ANNEXURE: 1 MODULE WISE COURSE CONTENT AND OUTCOME

SL.NO	MODULE NAME	MODULE CONTENT	MODULE LEARNING OUTCOME	DURATION (HRS)
1	**Introduction to Natural Language Processing**	Explore NLP and its applications- Basics of linguistics in NLP (syntax, semantics, and pragmatics) - NLP tasks: Text classification, tokenization, Named Entity Recognition (NER), part-of-speech tagging - Preprocessing techniques:Tokenization, stemming, lemmatization, stop word removal - NLP pipelines and their structure.	● Master basic NLP tasks like tokenization and stemming. ● Learn to clean and prepare raw text data for analysis. ● Apply fundamental text classification and tagging techniques.	9 Hrs
2	**Text Representation and Feature Extraction**	Bag of Words (BoW) model and its limitations - TF-IDF (Term Frequency-Inverse Document Frequency) model - Word embeddings: Word2Vec, GloVe, and FastText - Sentence embeddings using models like BERT, GPT - Dimensionality reduction techniques for feature selection.	● Apply different text feature extraction methods. ● Learn to visualize and interpret word importance in text. ● Gain experience with word embeddings and their applications in NLP.	9 Hrs
3	**Machine Learning in NLP**	Supervised and unsupervised learning algorithms for NLP - Classification algorithms for text: Naive Bayes, SVM, Logistic Regression - Clustering techniques: K-means, DBSCAN for document clustering - Evaluating NLP models: Precision, Recall, F1-score, ROC-AUC - Building and training models for sentiment analysis, spam detection.	● Implement machine learning algorithms for NLP tasks. ● Learn how to tune and optimize models for better accuracy. ● Develop an understanding of model evaluation metrics in NLP applications.	9 Hrs

4	**Deep Learning for NLP**	Introduction to neural networks for NLP tasks - Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTM), and GRU networks - Attention mechanisms and Transformers - Transfer learning in NLP with pre-trained models like BERT, GPT - Fine-tuning pre-trained models for specific NLP tasks.	• Gain experience in building and fine-tuning deep learning models for NLP. • Implement attention mechanisms for better text understanding. • Develop skills in using state-of-the-art models like BERT for NLP tasks.	9 Hrs
5	**Advanced NLP Applications**	Named Entity Recognition (NER) and relationship extraction - Text summarization: Extractive and abstractive methods - Language translation and sentiment analysis - Chatbots and conversational AI using NLP - NLP for speech recognition and generation.	• Master advanced NLP applications like NER and summarization. • Develop practical applications such as sentiment analysis and translation. • Apply advanced techniques to build real-world NLP tools.	9 Hrs

ANNEXURE : 2 Industry Use Cases/Final Projects

LEARNING OUTCOME	ASSESSMENT CRITERIA	PERFORMANCE CRITERIA	USE CASES
Develop natural language understanding with deep learning	Projects on understanding and processing natural language texts..	Applies deep learning models like BERT and GPT to interpret and understand text.	**Use Case 1:** Using BERT to develop a sentiment analysis tool for customer feedback on e-commerce platforms..
Implement text classification techniques	Exercises in classifying text based on content categories.	Effectively applies machine learning algorithms for accurate text classification.	**Use Case 2**: Building a system to classify legal documents into categories like contracts, agreements, and policies using machine learning..
Create language models for text generation.	Tasks on generating coherent and contextually relevant text.	Designs and trains language models that generate human-like text based on input.	**Use Case 3**: Developing a news article generator using GPT-3 to create human-like text content based on current events.
Design an NLP system for named entity recognition (NER)	Exercises on extracting entities from unstructured text.	Effectively identifies and extracts key entities like names, dates, and locations.	**Use Case 4**: Creating an NLP system to extract key information like names, dates, and locations from medical research papers.
Develop a chatbot for customer service	Projects on developing conversational agents.	Builds chatbots capable of understanding and responding to customer inquiries effectively.	**Use Case 5**: Building an intelligent customer service chatbot that answers queries about product details, return policies, and order tracking for an online store.
Implement machine translation for cross-language systems	Assignments on translating text across different languages.	Designs translation models that achieve high-quality translations across languages.	**Use Case 6**: Developing an automatic translation system for an e-commerce platform to allow customers to view product descriptions in multiple
Create a recommendation system using NLP	Projects on recommending items based on user text data.	Applies NLP techniques to build personalized recommendation systems.	**Use Case 7**: Designing a personalized recommendation engine that uses NLP to analyze user reviews and suggest products accordingly.
Apply NLP for document	Assignments on creating summaries from long documents.	Successfully summarizes documents while	**Use Case 8**: Creating an NLP tool that summarizes long research articles into

