Semester	**Six**
Course	**Major**
Paper Code	
Paper Title	**Time Series Analysis- I & Non-Parametric Methods**
No. of Credits	**4**
Theory/Composite/ Practical	**Theory**
Minimum No. of preparatory hours per week a student has to devote	**4** **Module 1: 2 periods/week** **Module 2: 2 periods/week**
Number of Modules	**2**
Syllabus	**Module 1: Time Series Analysis – I** ***Introduction:*** Idea of a Time Series. Time Series data. Examples of Time Series data from various fields. Evolutive and Stationary time series. [2L] ***Evolutive time series:*** Idea of Trend, Seasonal and Cyclical fluctuations. Classical decomposition of an evolutive time series. Estimation of trend by fitting mathematical curves and moving averages. Determination of indices of seasonal variation in a detrended series: Method of Averages. Fitting of asymptotic growth curves. [16L] ***Stationary Time Series***: Idea of Stationarity. Weak Stationarity. Auto-correlation function (acf) and Partial Auto-correlation functions (pacf). Correlogram. Illustrative examples. [8L] **Module 2: Non-Parametric Methods** ***Introduction:*** Basic idea of non-parametric methods. Concept of a Run. One-sample test for randomness using runs. [4L] ***Test for goodness of fit:*** Definition and properties of empirical distribution function (edf). Graphical representation of edf. Kolmogorov-Smirnov test for goodness of fit. [4L] ***Tests for location:*** One-sample problem. Sign Test and Wilcoxon Signed Rank Test. Two-sample problem. Wilcoxon Rank Sum Test and Mann-Whitney U Test. Test for location of k independent populations: Kruskal-Wallis Test. [14L] ***Tests for scale:*** Mood test, Ansari-Bradley test and Seigel-Tukey test. [2L] ***Interval Estimation:*** Concept of non-parametric tolerance intervals. [2L]
Learning Outcomes	1. Define a time series as a sequence of correlated random variables. 2. Explain the difference between time series and time series data. 3. Demonstrate some real life examples of time series arising from different fields. 4. Deduce the different components of a classical time series.

	5. Recognize stationarity of a time series. 6. Implement non-parametric methods for analysis of real life data.	
Reading/Reference List	1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol 2, 8th edition, The world Press, Kolkata 2. Cooray, TMJA (2008): Applied Time Series, Analysis and forecasting, Narosa Publishing house 3. Brockwell, P. J., & Davis, R. A. (Eds.). (2002): Introduction to time series and forecasting. New York, NY: Springer New York. 4. Box, G. E., Jenkins, G. M., Reinsel, G. C., & Ljung, G. M. (2015): Time series analysis: forecasting and control. John Wiley & Sons. 5. Brockwell, P. J., & Davis, R. A. (Eds.). (2002):. Introduction to time series and forecasting. New York, NY: Springer New York. 6. Shumway, R. H., & Stoffer, D. S. (2006): Time series analysis and its applications: with R examples. New York, NY: Springer New York. 7. Gibbons, J. D. and Chakraborty, S (2003): Nonparametric Statistical Inference. 4th Edition. Marcel Dekker, CRC.	
Evaluation	CIA: 30 End-Sem: 70 Total: 100	
Paper Structure for Semester Exam	**Module1 (35 marks)**	**Module 2 (35 marks)**
	Short questions (5 marks each): 4 out of 6 Long questions (15 marks each): 1 out of 2	Short questions (5 marks each): 4 out of 6 Long questions (15 marks each): 1 out of 2