

| Time Series Forecasting & NLP Elective |            |                                       |                                |  |  |  |  |   |  |   |
|--|------------|---------------------------------------|--------------------------------|--|--|--|--|---|--|---|
| Day                                    | Date       | Track Name                            | Sub Track                      | Topics   | Subtopics                                      | Session 1  | Session 2  | Session 3   | Session 4  | TOOLS/CASE STUDY  |
| 1                                      | 27-01-2026 | Time Series                           | Time Series Statistics         | Time-dependent features, trend, seasonality, autocorrelation | ACF, PACF, stationarity testing                | Introduction to Time Series Data, Overview of time series data. Components: trend, seasonality, noise.   | Exploring Trend and Seasonality, Identifying trends and seasonal patterns. Decomposition of time series data.                    | Autocorrelation and Partial Autocorrelation Analysis, Autocorrelation: Measuring correlation of time series with lagged values. Partial Autocorrelation: Identifying direct relationships without indirect influence. | Stationarity Testing and Visualization, Testing for stationarity, Visualizing stationarity with plots (ACF, PACF).   | Statsmodels, Pandas, Matplotlib, Seaborn, R (forecast package), Prophet, H2O.ai, Tableau                              |
| 2                                      | 28-01-2026 | Time Series                           | AR & MA Models                 | Autoregressive and Moving Average models                     | Lag selection, parameter tuning                | Introduction to AR and MA Models, Overview of AR and MA models. Key differences between AR, MA and ARMA.   | Understanding AR and MA Processes, AR: Dependency on previous values., MA: Dependency on past errors.                            | Parameter Selection and Tuning, Choosing lag (p, q). Tuning with grid search.   | Model Evaluation and Diagnostics, Residual analysis (ACF, PACF). Model evaluation (AIC, BIC).  | Statsmodels, Scikit-learn, R (forecast package), Pandas, Matplotlib, Seaborn, H2O.ai.                                 |
| 3                                      | 29-01-2026 | Time Series                           | ARMA & ARIMA Models            | Combining AR and MA, differencing for stationarity           | Model diagnostics, error metrics               | ARMA Model Construction, Combining AR and MA models. Model structure: $AR(p) + MA(q)$ .  | ARIMA Model Introduction and Difference Techniques, ARIMA: AR, MA, and differencing. Differencing for stationarity.              | Stationarity Through Differencing, Removing trends with differencing, Identifying the order of differencing (d).  | ARIMA Model Diagnostics and Evaluation, Residual analysis for ARIMA. Model evaluation with AIC, BIC, and forecast accuracy.  | Statsmodels, Scikit-learn, R (forecast package), Pandas, Matplotlib, Seaborn, H2O.ai.                                 |
| 4                                      | 30-01-2026 | Time Series                           | SARIMA & SARIMAX               | Seasonal components, exogenous variables                     | SARIMA, SARIMAX models, forecasting            | Seasonal Patterns in SARIMA Models, Capturing seasonal trends with SARIMA. Seasonal differencing and seasonal parameters.                                  | Exogenous Variables in SARIMAX, Adding external variables (X) in SARIMAX. Impact of exogenous variables on forecasting.          | Parameter Selection for SARIMA & SARIMAX, Choosing seasonal and non-seasonal parameters. Grid search for optimal parameters (p, d, q, P, Q).  | SARIMAX Forecasting and Validation, Forecasting with SARIMAX model. Model validation using residual analysis and accuracy metrics.                                       | Statsmodels, Scikit-learn, R (forecast package), H2O.ai, Pandas, Matplotlib, Seaborn.                                 |
| 5                                      | 31-01-2026 | NLP                                   | Text Processing                | Tokenization, stop word removal, stemming, lemmatization     | Part-of-speech tagging                         | Introduction to NLP, Overview and key applications (text classification, sentiment analysis).  | Tokenization and Stop Word Removal-Splitting text into tokens, removing common words.  | Lemmatization and Stemming Techniques-Lemmatization: Base form, Stemming: Root form.  | Part-of-Speech Tagging and Entity Recognition - POS tagging: Identifying word types, NER: Extracting entities.   | NLTK, SpaCy, Gensim, Scikit-learn, TextBlob, Hugging Face Transformers, Stanford NLP, Pattern.                        |
