



# Aror University of Art, Architecture, Design & Heritage Sukkur.

## BS (Artificial Intelligence) Fall-2025 Natural Language Processing

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**Course Code:** ARI-302

**Credit Hours:** (2+1)

**Course Instructor:** Abdul Aziz

**Electronic mail:** aziz.faculty@aror.edu.pk

### Description:

This course introduces Natural Language Processing (NLP), a field of Artificial Intelligence that enables machines to understand, interpret, and generate human language. The course covers classical and modern approaches, ranging from text preprocessing and statistical models to deep learning and transformer-based architectures. Practical labs emphasize implementation using Python and NLP libraries.

### Aims and Objectives:

1. Develop understanding of core NLP concepts and applications.
2. Learn classical methods: preprocessing, Bag-of-Words, TF-IDF, embeddings.
3. Gain hands-on practice with transformer-based NLP.
4. Build applications: sentiment analysis, chatbots, translation, summarization.

### Assessment:

S. No	Assessment Activities	Percentage	Total Activities
1	Sessional: Quizzes/Assignments/Lab Work	30%	10
2	Mid Term Exam	30%	1
3	Final Exam	40%	1

### Course Learning Outcomes (CLOs):

- C1: Understand fundamental concepts of NLP and classical methods (Domain: C, Level: 2).  
C2: Demonstrate ability to preprocess, represent, and model text (Domain: C, Level: 3).  
C3: Apply neural and transformer-based models to NLP tasks (Domain: C, Level: 3).  
C4: Design and implement NLP applications such as text classifiers, chatbots, and summarizers (Domain: C, Level: 4).



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## Course Outlines:

Week No	Lecture No	Topics	Reference	Course % Covered
01	01	Introduction to NLP: Definition, Applications, History; Install Python NLP tools	Ch.1 (Bird et al.)	5%
01	02	Introduction to NLP: Definition, Applications, History; Install Python NLP tools	Ch.1 (Bird et al.)	5%
02	03	Text Preprocessing: Tokenization, Stopwords, Stemming, Lemmatization	Ch.3 (Bird et al.)	10%
02	04	Text Preprocessing: Tokenization, Stopwords, Stemming, Lemmatization	Ch.3 (Bird et al.)	10%
03	05	Text Representation: Bag-of-Words, TF-IDF	Ch.4 (Bird et al.)	15%
03	06	Text Representation: Bag-of-Words, TF-IDF	Ch.4 (Bird et al.)	15%
04	07	Word Embeddings: Word2Vec, GloVe, FastText	Ch.6 (Bird et al.)	20%
04	08	Word Embeddings: Word2Vec, GloVe, FastText	Ch.6 (Bird et al.)	20%
05	09	Language Models: n-grams, Perplexity	Ch.5 (Bird et al.)	25%
05	10	Language Models: n-grams, Perplexity	Ch.5 (Bird et al.)	25%
06	11	Introduction to Neural NLP: RNNs, LSTMs	Ch.7 (Bird et al.)	30%
06	12	Introduction to Neural NLP: RNNs, LSTMs	Ch.7 (Bird et al.)	30%
07	13	Seq2Seq and Attention Mechanism	Ch.8 (Bird et al.)	35%
07	14	Seq2Seq and Attention Mechanism	Ch.8 (Bird et al.)	35%
08	15	Transformers: Self-Attention, Architecture	Tunstall et al., Ch.1-3	40%
08	16	Transformers: Self-Attention, Architecture	Tunstall et al., Ch.1-3	40%
09	17	Pretrained Models: BERT, GPT; Fine-tuning	Tunstall et al., Ch.4-6	45%



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09	18	Pretrained Models: BERT, GPT; Fine-tuning	Tunstall et al., Ch.4-6	45%
10	19	Information Extraction: POS, NER	Ch.9 (Bird et al.)	50%
10	20	Information Extraction: POS, NER	Ch.9 (Bird et al.)	50%
11	21	Text Classification: Spam detection, Sentiment analysis	Ch.10 (Bird et al.)	60%
11	22	Text Classification: Spam detection, Sentiment analysis	Ch.10 (Bird et al.)	60%
12	23	Question Answering and Chatbots	Tunstall et al., Ch.7	70%
12	24	Question Answering and Chatbots	Tunstall et al., Ch.7	70%
13	25	Machine Translation: Statistical vs Neural	Tunstall et al., Ch.8	80%
13	26	Machine Translation: Statistical vs Neural	Tunstall et al., Ch.8	80%
14	27	Summarization: Extractive and Abstractive	Tunstall et al., Ch.9	85%
14	28	Summarization: Extractive and Abstractive	Tunstall et al., Ch.9	85%
15	29	Ethics in NLP: Bias, Fairness, Multilingual NLP	Ch.11 (Bird et al.)	90%
15	30	Ethics in NLP: Bias, Fairness, Multilingual NLP	Ch.11 (Bird et al.)	90%
16	31	Revision + Final Project Presentations	All References	100%
16	32	Revision + Final Project Presentations	All References	100%



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## **Text Books:**

1. Bird, S., Klein, E., & Loper, E. (2009). Natural Language Processing with Python. O'Reilly Media. (Main Book)
2. Tunstall, L., von Werra, L., & Wolf, T. (2022). Natural Language Processing with Transformers. O'Reilly Media. (Reference Book)