# BSCE0156: NATURAL LANGUAGE PROCESSING

**Objective:** *The objective of this course is to introduce to the students the leading trends and system in natural language processing and make them understand the concepts of morphology, syntax, semantics and pragmatics of the language.*

**Credits: 03** **L-T–P: 3–0–0**

| Module No. | Content | Teaching Hours |
|---|---|---|
| I | Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural Language Understanding Systems, Linguistic Background: An outline of English syntax.<br>Applications: Named entity recognition and relation extraction- IE using sequence labelling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment- phrase-based translation – Question Answering<br>Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks. | 20 |
| II | Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.<br><br>Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part of speech Tagging - Rule-Based Part of Speech Tagging - Markov Models - Hidden Markov Models, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form. | 20 |

**Text Book:**

1. James Allen, Natural Language Understanding, 2/e, Pearson Education, 2003

**Reference Books:**

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education, 2002
3. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
4. T. Winograd, Language as a Cognitive Process, Addison-Wesley

**Outcomes:** After the completion of the course, the student will be able to:

- CO1: Understand the core tasks in NLP and its applications in real problems.
- CO2: Understand the human languages, be familiar with the most mainstream descriptive and theoretical frameworks for handling their properties.
- CO3: Understand the basics of knowledge representation, inference, and relations to the artificial intelligence.
- CO4: Understand the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics.
- CO5: Understand the various translation strategies and techniques of maintaining balance among the three basic criteria of translation: accuracy, clarity and naturalness.
- CO6: Apply the Markov Models and it's variants to do the Part of Speech Tagging.

**Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):**

| COs | POs/PSOs |
|---|---|
| CO1 | PO1/PSO1 |
| CO2 | PO2/PSO1 |
| CO3 | PO2,PO5/PSO5 |
| CO4 | PO3/PSO3 |
| CO5 | PO1/PSO1 |
| CO6 | PO5/PSO4 |