



# SIGNALS AND SYSTEMS



# Introduction to DTFS



## DTFS

- Mathematical tool used to represent discrete-time periodic signals.

## Importance in Signal Processing

- Analyzing signals in digital communication, audio processing etc,



# Mathematical Background



## Discrete Signals

- Sequence of numbers

## Periodicity in Discrete Signals

- $x[n]=x[n+N]$

## Continuous vs Discrete Signals

- Defined at every point in time
- Defined only at specific intervals



# Mathematical Expression for DTFS



$$X[k] = \frac{1}{N} \sum_{n=0}^{N-1} x[n] e^{-j \frac{2\pi}{N} kn}$$

$X[k]$  are the DTFS coefficients

$x[n]$  is the original signal

$N$  is the period of the signal

$k$  ranges from 0 to  $N-1$ .



# Properties of DTFS



- Linearity
- Time-Shifting
- Frequency-Shifting
- Conjugate Symmetry



# Applications



- Signal Analysis
- Filtering
- Modulation
- Communication Systems



Thank  
you

