

Birla Institute of Technology & Science, Pilani
Hyderabad Campus

Second Semester, 2020-2021

Course Handout(Part II)

Date : 16-1-2021

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 F446

Course Title: Pattern Recognition

Instructor – in - Charge: P.K.Thiruvikraman

Course Description: This is a first course on Pattern recognition. It begins with an introduction to the fundamentals of digital images and develops the theoretical background for Pattern Recognition. It goes on to discuss the different aspects like the preprocessing of a digital image, segmentation, representation and description and finally object recognition.

Scope & Objective: Over the past 30 years or so, pattern recognition has evolved into a mature subject embracing many topics and applications: these range from automatic (robot) assembly to automatic vehicle guidance, from automatic interpretation of documents to verification of signatures, and from analysis of remotely sensed images to checking of fingerprints and human blood cells. Currently, pattern recognition and automatic visual inspection are undergoing very substantial growth, necessary improvement in quality, safety and cost effectiveness being the stimulating factors. The course introduces the students to the fundamentals of digital images and various processing techniques that are applied to them not only to improve their quality but also to recognize them.

Text Book: Gonzalez, R. C. & R. E. Woods, Digital Image Processing, Pearson Education Asia, 3rd ed., 2009

Reference Books:

1. M. Sonka, V. Hlavac and R. Boyle, Image Processing, analysis and machine vision, 2nd Ed, Thompson Asia, 2003
2. E.R Davies, Machine Vision, 3rd Edition, Elsevier, 2005
3. Gose, Johnsonbaugh and Jost, Pattern Recognition and Image Analysis, Pearson, 2007
4. A course on Digital Image Processing with MATLAB, P.K.Thiruvikraman, IoPScience ebooks (<https://iopscience.iop.org/book/978-0-7503-2604-9>)

Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Chapter in the Text Book
1	To introduce Pattern recognition	Pattern recognition and applications	Lecture notes
2-3	To introduce the concept of digital image processing	Digital images, data structure for image analysis	2.4

4-8	To study techniques to preprocess the digital image for analysis	Some basic gray level transformations for image enhancement, Averaging and Median filters	3.1,3.5
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9-15	To learn image segmentation	Detection of discontinuities, edge linked boundary detection, thresholding, region based segmentation	10.1,10.2,10.3.1 to 10.3.5
16-25	Image Analysis	Scene segmentation and labeling, Counting objects, Perimeter measurement, Following and representing boundaries, Projections, Hough transforms, Texture	11.1-11.4
26-33	Statistical Decision Making	Bayes' theorem, Nearest neighbor classification	Ch. 12 & Ch. 7 (Ref Book 1), Ch3 & 4(Ref Book 3)
34-40	Clustering, Artificial neural networks	k-means, Hierarchical and Partitional clustering, Neural nets, Hopfield Nets	Ch 6 of Ref Book 3

Evaluation Scheme:

Evaluation Component	Duration	Weightage	Date, Time & Venue	Nature of Component
Mid-semester test	90 minutes	35%	02/03 3.30 - 5.00PM	Open Book
Programming Assignment		25%		Open Book
Comprehensive Examination	2 Hours	40%	05/05 AN	Open Book

Chamber Consultation Hour: To be announced in the class.

Notices: Notices concerning the course will be put up on Course Management Service (CMS).

Make-up Policy: Make-up for the mid-sem test will be granted only if the application is forwarded by the chief warden. Students should approach the timetable division for makeup of comprehensive examination.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-Charge
BITS F446