MOOC APPROVAL REQUEST

As per KTU B.Tech Regulations 2024, Section 17

_____

KTU Course Code: PECST862

KTU Course Name: Natural Language Processing

NPTEL Course Name: Natural Language Processing

Instructor: Prof. Pawan Goyal

Institution: IIT Kharagpur

Duration: 12 Weeks

Course ID: noc26-cs45

Semester: Jan-Apr 2026

Date: December 02, 2025

This document contains:

1. KTU Course Syllabus (Complete)
2. NPTEL Course Details
3. Syllabus Comparison for 70% Match Verification

Submitted for approval as per R 17.5 of KTU B.Tech Regulations 2024.

SECTION A
KTU COURSE SYLLABUS

NATURAL LANGUAGE PROCESSING
(Common to CS/CA/CD)

Course Code	PECST862	CIE Marks	40
Teaching Hours/Week (L:T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To provide a comprehensive understanding of natural language processing (NLP) and language models, focusing on the principles and techniques of prompt engineering to effectively guide and optimize AI-driven outputs.

2. practical skills necessary to design, implement, and evaluate prompt engineering strategies across various applications, while considering the ethical implications and challenges associated with AI-generated content.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Introduction to NLP:** Introduction to Natural Language Processing - Various stages of traditional NLP – Challenges - Basic Text Processing techniques - Common NLP Tasks. N-gram Language Models - Naive Bayes for Text Classification, and Sentiment Analysis – Evaluation-Precision, Recall and F-measure-Test sets and cross validation.	7
2	**Traditional NLP Techniques**: Annotating Linguistic Structures - Context-Free Grammars, Constituency Parsing, Ambiguity, CYK Parsing, Dependency Parsing - Transition-Based Dependency Parsing, Graph-Based Dependency Parsing, Evaluation.	7
3	**Neural Networks for NLP:** Word representations - Lexical Semantics, Vector Semantics, TF-IDF, Pointwise Mutual Information (PMI), Neural Word embeddings - Word2vec, GloVe, Contextual Word Embeddings. Evaluating Vector Models - Feedforward Neural Networks for Text Classification	10

4	**Advanced NLP and Applications:** Sequence Modelling - Recurrent Neural Networks, RNNs as Language Models, RNNs for NLP tasks, Stacked and Bidirectional RNN architectures, Recursive Neural Networks, LSTM & GRU, Common RNN NLP Architectures, Encoder-Decoder Model with RNNs, Attention models, Transformers. NLP Applications - Machine Translation, Question Answering and Information Retrieval, Introduction to Large Language Models.	**12**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total

● 2 Questions from each module.
● Total of 8 Questions, each carrying 3 marks
 	
      (8x3 =24 marks)
	● Each question carries 9 marks.
	● Two questions will be given from each module, out of which 1 question should be answered.
	● Each question can have a maximum of 3 subdivisions.
	      (4x9 = 36 marks)
		60

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand the foundational concepts of NLP and apply that to do text processing.	K3
CO2	Utilize word representations and evaluate vector models for NLP	K3
CO3	Analyse and implement advanced linguistic annotation and parsing techniques	K4
CO4	Apply advanced sequence modeling techniques using Neural Networks	K3
CO5	Apply NLP techniques in machine translation, question answering, and information retrieval.	K3

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3								3		
CO2	3	3			3							
CO3	3	3									3	
CO4	3	3	3		3							
CO5	3	3	3			3						

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Speech and language processing: An introduction to natural language processing, computational linguistics, and speech recognition	Dan Jurafsky and James H. Martin.	Pearson	2006
2	Introduction to Natural Language Processing	Jacob Eisenstein	MIT Press	2019
3	Natural Language Processing with Transformers	Lewis Tunstall, Leandro von Werra, and Thomas Wolf	O'Reilly	2022

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Deep learning for Natural Language Processing	Stephan Raaijmakers	Manning	2022
2	Natural Language Processing with PyTorch	Delip Rao and Brian McMahan	O'Reilly	2019
3	Deep Learning	Ian Goodfellow, Yoshua Bengio, Aaron Courville	MIT Press	2016

Video Links (NPTEL, SWAYAM…)	
No.	**Link ID**
1	https://onlinecourses.nptel.ac.in/noc19_cs56

