Semester	**Seven**
Course	**Major**
Paper Code	
Paper Title	**Advanced Time Series Analysis & 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: Advanced Time Series Analysis** ***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.

<table>
<tr><td></td><td colspan="2">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.
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>
</table>