Birla Institute of Technology & Science, Pilani
Instruction Division
First Semester, 2015-2016
Course Handout(Part II)

Date : 03.08.2015

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. : BITS F311

Course Title: Image Processing

Instructor – in - Charge: RAJ KUMAR GUPTA

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 the field of image processing. The course discusses different image processing techniques essential for image enhancement, image restoration and image compression. Finally, it briefly touches upon automatic image classification and recognition.

Scope & Objective: The course introduces the students to the fundamentals of digital images and various processing 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/data processing.

Text Book: Gonzalez, R. C. & R. E. Woods, Digital Image Processing, Pearson.

Reference Books: Foundations of Coding, Jiri Adamek, Wiley, 1991

Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Reference to Text Book
1-3	To introduce fundamental concepts and terms associated with digital images.	Introduction and digital image fundamentals.	Chapter 2
4	To introduce the concept of image enhancement	Image enhancement	Chapter 3
5-6	To study image enhancement by gray level transformations	Some basic gray level transformations	Chapter 3

7-8	To study Histogram processing of an image	Histogram processing	Chapter 3
9-10	To learn image enhancement by filtering in the spatial domain	Spatial filtering	Chapter 3
11-13	To introduce Fourier Transform and Discrete Fourier Transform	Fourier Transform, Discrete Fourier Transform and their properties.	Chapter 4
14-15	To introduce convolution and establish connection with Fourier transform	Convolution & Correlation theorems, auto-correlation	Chapter 4
16-17	To study the Fast Fourier Transform algorithm	Fast Fourier Transform	Chapter 4
18 – 19	To learn image enhancement by filtering in the frequency domain	Filtering in the frequency domain	Chapter 4
20	To introduce image degradation and degradation model	Image degradation model,	Chapter 5
21 – 22	To learn how to remove blur caused by uniform linear motion	Removal of blur caused by uniform linear motion	Chapter 5
23	To learn inverse filtering	Inverse filtering	Chapter 5
24 – 25	To introduce the fundamentals of image compression	Fundamentals of image compression	Chapter 8
26 – 27	To introduce basics of coding theory	Kraft's inequality, Huffman codes	Chaps 1 & 2 of ref. book 2
28 – 30	To introduce the basics of Information theory	Entropy and data compression	8.3.4, Chap 3 of ref. Book 2
31 – 33	To learn various error- free compression techniques	near optimal variable length codes, Arithmetic and LZW coding, run-length coding etc.	Chapter 8
34 – 36	To learn various lossy compression techniques and learn some image compression standards	Lossy compression, Image compression standards	Chapter 8
37 – 38	To learn some image segmentation techniques	Image segmentation	Chapter 10
39 – 40	To introduce the idea of image classification and pattern recognition	Image representation and classification	Chapter 11 & 12

Evaluation Scheme:

Evaluation Component	Duration	Weightage	Date, Time & Venue	Nature of Component
Mid Sem	90 Minutes	30%	6/10 2:00 - 3:30 PM	Closed/open Book
Quiz/Assignment		30%	-----	Closed Book
Comprehensive Examination	3 Hours	40%	4/12 FN	Closed/open Book

Chamber Consultation Hour: To be announced in the class.

Notices: Notices concerning the course will be put up on the FD III notice board and Nalanda.

Make-up Policy: Make-up for the tests will be granted only on genuine grounds of sickness **(to be supported by medical certificate and not prescription**) or urgency for going out of town. There will not be any make-up for the assignment / quiz test.

Instructor-in-Charge
BITS F311