Course code: Course Title	Course Structure			Pre-Requisite
SE314: Natural Language Processing	L	T	P	Theory of Automata
	3	1	0	

Course Objective: The goal of natural language processing (NLP) is to design and build computer systems that are able to analyze natural languages like German or English, and that generate their outputs in a natural language.

S. NO	Course Outcomes (CO)
CO1	Demonstrate understanding of fundamental concepts of natural language processing, including language structures, and finite-state automata.
CO2	Utilize various parsing techniques such as top-down, bottom-up, and feature-based parsing to analyse natural language structures.
CO3	Demonstrate grammars for natural language processing.
CO4	Implement probabilistic and statistical models, dependency parsing, and ambiguity resolution techniques in NLP applications.
CO5	Develop and demonstrate real-world NLP applications such as machine translation, speech recognition, and intelligent interfaces using advanced NLP techniques.

S. NO	Contents	Contact Hours
UNIT 1	**Introduction:** The study of Language, Introduction to NLP, Regular Expression, Finite State Automata, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Linguistic Background.	6
UNIT 2	**Grammars and Parsing:** Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.	7
UNIT 3	**Grammars for Natural Language:** Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars, Hold mechanisms in ATNs, Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.	6
UNIT 4	**Ambiguity Resolution:** Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Dependency Parsing, Best First Parsing, Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.	7
UNIT 5	**Advanced Features and Syntax, Features and Unification:** Feature structures – Unification of feature structures – Features structures in the grammar – Implementing unification – Parsing with unification constraints – Types and Inheritance. Lexicalized and Probabilistic Parsing: Probabilistic context-free grammar – problems with PCFGs – Probabilistic lexicalized CFGs – Dependency Grammars – Human parsing.	8
UNIT 6	**Application of NLP:** Intelligent Work Processors, Machine Translation, User Interfaces, Man-Machine Interfaces, Natural language Querying Tutoring and Authoring Systems, Speech Recognition Commercial use of NLP, Semantic Interpretation, Information Retrieval.	8
	TOTAL	**42**

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	James Allen, "Natural Language Understanding", Pearson Education, 2nd Edition.	**2002**
2	Christopher D. Manning, Hinrich Schutze, "Foundation of Statistical Natural Language Processing, The MIT Press.	**1999**
3	Daniel Jurafsky, James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Pearson Education India, 2nd Edition.	**2013**
4	Akshar Bharati, Vineet Chaitanya, Rajeev Sangal, "Natural Language Processing: A Paninian Perspective", Prentice Hall India Learning Private Limited.	**1995**
5	J. G. Carbonell, K.W. Church, W. Dilger, T. W. Finin, P.J. Hayes, W.A. Martin, J. G. Neal, R. S. Patil, J. Pitrat, A. Sagvall Hein, S.C. Shapiro, S. L. Small, M. Stone Palmer, M. Thiel, Leonard Bolc, "Natural Language Parsing Systems (Artificial Intelligence)", Springer-Verlag Berlin and Heidelberg GmbH & Co. K, 1st Edition.	**2011**