INTERNATIONAL QUALIFICATIONS

AND ASSESSMENT CENTRE (IQAC)

«Approved»

2025 y. «__» _____

Programme	**LEVEL 5 EXTENDED DIPLOMA IN ARTIFICIAL INTELLIGENCE**		
Unit Number/ Unit Title	UNIT 9 NATURAL LANGUAGE PROCESSING (NLP)		
Cohort Code:	L05NLP-U9		
Unit Level	5		
Total GLH	Total qualification time 200/ Total Guided learning hours 90/ Self-guided learning hours 110		
Credits	20 CATS/ 10 ECTS		
Lecturer			
Start Date		**End Date**	

Unit Aims	Students will explore various NLP techniques, including text preprocessing, tokenization, and sentiment analysis, focusing on their applications in tasks such as language translation and chatbots. The unit will cover advanced topics in NLP, including recurrent and transformer-based models, and their use in developing conversational AI systems.
Differentiation Strategies *(e.g. planned activities or support for individual learners according to their needs)*	The total number of students to be in the lesson is approximately 20. This is a multicultural group of students predominantly between the ages of 24 – 45, with numerous ethnic, gender, and creed background. These are UK academic level 5 students; hence it is assumed that they have practical, theoretical, or technological knowledge and understanding of a subject or field of work to find ways forward in broadly defined, complex contexts. These students must be able to generate information, evaluate, synthesise the use information from a variety of sources. Various approaches to addressing the various identified students needs will be adopted throughout the lesson. Such will include:- 1. Progressive tasks 2. Digital resources

	3. Verbal support 4. Variable outcomes 5. Collaborative learning 6. Ongoing assessment 7. Flexible-pace learning
Equality & Diversity	Variety of teaching techniques will be employed to ensure that the needs of each individual learner are met.
Safeguarding & Prevent	Safeguarding policies and the Prevent duty are strictly observed to ensure the safety, well-being, and inclusivity of all students and staff.
Health & Safety	SIRM H&S policies will be maintained.
Learning Resources	**Teaching and Learning Materials** • "Speech and Language Processing" by Daniel Jurafsky and James H. Martin • "Natural Language Processing with PyTorch" by Delip Rao and Brian McMahan • "Natural Language Processing with Python" by Steven Bird, Ewan Klein, and Edward Loper • "Deep Learning for Natural Language Processing" by Jason Brownlee • "Hands-On Natural Language Processing with Python" by Rajesh Arumugam and Rajalingappaa Shanmugamani.

Learning Outcome	Assessment Criteria
LO1. Understand the fundamentals of NLP.	1.1 Explain key concepts and techniques in natural language processing. 1.2 Describe the process of tokenization, parsing, and semantic analysis. 1.3 Understand the challenges of ambiguity and context in natural language understanding.
LO2. Develop NLP applications.	2.1 Implement text pre-processing techniques such as stemming and lemmatization. 2.2 Build models for text classification and sentiment analysis. 2.3 Create and evaluate language models for text generation.
LO3. Utilize deep learning for NLP tasks.	3.1 Apply recurrent neural networks (RNNs) and long short-term memory (LSTM) networks for sequence modelling. 3.2 Implement transformer-based models such as BERT and GPT for advanced NLP tasks. 3.3 Use attention mechanisms to improve model performance on complex NLP tasks.
LO4. Evaluate NLP models.	4.1 Assess model performance using metrics like accuracy, precision, recall, and F1 score. 4.2 Conduct error analysis to identify and address weaknesses in NLP models. 4.3 Optimize NLP models for efficiency and scalability.
LO5. Understand the ethical considerations in NLP.	5.1 Discuss the ethical implications of NLP applications, including privacy and bias issues. 5.2 Evaluate the impact of biased training data on NLP model predictions. 5.3 Develop strategies to mitigate ethical risks in NLP.

