Semester	**SEVEN**
Course	**Major**
Paper Code	**C4ST230721T**
Paper Title	**Advanced Time Series Analysis & Demography**
No. of Credits	**6**
Theory / Practical /Composite	**Theory**
Classes per week	**4** **Module I: 2 periods /week** **Module II: 2 periods/week**
Module	**2**

Course Outcomes for Module I

1. Remember the different stationarity models for a time series.
2. **Understand** how the different models induce stationarity in a time series.
3. **Apply** test for randomness, statioarity and forecasting methods .
4. **Analyze** real life data on time series for stationarity and further insights
5. Evaluate the different probability models for stationarity
6. Create real life problems for studying the stationarity of a time series.

Course Outcomes for Module II

1. Remember the definitions of the different measures of vital events.
2. **Understand** the difference between rate and ratio and interpret the different measures.
3. Apply different demographic methods in relevant situations.
4. **Analyze** real life demographic data.
5. Evaluate the performance of the different demographic measures
6. Create meaningful problems from real life data that provide demographic insights..

Syllabus

Unit/Module	Content	No. of lectures	CO mapping	Cognitive levels
Module I				
Unit 1	***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.	18	CO1 CO2	K1 K2

Unit 2	***Tests for Stationarity:*** Test for randomness of a residual series. Dickey-Fuller and Augmented Dickey- Fuller Test.	4	CO3 CO4 CO5 CO6	K3 K4 K5 K6
Unit 3	***Forecasting Techniques:*** Simple Exponential Smoothing. Holt-Winter`s Smoothing.	4	CO3 CO4 CO5 CO6	K3 K4 K5 K6
Module II				
Unit 1	***Introduction:*** Demographic events. Sources of demographic data. Rates and ratios of vital events.	3	CO1 CO2	K1 K2
Unit 2	***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.	8	CO3 CO4 CO5 CO6	K3 K4 K5 K6
Unit 3	***Measurements of Morbidity:*** Morbidity Incidence Rate and Morbidity Prevalence Rate.	2	CO3 CO4 CO5 CO6	K3 K4 K5 K6
Unit 4	***Measurements of Fertility:*** Crude Birth Rate (CBR). General Fertility Rate (GFR). Specific Fertility Rate (SFR) and Total Fertility Rate (TFR) - Definitions and Applications.	5	CO3 CO4 CO5 CO6	K3 K4 K5 K6
Unit 5	***Measurement of Population Growth:*** Crude Rates of Natural Increase. Pearl's Vital Index. Gross Reproduction Rate (GRR) and Net Reproduction Rate (NRR).	3	CO3 CO4 CO5 CO6	K3 K4 K5 K6
Unit 6	***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.	5	CO3 CO4 CO5 CO6	K3 K4 K5 K6

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. Ramakumar R (2002) Technical Demography, New Age.
8. Population Studies by Prof. A. K. Sharma IIT Kanpur – Swayam.

Evaluation

	CIA: 30 End-Sem: 70 Total: 100	
Paper Structure for Semester Exam	**Module 1 (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

CO	CO description for Module I	Cognitive levels
CO1	**Remember** the different stationarity models for a time series	K1
CO2	**Understand** how the different models induce stationarity in a time series	K2
CO3	**Apply** test for randomness, stationarity and forecasting methods	K3
CO4	**Analyze** real life data on time series for stationaroty and further insights	K4
CO5	**Evaluate** the different probability models for stationarity	K5
CO6	**Create** real life problems for studying the stationarity of a time series	K6

CO	CO description for Module II	Cognitive levels
CO1	**Remember** the definitions of the different measures of vital events	K1
CO2	**Understand** the difference between rate and ratio and interpret the	K2

	different measures	
CO3	**Apply** different demographic methods in relevant situations	K3
CO4	**Analyze** real life demographic data	K4
CO5	**Evaluate** the performance of the different demographic measures	K5
CO6	**Create** meaningful problems from real life data that provide demographic insights.	K6