Course code	Course Name	L-T-P - Credits	Year of Introduction
EE466	Digital Image Processing	3-0-0-3	2016

Prerequisite: Nil

Course Objectives

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To impart the image enhancement, image restoration and image compression procedures
- To know about morphological image processing.
- To study the image segmentation and representation techniques.

Syllabus

Elements of visual perception, Basic geometric transformations, Separable Image Transforms, Spatial Domain methods, Frequency domain filters, Model of Image Degradation/restoration process, Compression Techniques, Morphological Processing, Segmentation, Representation and Description

Expected Outcomes.

The students will be able to

i. Demonstrate understanding of the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
ii. Demonstrate understanding of spatial filtering techniques, including linear and nonlinear methods.
iii. Demonstrate understanding of 2D Fourier transform concepts, including the 2D DFT and FFT, and their use in frequency domain filtering.
iv. Apply programming skills in digital image processing related problems

Text Book:

Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson Education

References:

1. K. Jain, Fundamentals of Digital Image Processing, PHI
2. Chanda Dutta Magundar, Digital Image Processing and Applications, PHI
3. MilanSonka, Vaclav Hlavac, Roger Boyle, Image Processing, Analysis and Machine Vision, CL Engineering, 2007
4. William K. Pratt, Digital Image Processing, John Wiley & Sons

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Elements of visual perception – Image sampling and quantization Basic relationship between pixels – Basic geometric transformations-Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms -Walsh –Hadamard – Discrete Cosine Transform, Haar transforms	7	15%
II	Spatial Domain methods: Basic grey level transformation – Histogram equalization –Image subtraction – Image averaging Spatial filtering: Smoothing, sharpening filters – Laplacian filters Frequency domain filters : Smoothing – Sharpening filters – Homomorphic filtering.	7	15%
FIRST INTERNAL EXAMINATION			

III	Model of Image Degradation/restoration process – Noise models – Inverse filtering –Least mean square filtering – Constrained least mean square filtering – Blind image restoration – Pseudo inverse – Singular value decomposition	7	15%
IV	Lossless compression: Variable length coding – LZW coding – Bit plane coding, predictive coding-DPCM. Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG	7	15%
SECOND INTERNAL EXAMINATION			
V	Morphological Image Processing-Dilation, Erosion, Morphological Reconstruction- Gray Scale Morphology Edge detection – Thresholding - Region Based segmentation	7	20%
VI	Boundary representation: chair codes- Polygonal approximation –Boundary segments – boundary descriptors: Simple descriptors Fourier descriptors - Regional descriptors –Simple descriptors	7	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks: 100 Exam Duration: 3Hourrs.

Part A: 8 compulsory questions.

One question from each module of Modules I - IV; and two each from Module V & VI.

Student has to answer all questions. (8 x5)=40

Part B: 3 questions uniformly covering Modules I & II. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

Part C: 3 questions uniformly covering Modules III & IV. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

Part D: 3 questions uniformly covering Modules V & VI. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.