BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

FIRST SEMESTER 2020-21
COURSE HANDOUT

Date: 18.08.2020

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

Course No : EEE F435
Course Title : Digital Image Processing
Instructor-in-Charge : Karunesh Kumar Gupta
Instructor(s) : NA
Tutorial/Practical Instructors: NA

1. Course Description: This is a first course on digital image processing. It begins with an introduction to the fundamentals of digital images and discusses the various discrete transforms, which are extensively used in image processing. It then goes on to discuss the different image processing techniques such as image enhancement, automatic image classification and recognition.

2. Scope and Objective of the Course: The course introduces the students to the fundamentals of digital image processing and various techniques that are applied to them so as to improve their quality. These techniques are essential for image enhancement, image restoration and image compression. It also briefly introduces automatic image classification and recognition. Matlab™ software will be introduced to the students so as to improve their skills in writing codes related to image processing.

3. Text Books: Gonzalez, R. C. & R. E. Woods, Digital Image Processing, Pearson Education.

4. Reference Books: 1. Milan Sonka, Vaclav H., and Roger Boyle, Image Processing, Analysis, and Machine Vision, Thomson.

2. Jain, Anil K, Fundamental of Digital Image Processing, Prentice Hall.

3. Gonzalez, Digital Image Processing using MATLAB, Woods & Eddins, Pearson.

5. Course Plan:

Module No.	Lecture Session	Reference	Learning outcomes
1	To introduce fundamental of Imagery system	Chapter 1	Study different spectrum band imaging systems - Gamma-ray, X-ray, ultraviolet, microwave.
2-4	To introduce fundamental concepts and terms associated with digital images.	Chapter 2	Digital image fundamentals- image formation, image sampling, quantization, and interpolation
5-6	To study concept of image enhancement by gray level transformations	Chapter 3	Some basic gray level transformations
7-8	To study Histogram processing of an image	Chapter 3	Histogram processing

9-10	To learn image enhancement by filtering in the spatial domain	Chapter 3	Spatial filtering
11-13	To study image Transforms	Chapter 4	Convolution, correlation, FFT, DCT, WHT
14	To learn image enhancement by filtering in the frequency domain	Chapter 4	Filtering in the frequency domain
15-16	To study image degradation	Chapter 5	Image degradation model, estimation, inverse filtering
17-18	To introduce fundamental of image compression	Chapter 8	Fundamental of image compression
19-20	To introduce basics of coding theory	Chapter 8	Entropy, data compression, Kraft's inequality, Huffman code
21-24	To study basic compression algorithms	Chapter 8	Arithmetic , LNW, RLC, DCT, DWT, JPEG
25-26	Morphological Image Processing	Chapter 9	Erosion, dilation, Opening closing, Hit-or-miss transformation, some basic morphological algorithms
27-30	Image Segmentation	Chapter 10	Discontinuity, Hough Transform, thresholding, regional based, Morphological watershed
31-33	Representation and description	Chapter 11	Boundary following, chain codes, signatures, boundary descriptors, regional descriptors, principal components analysis (PCA)
34-35	Object Recognition	Chapter 12	Patterns and pattern classes, decision-theoretic methods
36-40	To learn where the image processing techniques applied	Notes/Papers	Biomedical, Remote sensing

6. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of component (Close Book/ Open Book)
Test - 1	50 Min.	15%		
Test - 2	50 Min.	15%		
Test - 3	50 Min.	15%		
Comprehensive Examination	2 h	35%		
Quiz /Assignment /Matlab coding		20%	Announced in class	Closed/open

7. Chamber Consultation Hour: to be announce in the class.

8. Notices: Nalanda website

9. Make-up Policy: As per Institute rule.

10. Note (if any):

Instructor-in-charge
Course No. EEE F435