

1.	Title of the course	Applied Time-Series Analysis
2.	Course number	CH528L
3.	Structure of credits (L-T-P-C)	3-1-0-4
4.	New course/modification to	New
5.	To be offered by	Chemical Engineering
6.	Proposed by	T Arun Kumar
7.	Prerequisite	CoT
8.	Course Objective(s): To provide an overview of the subject of time-series analysis. To impart theoretical foundations of developing time-series models, forecasting and spectral analysis of data. To provide necessary relevant foundations in statistical inferencing (estimation). To provide training in practical implementations of the theoretical concepts (on a software platform).	
9.	Course Content: Introduction to time-series analysis; Review of probability theory, random variables and moments, covariance and correlation with focus on prediction (probability to prediction); Random processes: theoretical definitions and concepts, auto-, partial- and cross-correlation functions; Time-series modelling: auto-regressive, moving average and integrated ARIMA models; Spectral representations: frequency-domain representations of deterministic signals, power spectra, spectral densities and representations for stochastic signals; Prediction theory: best linear predictors, one-step and multi-step forecasting; Estimation theory: estimators of statistics, statistical properties of estimators, Cramer-Rao bound, Yule-Walker estimators, least squares and maximum likelihood estimation methods; Estimation of correlation functions, time-series models and spectra: estimation of CCF/ACF/PACF and ARIMA models, periodograms and their smoothed versions for estimation of spectral densities; Exploratory topics: seasonal effects and SARIMA models.	
10.	Textbook(s): 1. Tangirala A K, Principles of System Identification - Theory and Practice, CRC Press (2014). 2. Shumway R H and Stoffer D S, Time-Series Analysis and its Applications: With R Examples, 4th Edition, Springer-Verlag, New York (2017).	
11.	Reference(s): 1. Brockwell P J and Davis R A, Introduction to Time-Series and Forecasting, 2nd Edition, Springer Series in Statistics (2002). 2. Cryer J D and Chen K-S, Time Series Analysis with Applications in R, 2nd Edition, Springer (2008). 3. Priestley M B, Spectral Analysis and Time-Series, Academic Press (1981). 4. Box G, Jenkins G M and Reinsel G, Time Series Analysis: Forecasting & Control, 3rd Edition, Prentice Hall India (1994).	