Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ETC701	Image and Video Processing	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Ave. Of Test 1 and Test 2					
ETC701	Image and Video Processing	20	20	20	80	-	-	-	100

Course pre-requisite:

- ETC 405: Signals and Systems
- ETC 602: Discrete Time Signal Processing

Course Objectives:

- To cover the fundamentals and mathematical models in digital image and video processing.
- To develop time and frequency domain techniques for image enhancement.
- To expose the students to current technologies and issues in image and video processing.
- To develop image and video processing applications in practice.

Course outcomes: Students will be able to

- Understand theory and models in Image and Video Processing.
- Interpret and analyze 2D signals in frequency domain through image transforms.
- Apply quantitative models of image and video processing for various engineering applications.
- Develop innovative design for practical applications in various fields.

Module No.		Topics	Hrs.
1		**Image Fundamentals**	04
	1.1	Image acquisition, sampling and quantization, image resolution, basic relationship between pixels, color images, RGB, HSI and other models	
2		**Two Dimensional Transforms**	06
	2.1	Discrete Fourier Transform, Discrete Cosine Transform, KL Transform, and Discrete Wavelet Transform	
3		**Image Enhancement**	
	3.1	**Spatial Domain** **Point Processing:** Digital Negative, contrast stretching, thresholding, gray level slicing, bit plane slicing, log transform and power law transform. **Neighborhood Processing**: Averaging filters, order statistics filters, high pass filters and high boost filters	08
	3.2	**Frequency Domain:** DFT for filtering, Ideal, Gaussian and Butterworth filters for smoothening and sharpening, and Homomorphic filters	
	3.3	**Histogram Modeling:** Histogram equalization and histogram specification	
4		**Image Segmentation and Morphology**	07
	4.1	Point, line and edge detection, edge linking using Hough transform and graph theoretic approach, thresholding, and region based segmentation.	
	4.2	Dilation, erosion, opening, closing, hit or miss transform, thinning and thickening, and boundary extraction on binary images	
5		**Image Restoration:**	07
	5.1	Degradation model, noise models, estimation of degradation function by modeling, restoration using Weiner filters and Inverse filters	
6		**Video Formation, Perception and Representation**	08
	6.1	Digital Video Sampling, Video Frame classifications, I, P and B frames, Notation, ITU-RBT 601Digital Video formats, Digital video quality measure.	
	6.2	**Video Capture and display:** Principle of colour video camera, video camera, digital video	
	6.3	**Sampling of video Signals:** Required sampling rates, sampling in two dimensions and three dimensions, progressive virus interlaced scans	
7		**Two Dimensional Motion Estimation**	12
	7.1	**Optical Flow:** 2-D motion Vs optical flow, optical flow equations, motion representation, motion estimation criteria, optimization method.	
	7.2	**Pixel based motion estimation:** Regularization using motion smoothing constraints, using multipoint neighborhood.	
	7.3	**Block Matching Algorithms:** Exhaustive block matching algorithms, phase correlation method, Binary feature matching.	
	7.4	**Multi resolution Motion Estimation:** General formulation, Hierarchical blocks matching Algorithms.	
Total			**52**

Recommended Books:

1. Gonzales and Woods, "*Digital Image Processing*", Pearson Education, India, Third Edition,
2. Anil K.Jain, "*Fundamentals of Image Processing*", Prentice Hall of India, First Edition, 1989.
3. Murat Tekalp, "*Digital Video Processing*", Pearson, 2010.
4. John W. Woods, "*Multidimensional Signal, Image and Video Processing*", Academic Press 2012
5. J.R.Ohm , "*Multimedia Communication Technology*", Springer Publication.
6. A.I.Bovik, "*Handbook on Image and Video Processing*", Academic Press.

Internal Assessment (IA):
Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the test will be considered for final internal assessment.

End Semester Examination:
1. Question paper will comprise of 6 questions, each of 20 marks.
2. Total 4 questions need to be solved.
3. Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4. Remaining question will be selected from all the modules.