Skill Department of Computer Science / IT
Skill Faculty of Engineering & Technology

SHRI VISHWAKRMA SKILL UNIVERSITY
DUDHOLA, PALWAL

ANNEXURE-4

DIGITAL IMAGE PROCESSING

Course No. CS 1001

Course Credit: 03(3-0-0)
Max. Marks: 100(30I+70E)

Course Objective: To treat the 2D systems as an extension of 1D system design and discuss techniques specific to 2D systems.

Course Outcomes:
CO1: able to understand the need for image transforms, different types of image transforms and their properties.
CO2: Able to apply the image processing techniques in developing any image processing application.
CO3: Able to analyse different techniques employed for the enhancement of images.
CO4: Able to evaluate different causes for image degradation and overview of image restoration techniques.
CO5: Able to understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.
CO6: Able to create different feature extraction techniques for image analysis and recognition.

Unit	Contents
I: Introduction (CO1)	What is Digital Image Processing, examples of fields that use digital image processing, fundamental Steps in Digital Image Processing, Components of an Image processing system, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.
II: Image Enhancements (CO2, CO3)	Image Enhancement in the spatial domain: some basic gray level transformations, histogram processing, enhancement using arithmetic and logic operations, basics of spatial filters, smoothening and sharpening spatial filters, combining spatial enhancement methods.
III: Image Segmentation (CO5)	**Segmentation:** Thresholding, Edge Based Segmentation: Edge Image Thresholding, Region Based Segmentation, Matching, **Representation and Description**: Representation, Boundary Descriptors, Regional Descriptors.
IV: Compression & Morphological Operations (CO3,CO4)	**Image Compression:** Fundamentals, image compression models, elements of information theory, error-free compression, lossy compression, Image Compression Standards. **Morphological Image Processing:** Preliminaries, dilation, erosion, open and closing, hit transformation, basic morphologic algorithms.
V: Feature Extraction (CO6)	**Color Image Processing**: Color fundamentals, Color Models and basics of full-color image processing

	Feature Extraction from the Image: Boundary descriptors, Regional descriptors, Relational descriptors.

Text Books:

1. R. C.Gonzalez, R.E.Woods," Digital Image processing", Pearson edition, Inc3/e,2008.

Reference Books:

1. A.K.Jain," Fundamentals of Digital Image Processing", PHI,1999.
2. J.C. Russ," The Image Processing Handbook", (5/e), CRC, 2006.
3. R.C.Gonzalez & R.E. Woods; "Digital Image Processing with MATLAB", Prentice Hall, 2003.

ARTIFICIAL NEURAL NETWORKS

Course No. CS 1002 **Course Credit: 03(3-0-0)**
Max. Marks: 100(30I+70E)

Course Objective: An Artificial neural network is an abstract simulation of real nervous system and its study corresponds to growing interdisciplinary field which consider the systems as adaptive, distributed and mostly nonlinear, three of elements found in real applications. The ANN's are used in many important engineering and scientific applications, some of these are, signal enhancement, noise cancellation, pattern classification, system identification, prediction and control. Besides they are used in many commercial products such as modems, image processing and recognition systems, speech recognition and bio medical instrumentation among others.

Course Outcomes:

CO1: Able to understand the synaptic connectivity as the basis of neural computation and learning
CO2: Able to apply the basics of artificial neural networks in designing applications.
CO3: Able to analyse the applications of the artificial neural networks.
CO4: Able to evaluate the different structures of artificial neural networks.
CO5: Able to create the Perceptron and dynamical theories of recurrent networks including amplifiers, attractors, and hybrid computation.
CO6: Able to design / create supervised and unsupervised artificial neural networks.

Unit	Contents
I: Introduction to ANN (CO1)	Features, structure and working of Biological Neural Network, Trends in Computing Comparison of BNN and ANN. Basics of Artificial Neural Networks - History of neural network research, characteristics of neural networks terminology, models of neuron Mc Culloch – Pitts model, Perceptron, Adaline model, Basic learning laws, Topology of neural network architecture
II: Backpropagation networks: (BPN) (CO2)	Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, backpropagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.
III: Activation & Synaptic Dynamics (CO3)	Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. Basic functional units of ANN for pattern recognition tasks: Basic feed forward, Basic feedback and basic competitive learning neural network. 4 9 Pattern association, pattern classification and pattern mapping tasks.
IV: Feedforward and Feedback Networks (CO4)	a) Feedforward neural networks – Linear Responsibility X-OR problem and solution. - Analysis of pattern mapping networks summary of basic gradient search methods. b) Feedback neural networks Pattern storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning
V: Applications of ANN (CO5, CO6)	Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron – Recognition of handwritten characters. NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments , texture classification and segmentation

Text Books:

1. Haykin, Simon. Neural networks and learning machines, 3/E. Pearson Education India, 2010.

Reference Books:

1. B. Yegnanarayana - Artificial neural network PHI Publication.
2. S. Raj sekaran, Vijayalakshmi Pari - Neural networks, Fuzzy logic and Genetic Algorithms.
3. Kevin L. Priddy, Paul E. Keller – Artificial neural networks: An Introduction - SPIE Press, 2005.
4. Mohammad H. Hassoun – Fundamentals of artificial neural networks - MIT Press ,1995.
5. Nelson Morgan – Artificial neural network: Electronic Implementations – IEEE Press, 1990.