CVM UNIVERSITY
(Established under Gujarat Private Universities (Second Amendment) Act : 2019 Gujarat Act No. 20 of 2019)

FACULTY OF ENGINEERING & TECHNOLOGY

First Year Master of Engineering

Semester I

Course Code: 102430106

Course Title: Signal Transforms

Type of Course: Program Elective I

Course Objectives: To understand characteristics of various signals and transformation methodology and to study Applications of various signal transforms.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	30 / 15	20 / 10	70 / 35	30 / 15	150 / 75

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction: Need for transform, Frequency domain sampling, properties of DFT, Linear filtering methods based on the DFT, Fast Fourier transform, Applications of FFT Algorithms, Linear Filtering Approach for computation of the DFT, Quantization effects in the computation of the DFT	09
2	Signal Transforms: Walsh Transform, Hadamard Transform, Haar Transform, Slant Transform, Discrete Cosine Transform, Karhunen- Loeve Transform, Singular Value Decomposition, Radon Transform, Eigen values, Eigen vectors, Properties of Eigen values and Eigen vectors of Hermitian matrices	10
3	Fourier Transform: Parseval Theorem and need for joint time-frequency Analysis. Concept of non-stationary signals, Short-time Fourier transforms (STFT), Uncertainty Principle, and Localization/Isolation in time and frequency, Hilbert Spaces, Banach Spaces, and Fundamentals of Hilbert Transform.	10
4	Wavelet Transform: Introduction, Pyramids, Sub band coding, The Haar Transform, Multi Resolution Analysis, Continuous Wavelet Transform, Discrete Wavelet Transform, Fast Wavelet Transform, Multi Wavelet	10

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
10	15	15	10	15	05	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1	John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing – Principles, Algorithms and Applications", PHI Publications
2	S Jayaraman, S Esakkirajan, T Veerakumar, "Digital Image Processing", Tata McGraw Hill Education
3	Alexander D. Poularikas, "Transforms and Applications Handbook", CRC Press, Taylor and Francis Group.
4	S. Mallat, "A Wavelet Tour of Signal Processing," 2nd Edition, Academic Press, 1999.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	The students should be able to solve numerical based on DFT, FFT and many other transformation.	**30 %**
CO-2	They will learn transformations and its use in signal, image and video processing algorithms.	**35 %**
CO-3	At the end they should be able to develop various applications using analysis and transformation of different signals.	**35 %**

List of Practicals / Tutorials:

1	Representation and generation of basic signals
2	Discrete convolution and circular convolution
3	Correlation and Auto correlation
4	Effect of pole/zero on frequency response
5	Discrete time Fourier Transform and Discrete Fourier Transform
6	Design of Fast Fourier Transform
7	Implementation of Frequency response of LTI systems
8	Program to find Z Transform
9	Design algorithm for Discrete Cosine Transform
10	Walsh Transform and Radon Transform implementation

Supplementary learning Material:	
1	NPTEL website

Curriculum Revision:	
Version:	**1**

Drafted on (Month-Year):	Apr-20
Last Reviewed on (Month-Year):	Jul-20
Next Review on (Month-Year):	Apr-22