CT-505   **:**   **Image Processing and Computer Vision**   **First Semester**

Text Book   **:**   **Digital Image Processing (2nd Edition)**
                          by Rafael C. Gonzalez and Richard E. Woods

Period   **:**   **45 periods for 15 weeks (Lecture + Lab)**

Course Description

This course aims at offering a self-contained account of computer vision and its underlying concepts, including the recent use of deep learning. The first part starts with an overview of existing and emerging applications that need computer vision. It shows that the realm of image processing is no longer restricted to the factory floor, but is entering several fields of our daily life. First the interaction of light with matter is considered. The most important hardware components such as cameras and illumination sources are also discussed.

Course Objective

Overview of the most important concepts of image formation, perception and analysis, and Computer Vision. Gaining own experience through theoretical and programming exercises. The course then turns to image discretization, necessary to process images by computer. The next part describes necessary pre-processing steps, that enhance image quality and/or detect specific features.

Assessment Plan for the Course

Paper Exam: 60%

Attendance: 10%

Test/ Quiz: 10%

Lab: 10%

Project: 10%

Tentative Lecture Plan

No.	Chapter	Page	Period	Detail Lecture Plan
	Chapter 1 Introduction to Image Processing		**3**	
1.	1.1 Digital Image Processing	1- 3	1	
2.	1.4 Fundamental steps in Digital Image Processing	25 to 28	1	
3.	1.5 Components of Digital Image Processing System	28 to 30	1	
	Chapter 2 Digital Image Fundamental		**6**	
4.	2.4 Image Sampling and Quantization	52 to 65	3	
5.	2.5 Pictures Elements (Pixels)	66 to 69	2	
6.	2.6 Linear and Nonlinear Operation	70	1	
	Chapter 3 Image Enhancement in the Spatial Domain		**12**	
7.	3.2 Gray Level Transformation	78 to 87	2	
8.	3.3 Histogram Processing	88 to 107	2	
9.	3.4 Enhancement Using Arithmetic/Logic Operations	108 to 115	2	
10.	3.5 Basic of Spatial Fileters	116 to 118	1	
11.	3.6 Smoothing Spatial Filters	119 to 124	1	
12.	3.7 Sharpening Spatial Filters	125 to 136	3	
13.	3.8 Combining Spatial Enhancement	137 to 140	1	
	Chapter 4 Image Enhancement in the Frequency domain		**16**	
14.	4.1 Fourier Transform	148	2	
15.	4.2 Fourier Transform and the Frequency domain	149 to 166	6	
16.	4.3 Smoothing the Frequency domain Filter	167 to 179	3	
17.	4.4 Sharpening the Frequency domain Filter	180 to 190	3	
18.	4.5 Homomorphic Filtering	191 to 193	2	
	Chapter 5 Image Restoration		**6**	

No.	Chapter	Page	Period	Detail Lecture Plan
19.	5.1 A model of the image degradation/Restoration Process	220 to 222	1	
20.	5.2 Noise Models	222 to 229	2	
21.	5.3 Restoration in the presence of Noise Only-Spatial Filtering	230 to 242	3	
	Revision		**2**	All Chapters