Semester	**Seven**
Course	**Major**
Paper Code	
Paper Title	**Time Series Analysis II & Demography**
No. of Credits	**6**
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 II** ***Box Jenkins Models:*** Moving Average (MA) Process. Auto-regressive (AR) Process. Auto-regressive Moving Average (ARMA) Process. Auto-regressive Integrated Moving Average (ARIMA) Process and Seasonal Auto-regressive Integrated Moving Average (SARIMA) Process. Box Jenkins Approach to ARIMA modelling. Estimation of parameters of an Auto-regressive Process of order p using Yule Walker equations. [18L] ***Tests for Stationarity:*** Test for randomness of a residual series. Dickey-Fuller and Augmented Dickey- Fuller Test. [4L] ***Forecasting Techniques:*** Simple Exponential Smoothing. Holt-Winter`s Smoothing. [4L] **Module 2: Demography** ***Introduction:*** Demographic events. Sources of demographic data. Rates and ratios of vital events. [3L] ***Measurements of Mortality:*** Crude Death Rate (CDR). Specific Death Rate (SDR). Standardized Death Rates (STDR) and Infant Mortality Rate (IMR) - Definitions and applications. Description and construction of complete life table. Force of mortality. [8L] ***Measurements of Morbidity:*** Morbidity Incidence Rate and Morbidity Prevalence Rate. [2L] ***Measurements of Fertility:*** Crude Birth Rate (CBR). General Fertility Rate (GFR). Specific Fertility Rate (SFR) and Total Fertility Rate (TFR) - Definitions and Applications. [5L] ***Measurement of Population Growth:*** Crude Rates of Natural Increase. Pearl's Vital Index. Gross Reproduction Rate (GRR) and Net Reproduction Rate (NRR). [3L] ***Population Estimation, Projection and Forecasting:*** Use of AP and GP methods for population estimates. Use of Component method for population projection. Fitting of Logistic curve for population forecasting using Rhode's method. [5L]
Learning Outcomes	1. Interpret the different probability models for a stationary series. 2. Implement the Box- Jenkins modelling technique. 3. Generate forecasts and check their accuracy. 4. Understand Mortality and Fertility Rates. 5. Apply rates and ratios of Vital Events.

<table>
<tr><td></td><td colspan="2">6. Analyse Life Table and its components.
7. Construct Life Tables.
8. Understand Reproduction Rates.
9. Analyse population projection.</td></tr>
<tr><td>Reading/Reference List</td><td colspan="2">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. Ramakumar R (2002) Technical Demography, New Age.
8. Population Studies by Prof. A. K. Sharma IIT Kanpur – Swayam.</td></tr>
<tr><td>Evaluation</td><td colspan="2">CIA: 30
End-Sem: 70
Total: 100</td></tr>
<tr><td rowspan="2">Paper Structure for Semester Exam</td><td>Module 1 (35 marks)</td><td>Module 2 (35 marks)</td></tr>
<tr><td>Short questions (5 marks each): 4 out of 6
Long questions (15 marks each): 1 out of 2</td><td>Short questions (5 marks each): 4 out of 6
Long questions (15 marks each): 1 out of 2</td></tr>
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