ITE1017	Transformation Techniques	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**MAT2002**	**Syllabus version**				
		1.0				

Course Objectives:

- To introduce the various mathematical transform techniques that can be used in diverse areas of engineering domains.
- To apply the orthogonal and non-orthogonal techniques for image processing applications
- To learn various statistical based and directional transformation techniques

Expected Course Outcome:

1) Analyze the use of 2D Z Transform techniques.
2) Understand how integral transforms can be used to solve a variety of differential equations
3) Formulate important results and theorems of various sinusoidal orthogonal transforms
4) Formulate important results and theorems of various non-sinusoidal orthogonal transforms.
5) Demonstrate Statistical based and Directional transforms for automotive applications.
6) Use directional transforms as a techniques for solving real time problems
7) Apply Wavelet and other advanced transforms to video processing applications (surveillance)

Student Learning Outcomes (SLO):	**1, 2, 9**

[1] Having an ability to apply knowledge of mathematics, science, and engineering

[2] Having a clear understanding of the subject related concepts and of contemporary issues

[9] Having problem-solving ability solving social issues and engineering problems.

Module:1	**2D signals and Systems:**	**6 hours**

Separable Sequence - Periodic sequence - Classification of 2D Systems - 2D Convolution - 2D Z-Transform - Properties - 2D Inverse Z transform - 2D Digital Filter

Module:2	**Convolution and Correlation:**	**7 hours**

2D Convolution through Graphical Method - Convolution through Z-Transform - 2D Convolution through Matrix Analysis - Circular Convolution – Applications

Module:3	**Sinusoidal, Orthogonal transforms:**	**7 hours**

Orthogonal sinusoidal basis function - Fourier transform - Fast FFT - Properties - Discrete Cosine transform - Discrete sine transform – Applications

Module:4	**Non-sinusoidal Orthogonal Transforms:**	**6 hours**

Non-sinusoidal orthogonal basis function - Haar Tansform - Walsh transform - Hadamard Transform - Slant Transform – Applications

Module:5	**Statistics based transforms:**	**4 hours**
KL transform - Singular value decomposition – Applications		
Module:6	**Directional Transforms:**	**6 hours**
Hough transform - Radon transform - Ridgelet transform - Contourlet transform – Applications		
Module:7	**Wavelet Transform:**	**6 hours**
Continuous Wavelet Transform - Multi-resolution Analysis - Image Compression - Image Coding - SPIHT - JPEG2000 - Wavelet based denoising - Watermarking - Applications.		
Module:8	**Contemporary issues:**	**3 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	Rafael C. Gonzalez, Digital Image Processing, Pearson Education, New Delhi, 2013

Reference Books

1. S. Sridhar, Digital Image Processing, Oxford University Press, Sixth impression, New Delhi, 2014

Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016