| 6                                      | 02-02-2026 | NLP                                   | Text Cleaning & Annotation     | Removing noise, entity recognition, labelling strategies     | Data annotation strategies                     | Text Cleaning Fundamentals - Removing noise, special characters, and handling missing data.  | Entity Recognition with spaCy - Using spaCy for Named Entity Recognition (NER).  | Annotation and Labeling Techniques - Manual and automated data labeling.  | Noise Removal and Text Pre-processing - Removing stop words, punctuation, and tokenization.  | SpaCy, NLTK, TextBlob, Hugging Face Transformers, Pandas, Prodigy, Labelbox, RapidMiner.                              |
| 7                                      | 03-02-2026 | NLP                                   | Rule-Based NLP                 | Pattern matching with spaCy, custom rules                    | Phrase matching, entity ruler                  | Introduction to Rule-Based NLP - Overview of rule-based methods in NLP. Applications: Text extraction, information retrieval.                              | Rule Creation and Pattern Matching - Defining rules and matching patterns in text.   | Phrase Matching and Entity Ruler - Matching specific phrases and entities using spaCy's Entity Ruler.   | Customizing spaCy for Rule-Based Matching - Customizing spaCy pipeline for specific rule-based matching tasks  | SpaCy, NLTK, Regex, Hugging Face Transformers, Prodigy, Pattern, RapidMiner.  |
| 8                                      | 04-02-2026 | NLP                                   | Text Classification            | Binary, multi-class, multi-label classification              | Evaluation metrics, confusion matrix           | Introduction to Text Vectorization - Converting text to numerical format (e.g., TF-IDF, Word2Vec).   | Binary Text Classification Models - Classifying text into two categories (e.g., spam vs. non-spam).                              | Multi-Class and Multi-Label Classification - Multi-class: Assigning one category to each text. Multi-label: Assigning multiple categories to each text.   | Confusion Matrix and Model Evaluation - Evaluating model performance using confusion matrix (accuracy, precision, recall, F1-score).                                     | Scikit-learn, NLTK, SpaCy, Hugging Face Transformers, Gensim, XGBoost, LightGBM, TensorFlow, Keras, RapidMiner.       |
| 9                                      | 05-02-2026 | NLP & GenAI                           | Advanced Classification Models | fastText, advanced classification techniques                 | Model training and tuning                      | Introduction to fastText for Classification - Overview of fastText for text classification. Benefits: Speed and efficiency in training.                    | Training Classifiers Using fastText - Training models with labeled data using fastText. Steps: Data preparation, model training. | Model Tuning and Evaluation - Hyperparameter tuning for optimal performance. Evaluating model using accuracy, precision, recall.  | Advanced Classification with GenAI Integration - Enhancing classification models with GenAI tools. Integrating fastText with GenAI for improved results.                 | fastText, Hugging Face Transformers, Scikit-learn, TensorFlow, Keras, XGBoost, LightGBM, H2O.ai, Google Cloud AutoML. |
| 10                                     | 06-02-2026 | Time Series & NLP                     | GenAI for Forecasting & NLP    | Apply GenAI for forecasting and text preprocessing           | Automating predictions and insights extraction | GenAI Tools Overview for Time Series Forecasting - Overview of GenAI tools for time series analysis. Applying GenAI for forecasting accuracy improvements. | Using GenAI for NLP and Text Cleaning - Leveraging GenAI for text preprocessing. Automating text cleaning with GenAI.            | Enhancing Model Predictions with GenAI - Using GenAI to improve model accuracy and predictions. Fine-tuning models with GenAI integration.  | Final Project Integration: Time Series + NLP Automation - Combining time series forecasting and NLP with GenAI. End-to-end automation for forecasting and text analysis. | Google Cloud AutoML, H2O.ai, DataRobot, TensorFlow, Hugging Face Transformers, MLflow, Amazon SageMaker, RapidMiner.  |
| 11                                     | 07-02-2026 | <b>REVISION</b>                       |                                |  |  |  |  |   |  |   |
| 12                                     | 09-02-2026 | <b>FINAL END SEMESTER EXAMINATION</b> |                                |  |  |  |  |   |  |   |