



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani  
Pilani Campus

**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* : EEE C435  
*Course Title* : **Digital Image Processing**  
*Instructor-in-charge* : **KARUNESH K GUPTA**

**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. Text Books:**

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

**Reference Books:**

1. Gonzalez, Digital Image Processing using MATLAB, Woods & Eddins, Pearson, 2007.
2. Jain, Anil K, Fundamental of Digital Image Processing-- Englewood Cliffs, Prentice Hall, 1989.
3. Milan Sonka, Vaclav Hlavac, and Roger Boyle, Image Processing, Analysis, and Machine Vision, Thomson, 2008.
4. William K. Pratt, Introduction to Digital Image Processing, CRC Press, 2014.

**3. Course Plan:**

| Lecture No. | Learning Objectives   | Topics to be covered   | Reference to Text Book |
|-------------|---|--|------------------------|
| 1           | To introduce fundamental of Imagery system                                  | Study different spectrum band imaging systems - Gamma-ray, X-ray, ultraviolet, microwave.    | Ch. 1                  |
| 2-4         | To introduce fundamental concepts and terms associated with digital images. | Digital image fundamentals- image formation, image sampling, quantization, and interpolation | Ch. 2                  |



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|       |   |  |        |
|-------|---|--|--------|
| 5-6   | To study concept of image enhancement by gray level transformations | Some basic gray level transformations  | Ch. 3  |
| 7-9   | To study Histogram processing of an image                           | Histogram processing   | Ch. 3  |
| 10-11 | To learn image enhancement by filtering in the spatial domain       | Spatial filtering  | Ch. 3  |
| 12-14 | To study image Transforms   | Convolution, correlation, FFT, DCT, WHT, KL, DHT   | Ch. 4  |
| 15    | To learn image enhancement by filtering in the frequency domain     | Filtering in the frequency domain  | Ch. 4  |
| 16-17 | To study image degradation  | Image degradation model, estimation, inverse filtering   | Ch. 5  |
| 18-19 | To introduce fundamental of image compression                       | Fundamental of image compression   | Ch. 8  |
| 20-21 | To introduce basics of coding theory                                | Entropy, data compression, Kraft's inequality, Huffman code  | Ch. 8  |
| 22-26 | To study basic compression algorithms                               | Huffman, Arithmetic, LNW, RLC, DCT, DWT, JPEG  | Ch. 8  |
| 27    | Morphological Image Processing                                      | Erosion, dilation, Opening closing, Hit-or-miss transformation, some basic morphological algorithms                          | Ch. 9  |
| 28-34 | Image Segmentation  | Point, line and edge detection, thresholding   | Ch. 10 |
| 35-37 | Representation and description                                      | Boundary following, chain codes, signatures, boundary descriptors, regional descriptors, principal components analysis (PCA) | Ch. 11 |
| 38-40 | Object Recognition  | Patterns and pattern classes, decision-theoretic methods   | Ch. 12 |





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|----|---|---------------------------------|-------|
| 41 | To learn where the image processing technique applied | OCR, Biomedical, Remote sensing | Notes |
|----|---|---------------------------------|-------|

**4. Evaluation Scheme:**

| Evaluation Component       | Duration   | Weightage | Date, Time               | Remarks          |
|----------------------------|------------|-----------|--------------------------|------------------|
| Mid-semester Test          | 90 Minutes | 25%       | 8/10 2:00 - 3:30 PM      | CB               |
| Lab Assignment / Project * |            | 40%       | To be announced in class | OB               |
| Comprehensive Examination  | 3 Hours    | 35%       | 9/12 FN                  | Partly open book |

\* Individual project on the topic of your choosing, subject to approval of the instructor.

**5. Chamber Consultation Hour:** To be announced in the class.

**6. Notices:** Notices concerning the course will be put up on the EEE notice board only.

**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 on-line test.

**Instructor-in-Charge  
EEE G612**



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