# OTL554 WAVELETS AND ITS APPLICATIONS

DETAILED SYLLABUS

## OBJECTIVES:

- To understand the concept of Fourier, transform and short time Fourier transform.
- To understand the concept of continuous time wavelet transform,
- To analyze the concept of interpolation and decimation.
- To understand the types of filter bank.
- To analyze the concept of image compression.

## UNIT I FOURIER ANALYSIS

Fourier basis & Fourier Transform – failure of Fourier Transform – Need for Time-Frequency Analysis – Heisenberg‟s Uncertainty principle – Short time Fourier transform (STFT) – short comings of STFT– Need for Wavelets

## UNIT II CWT AND MRA

Wavelet basis – Continuous time Wavelet Transform (CWT) – need for scaling function – Multi Resolution Analysis – important wavelets: Haar– Mexican hat– Meyer– Shannon– Daubachies.

## UNIT III INTRODUCTION TO MULTIRATE SYSTEMS

Decimation and Interpolation in Time domain - Decimation and Interpolation in Frequency domain – Multi rate systems for a rational factor.

## UNIT IV FILTER BANKS AND DWT

Two channel filter bank – Perfect Reconstruction (PR) condition – relationship between filter banks and wavelet basis – DWT – Filter banks for Daubachies wavelet function.

## UNIT V APPLICATIONS

Feature extraction using wavelet coefficients– Image compression– interference suppression– Microcalification cluster detection– Edge detection–Faulty bearing signature identification.

**OUTCOMES:**

At the end of the course, students would be able to

- Analyze the need for time frequency analysis.
- Design the concept of multi resolution analysis.
- Analyze the multirate system for rational factor.
- Analyze the relationship between the filter bank and wavelet.
- Analyze the application of wavelet.

**TEXT BOOK:**

1.K.P. Soman, K.I. Ramachandran, N.G. Rasmi,"Insight Into Wavelets: From Theory to Practice" PHI Learning Private Limited, Third Edition, 2010

**REFERENCE BOOKS:**

1.Sidney Burrus C, "An Introduction to Wavelets "Academic press, 2014

2. Stephane G Mallat, A Wavelet Tour of Signal Processing:The sponse way" Academic Press, Third edition, 2008