SECTION B
NPTEL COURSE DETAILS

NATURAL LANGUAGE PROCESSING

PROF. PAWAN GOYAL
Department of Computer Science and Engineering

IIT Kharagpur

PRE-REQUISITES : Basic knowledge of probabilities for the lectures and python for programming assignment

INDUSTRIES APPLICABLE TO : Microsoft Research, Google, Adobe, Xerox, Flipkart, Amazon

COURSE OUTLINE :
This course starts with the basics of text processing including basic pre-processing, spelling correction, language modeling, Part-of-Speech tagging, Constituency and Dependency Parsing, Lexical Semantics, distributional Semantics and topic models. Finally, the course also covers some of the most interesting applications of text mining such as entity linking, relation extraction, text summarization, text classification, sentiment analysis and opinion mining.

ABOUT INSTRUCTOR :
Prof. Pawan Goyal is an Assistant Professor at the Department of Computer Science and Engineering, IIT Kharagpur. His research interests include Natural Language Processing, Text Mining, Information Retrieval and Sanskrit Computational Linguistics. He has published around 75 research papers in international conferences and journals. He has published in various top-tier conferences and journals including ACL, NAACL, EMNLP, SIGIR, KDD, CIKM, JCDL, ICWSM, CSCW, Coling, IEEE and ACM transactions. Prior to joining IIT Kharagpur, he received his B. Tech. degree in Electrical Engineering from IIT Kanpur in 2007 and his Ph.D. degree in the faculty of Computing and Engineering from University of Ulster, UK in 2011. He was then a Post Doctoral Fellow at INRIA Paris Rocquencourt.

COURSE PLAN :

Week 1: Introduction and Basic Text Processing

Week 2: Spelling Correction, Language Modeling

Week 3: Advanced smoothing for language modeling, POS tagging

Week 4: Models for Sequential tagging – MaxEnt, CRF

Week 5: Syntax – Constituency Parsing

Week 6: Dependency Parsing

Week 7: Distributional Semantics

Week 8: Lexical Semantics

Week 9: Topic Models

Week 10: Entity Linking, Information Extraction

Week 11: Text Summarization, Text Classification

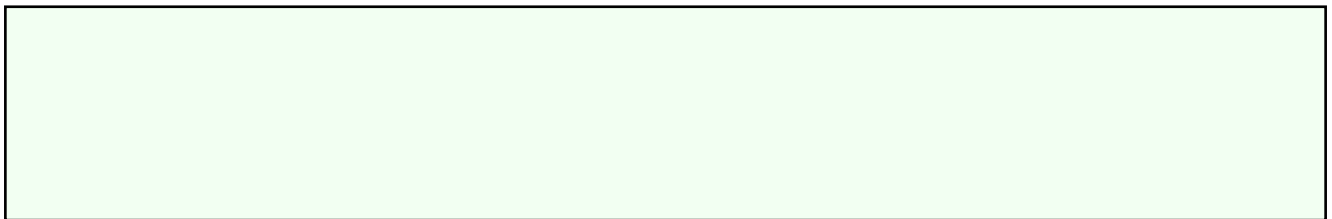**Week 12:** Sentiment Analysis and Opinion Mining

SECTION C
SYLLABUS COMPARISON

SYLLABUS COMPARISON REPORT

KTU: PECST862 - Natural Language Processing
NPTEL: Natural Language Processing

KTU Topics	NPTEL Topics	Match
Module 1	Week 1-2	? Matched
Module 2	Week 3-4	? Matched
Module 3	Week 5-6	? Matched
Module 4	Week 7-8	? Matched
Module 5	Week 9-10	? Matched

RECOMMENDATION

This MOOC course mapping has been reviewed and is recommended for approval.

The proposed NPTEL course meets all the requirements specified in:
? R 17.1 - Approved MOOC Agency (NPTEL/SWAYAM)
? R 17.2 - Minimum 8 weeks duration
? R 17.3 - Online mode with proctored examination
? R 17.4 - At least 70% content overlap with KTU syllabus

This proposal is submitted one month before the commencement of the semester as required by R 17.5.

Verified by:

_____   _____
  HoD (Department)   IQAC Coordinator

_____
   Principal