body visualization. Principal axis registration, Interactive principal axis registration, Feature based registration. Elastic deformation based registration, Medical image fusion, Image visualization – 2D display methods, 3D display methods, virtual reality based interactive visualization.

REFERENCES:
1. Atam P.Dhawan, 'Medical Image Analysis', Wiley Interscience Publication, NJ, USA 2003.
2. R.C.Gonzalez and R.E.Woods, 'Digital Image Processing', Second Edition, Pearson Education,2002.
3. Anil. K. Jain, 'Fundamentals of Digital Image Processing', Pearson education, Indian Reprint 2003.
4. Alfred Horowitz, 'MRI Physics for Radiologists – A Visual Approach', Second edition Springer Verlag Network, 1991.
5 Kavyan Najarian and Robert Splerstor," Biomedical signals and Image processing",CRC - Taylor and Francis,New York,2006.
6. John L.Semmlow,"Biosignal and Biomedical Image Processing Matlab Based applications" Marcel Dekker Inc.,New York,2004.
7. Jerry L.Prince and Jnathan M.Links." Medical Imaging Signals and Systems"- Pearson Education Inc. 2006.
8. Geoff Dougherty, "Digital Image Processing for Medical Apllications,"Cambridge University Press,India 2009.

OUTCOME:
This course provides in depth knowledge about the various digital image processing techniques applied in processing of the medical images.