Module Code:	STAT- 411
Module Title:	Time Series Analysis-I (Theory) – 3 Credit Hours
Name of Scheme:	BS Statistics (Specialization)

Course Outline

1. Introduction to time series, time series analysis, Objectives of time series analysis, Components of time series, time series plots, time series and stochastic processes, special features of time series data, means, variance, auto-covariance, auto-correlation and partial auto-correlation for sample time series data.
2. Simple Descriptive Techniques: Stationary time series, transformations, Analyzing the secular trend, Filtering, Differencing, Analyzing Seasonal Variations, Analyzing Cyclical Variations, Analyzing Irregular Variations, Auto-correlation (correlogram) and other tests of randomness.
3. Probability Models for Time Series: Stochastic processes and stationary processes, useful stochastic processes, purely random process, random walk, moving average process, Stationarity and Invertibility of moving average models, auto-regressive process, Stationarity and invertibility of auto-regressive models, Duality between moving average and auto-regressive models, Principle of parsimony, Recursion rule for ACVF and ACF of auto-regressive process, Yule-Walker equations for auto-regressive process, Mixed ARMA models, moving average and auto-regressive representations of mixed ARMA models, Models for Non-stationary Time series, Box-Jenkins Integrated ARIMA models,: Stationarity through differencing, other transformations. General linear processes and continuous processes.

Books Recommended

1. Chatfield, C. (2003). *The analysis of time series: An introduction* (6th ed.). Chapman & Hall: London.
2. Wei, W. (1990). *Time series analysis: Univariate and multivariate methods*. Addison-Wesley publishing company, Inc.
3. Box, G.E.P., Jenkins, G.M. & Reinsel, G.C. (2004). *Time series analysis: Forecasting and control* (3rded.). Holden-dayk: San Francisco.
4. Brockwell, P.J., & Davis, R.A. (2002). *Introduction to time series and forecasting*. (2nded.). Springer: New York.

Reference Books

1. Gottman, J.M. (1981). *Time series analysis*, University Press: Cambridge.
2. Gyer, J.D. (1990). *Time series analysis*. Duxbury Press: Boston.
3. Montgomery, D.C. (1990). *Forecasting and time series analysis* (2nd ed.). McGraw Hill Book Company: New York.
4. Anderson, T.W. (1994). *Statistical analysis of time series*. Wiley: New York.
5. Janacek & Gareth. (2001). *Practical time series*. Arnold Co.: UK.
6. Akaike, H. & Kitagawa, G. (1999). *The practice of time series analysis* .Springer: New York.
7. Hamilton, & James, D. (1994). *Time series analysis*. Princeton University Press: New Jersey.
8. Chatfield, C. (2000). *Time series forecasting* .Chapman & Hill/CRC: New York.