CO6	Ability to describe real-world applications of Speech and Natural Language Understanding.

S. NO.	Contents	Contact Hours
UNIT 1	**Introduction to natural language understanding using speech:** Introduction to Natural Language Understanding using speech signals. Characteristics of speech signals-pitch, energy, formants etc. Extraction, analysis and classification of speech-based features such as MFCC and spectrograms. Phonetics- phonemes, phonetic analysis of English words.	**12**
UNIT 2	**Introduction to natural language understanding using text**: Introduction to Natural Language Understanding using text. Pattern matching using regular expressions. Text pre-processing: Tokenization, Lemmatization, Stemming. Bag of Words, 1-hot encoding, TF, TF-IDF, N-gram language modelling, Word Embeddings.	**12**
UNIT 3	**Text-based semantics:** Word Senses, WordNet, Synsets, Hypernyms, Hyponyms, Meronyms, Holonyms, Word Sense Disambiguation, Word Similarity, Semantic Role Labelling.	**8**

UNIT 4	**Advanced techniques:** Large Language Models, Deep learning models for speech and text, Machine Translation, Man-Machine Interfaces, Advanced speech recognition systems.	**10**
	TOTAL	**42**