APPROVED

DATA C9005: Time Series Analysis

Module Details

Module Code:	DATA C9005
Full Title:	Time Series Analysis APPROVED
Valid From::	Semester 1 - 2024/25 (September 2024)
Language of Instruction:	English
Duration:	1 Semester
Credits::	5
Module Owner::	Rajesh Jaiswal
Departments:	Unknown
Module Description:	This module builds on fundamentals of linear algebra needed to comprehend various dimension reduction techniques, time series and auto-correlated responses. The module focuses on dimension reduction techniques such as ICA and PCA of time series data for prediction and signal extraction. Students will learn techniques to build various time series models for time series forecasting.

Module Learning Outcome	
On successful completion of this module the learner will be able to:	
#	**Module Learning Outcome Description**
MLO1	Investigate the role of linear algebra in Statistics
MLO2	Interpret and implement dimension reduction techniques using basis vectors
MLO3	Design and develop regression and time series models for prediction, and give an account of the paradigm under which the forecasts are being made, along with their reliability.
MLO4	Perform diagnostic analysis and forecasts for time series models

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named DkIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).*
No recommendations listed

Module Indicative Content
Linear Algebra Matrix Algebra, Eigenvalues, Eigenvectors, Linear transformations
Basis Vectors and Data Projections Dimension reduction - Principle Components Analysis, Independent Component Analysis, Common Factor Analysis - Non-negative Matrix Factorisation
Time series Analysis Time and Frequency domain analysis. Decomposition, Smoothing Techniques, Stationarity, Autocorrelation, Correlograms, Autoregressive (AR), Moving Average (MA) and ARIMA models.
Forecasting Forecast Error, Confidence Intervals, MAE, MAPE, MPE, RMSE, Ljung-Box Statistic

Module Assessment

Assessment Breakdown	%
Course Work	50.00%
Final Examination	50.00%

Module Special Regulation

Assessments

Full-time

Course Work

Assessment Type	Continuous Assessment	**% of Total Mark**	15
Marks Out Of	100	**Pass Mark**	40
Timing	S1 Week 4	**Learning Outcome**	1,2
Duration in minutes	0		

Assessment Description
Assignment covering the role of linear algebra in Statistics and application of dimension reduction techniques

Assessment Type	Continuous Assessment	**% of Total Mark**	35
Marks Out Of	100	**Pass Mark**	40
Timing	S1 Week 10	**Learning Outcome**	1,2,3,4
Duration in minutes	0		

Assessment Description
Data Project 2- End of semester project where students will use regression and time series model for a data analytics problem and perform a diagnostic analysis and carry out informed predictions.

No Project

No Practical

Final Examination

Assessment Type	Formal Exam	**% of Total Mark**	50
Marks Out Of	100	**Pass Mark**	40
Timing	End-of-Semester	**Learning Outcome**	1,2,3,4
Duration in minutes	120		

Assessment Description
End of module examination covering all the learning outcomes

Part-time

Course Work

Assessment Type	Continuous Assessment	**% of Total Mark**	15
Marks Out Of	100	**Pass Mark**	40
Timing	S1 Week 4	**Learning Outcome**	1,2
Duration in minutes	0		

Assessment Description
Assignment covering the role of linear algebra in Statistics and application of dimension reduction techniques

Assessment Type	Continuous Assessment	**% of Total Mark**	35
Marks Out Of	100	**Pass Mark**	40
Timing	S1 Week 10	**Learning Outcome**	1,2,3,4
Duration in minutes	0		

Assessment Description
Data Project 2- End of semester project where students will use regression and time series model for a data analytics problem and perform a diagnostic analysis and carry out informed predictions.

No Project

No Practical

Final Examination

Assessment Type	Formal Exam	**% of Total Mark**	50
Marks Out Of	100	**Pass Mark**	40
Timing	End-of-Semester	**Learning Outcome**	1,2,3,4
Duration in minutes	120		

Assessment Description
End of Module Examination covering all the learning outcomes

Reassessment Requirement

A repeat examination
Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

DKIT reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full-time					
Workload Type	*Contact Type*	*Workload Description*	*Frequency*	*Average Weekly Learner Workload*	*Hours*
Lecture	Contact	1-hour lecture to cover theory of time series analysis	Every Week	1.00	1
Practical	Contact	2-hour labs with integrated tutorials	Every Week	2.00	2
Directed Reading	Non Contact	Lecture notes, books and online materials	Every Week	1.00	1
Independent Study	Non Contact	Lecture notes, books and online materials	Every Week	4.00	4
				Total Weekly Learner Workload	8.00
				Total Weekly Contact Hours	3.00

Workload: Part-time					
Workload Type	*Contact Type*	*Workload Description*	*Frequency*	*Average Weekly Learner Workload*	*Hours*
Lecture	Contact	1-hour lecture to cover theory of time series analysis	Every Week	1.00	1
Practical	Contact	2-hour labs with integrated tutorials	Every Week	2.00	2
Directed Reading	Non Contact	Lecture notes, books and online materials	Every Week	1.00	1
Independent Study	Non Contact	Lecture notes, books and online materials	Every Week	4.00	4
				Total Weekly Learner Workload	8.00
				Total Weekly Contact Hours	3.00

Module Resources

Recommended Book Resources

Peter J. Brockwell, Richard A. Davis. (2016), Introduction to Time Series and Forecasting (Springer Texts in Statistics).

Supplementary Book Resources

Aileen Nielsen. (2019), Practical Time Series Analysis.

This module does not have any article/paper resources

Other Resources

Website, GITHUB - python,
https://github.com/rouseguy/TimeSeriesAn alysiswithPython