No	Learning Outcome / Topic	Learning and Teaching Activities	Which assessment criteria does the session relate to?	Day/month/year/ signature
1.	**Introduction to NLP**	**Introduction to NLP** Definition, applications (chatbots, translation), and challenge	LO1: NLP Fundamentals (Theory)	
2.	**Linguistic Essentials**	**Linguistic Essentials** Syntax vs. semantics, morphology, pragmatics	LO1: NLP Fundamentals (Theory)	
3.	**Text Preprocessing I**	**Text Preprocessing I** Tokenization, stopword removal, regex cleaning	LO1: NLP Fundamentals (Theory)	
4.	**Text Preprocessing II**	**Text Preprocessing II** Stemming (Porter), lemmatization (WordNet), POS tagging	LO1: NLP Fundamentals (Theory)	
5.	**Language Ambiguity**	**Language Ambiguity** Lexical (homonyms), syntactic, and real-world examples	LO1: NLP Fundamentals (Theory)	
6.	**Text Representation**	**Text Representation** Bag-of-Words, TF-IDF, n-grams (hands-on with scikit-learn)	LO2: NLP Application Development (Practical)	
7.	**Text Classification**	**Text Classification** Naïve Bayes, SVM for sentiment analysis (IMDb dataset)	LO2: NLP Application Development (Practical)	
8.	Half-Term Exam	- Review of LO1 topics - Practice questions and mock assessment - **Half-term assessment** based on LO1 (theory)	LO1 LO2	
9.	**Language Models**	**Language Models** N-gram models, perplexity evaluation	LO2: NLP Application Development (Practical)	
10.	**Word Embeddings**	**Word Embeddings** Word2Vec, GloVe (implementation with Gensim)	LO2: NLP Application Development (Practical)	

11.	**Named Entity Recognition (NER)**	**Named Entity Recognition (NER)** spaCy implementation for entity detection	LO2: NLP Application Development (Practical)	
12.	**RNNs & LSTMs**	**RNNs & LSTMs** Architecture, vanishing gradients, text generation	LO3: Deep Learning for NLP	
13.	**Seq2Seq Models**	**Seq2Seq Models** Encoder-decoder architecture, teacher forcing	LO3: Deep Learning for NLP	
14.	Final Exam Preparation & Review	- Comprehensive review of all learning outcomes - Practice questions and revision of key topics		
15.	Final Exam	- **Final-term assessment** covering all learning outcomes (theory and practical elements)		
16.	Feedback & Reflection	- Review of final exam - Individual feedback on performance - Reflective discussion on key learning points		
17.	**Transformer Revolution**	**Transformer Revolution** Self-attention, multi-head attention (conceptual)	LO3: Deep Learning for NLP	
18.	**BERT & GPT Models**	**BERT & GPT Models** Pretraining/fine-tuning, Hugging Face transformers	LO3: Deep Learning for NLP	
19.	**Attention Mechanisms**	**Attention Mechanisms** Visualizing attention weights in translation tasks	LO3: Deep Learning for NLP	
20.	**Evaluation Metrics**	**Evaluation Metrics** Precision/recall, F1, confusion matrices for NLP	LO4: Model Evaluation & Optimization	
21.	**Error Analysis Workshop**	**Error Analysis Workshop** Case study: Bias in hate speech detection	LO4: Model Evaluation & Optimization	
22.	**Model Optimization**	**Model Optimization** Quantization, distillation for edge deployment	LO4: Model Evaluation & Optimization	
23.	Half-Term Exam	**NLP Project Lab** End-to-end pipeline (topic modeling + visualization)		

24.	**Scalability Challenges**	**Scalability Challenges** Handling large text corpora (Dask, Spark NLP)	LO4: Model Evaluation & Optimization	
25.	**Bias in NLP**	**Bias in NLP** Gender/racial bias in word embeddings (Bolukbasi et al.)	LO5: Ethics in NLP	
26.	**Privacy Concerns**	**Privacy Concerns** Data anonymization, GDPR compliance	LO5: Ethics in NLP	
27.	**Mitigation Strategies**	**Mitigation Strategies** Debiasing techniques, diverse dataset curation	LO5: Ethics in NLP	
28.	**Multilingual NLP**	**Multilingual NLP** Low-resource language challenges	LO5: Ethics in NLP	
29.	Final Exam Preparation & Review	LO1, LO2, LO3, LO4	LO1, LO2, LO3, LO4	
30.	Final Exam		LO1, LO2, LO3, LO4	