

|           |                              |                    |
|-----------|------------------------------|--------------------|
| Soft Core | STS504: TIME SERIES ANALYSIS | No. of credits : 3 |
|-----------|------------------------------|--------------------|

### **Course Outcomes:**

- CO1: Understand the concept of time series and its components
- CO2: Understand the bases of different models of time series analysis including decomposition
- CO3: To learn proper model identification and its estimation.
- CO4: To learn several ways of identifying the forecasting methods with the least forecasting error.

### **Unit-I**

Simple Descriptive Techniques: time series plots, trend, seasonal effect.

Tests for trend and seasonality: estimation and elimination of trend and seasonal components. Exponential and moving average smoothing.

Time Series as discrete parameter stochastic process. Stationarity, autocovariance and autocorrelation function and their properties. Partial autocorrelation function. (8 hrs)

### **Unit-II**

Probability Models: White noise model, random walk, linear processes, Moving Average (MA), Autoregressive (AR), ARMA and ARIMA, seasonal ARIMA models. Invertibility. ACF and PACF of these processes. Sample ACF and PACF. Model identification. (12 hrs)

### **Unit-III**

Model Building: Estimation of mean, autocovariance function and autocorrelation function. Estimation of AR models – Yule-Walker equations, estimation of MA model and ARMA models. Order selection in AR and MA models. (10 hrs)

### **Unit-IV**

Forecasting: Forecast mean square error (FMSE), Least squares prediction. BLUP. Box-Jenkins forecasting. Forecasting through exponential smoothing and Holt-Winters smoothing. Residual analysis and diagnostic checking. Nonstationary time series models and their identification. (10 hrs)

## References:

1. Box GEP and Jenkins G.M. (1976): Time Series Analysis: Forecasting and Control, Holden-day, San Franscisco.
2. Brockwell P.J. and Davis R.S. (2002): Introduction to Time Series and Forecasting, 2<sup>nd</sup> Ed., Springer.
3. Chatfield C. (1996): The Analysis of Time Series An Introduction, Chapman & Hall.
4. Janacek G. (2001): Practical Time Series Arnolds Texts in Statistics.
5. Kendall M.G. and Ord J.K. (1990): Time Series, 3<sup>rd</sup> Ed., Edward Arnold.
6. Montgomery D.C. and Johnson L.A. (1977): Forecasting and Time Series Analysis, McGraw Hill.
7. K. Tanaka (1996): Time Series Analysis, Wiley Series.
8. Dilip M. Nachane (2006) “ Econometrics- Theoretical Foundations and Empirical Perspectives”, OUP India