summarization		retaining key information and context.	key points for quick review by scientists and researchers.
Design a text-based data extraction tool	Exercises in extracting specific information from text.	Effectively extracts relevant data such as names, dates, and financial figures from documents..	**Use Case 9**: Implementing an NLP tool that extracts key data such as names, dates, and financial figures from invoices and receipts for automated processing.
Develop a sentiment analysis model for social media	Projects on analyzing emotions in social media text.	Successfully categorizes the sentiment of social media posts (positive, negative, neutral)..	**Use Case 10**: Building a sentiment analysis model to track public sentiment about a brand on Twitter by analyzing mentions and hashtags.
Implement an NLP solution for automatic text translation.	Tasks on translating speech to text and vice versa.	Designs real-time translation systems for multiple languages, focusing on accuracy..	**Use Case 11**: Developing a real-time speech-to-text translation app that translates conversations from English to Spanish for travelers.
Create a question-answering system using deep learning	Assignments on building systems that answer text-based queries.	Designs a system that processes natural language questions and returns accurate answers.	**Use Case 12**: Building a medical Q&A system using BERT, where patients can ask health-related questions and get accurate responses based on medical journals and resources.
Develop text summarization for news and articles.	Projects on summarizing long-form content.	Develops accurate and concise text summaries while retaining essential details.	**Use Case 13**: Designing an NLP-based tool to generate concise summaries for daily news articles, enabling users to quickly catch up with current events.
Build an NLP-based email classifier	Exercises on automating the classification of email content.	Effectively categorizes emails into predefined categories (e.g., work, personal, spam).	**Use Case 14**: Designing a system that automatically classifies incoming emails into categories such as work, personal, and promotions for better organization.
Implement deep learning for predictive text systems	Tasks on developing systems to predict the next word or phrase.	Creates predictive models that generate text in a natural, contextually relevant manner.	**Use Case 15**: Developing a predictive text feature in a smartphone keyboard using NLP to suggest the next word based on user typing patterns.
Build an	Projects on detecting	Successfully filters	**Use Case 16**: Creating an

automated content moderation system	and filtering inappropriate language.	out harmful or inappropriate content based on context and keywords..	NLP-powered content moderation system that automatically filters inappropriate language from user-generated content on a social media platform.
Create a voice assistant using NLP	Projects on developing intelligent voice-controlled applications.	Designs voice assistants that understand and respond to a wide variety of user queries.	**Use Case 17**: Designing a voice-controlled assistant for smart homes that responds to user commands and queries about the weather, calendar events, and news.
Develop a deep learning-based language model for chatbots	Tasks on creating conversational models for chatbot interaction.	Develops sophisticated chatbot models that engage users in a natural, human-like manner.	**Use Case 18**: Building a chatbot for a healthcare provider to schedule appointments and answer general inquiries using a conversational model based on GPT-3.
Implement NLP for medical data analysis.	Assignments on extracting and analyzing medical data from texts.	Applies NLP models to identify and extract relevant medical information from clinical texts.	**Use Case 19**: Developing an NLP system that analyzes clinical trial reports and extracts relevant medical terms and results for further analysis.
Design a plagiarism detection tool using NLP	Projects on detecting text similarities in academic papers.	Develops systems that can accurately identify and compare text overlap and plagiarism.	**Use Case 20**: Creating an NLP-based plagiarism detection system for academic papers that identifies text overlap and similarity to previously published work.

LIST OF FINAL PROJECTS	
SL.NO	**FINAL PROJECT**
1	Spam Email Detection System
2	Social Media Sentiment Analysis
3	Named Entity Recognition for Legal Texts
4	Customer support chatbot
5	English to French Machine Translation System
6	News Article Summarization
7	Part-of-speech Tagging Tool
8	Text Classification for Topic Modeling
9	Voice Assistant for Home Automation
10	Text Similarity and Duplicate Detection System
11	Speech Sentiment Analysis
12	Legal Documentation Classification System
13	Fake news Detection System
14	Optical Character Recognition (OCR) System
15	Text-To-Speech (TTS) for Accessibility
16	Customer Review Analysis for E-Commerce
17	Social Media Content Moderation System
18	Resume Screening and Job Matching System
19	Topic Modeling for Research Papers
20	Automated Essay Grading System

ANNEXURE 3 – COURSE ASSESSMENT RUBRICS

COURSE ASSESSMENT RUBRICS (TOTAL MARKS: 70)				
ASSESSMENT CRITERIA	**DESCRIBE THE CRITERIA OF THE BELOW CATEGORY PERFORMANCE**			**TOTAL MARKS**
	FAIR	**GOOD**	**EXCELLENT**	
Natural Language Processing Techniques	Basic cleaning (e.g., removing punctuation)	Proper handling of stop words and punctuation	Advanced preprocessing, including stemming, lemmatization, etc.	20
Tokenization	Simple word splitting	Word and sentence tokenization with consideration of special cases	Advanced tokenization with context-aware methods	15
Named Entity Recognition (NER)	Limited or no NER usage	Basic NER implemented for common entities	Accurate and advanced NER for diverse entities and complex cases	25
Model Selection & Evaluation	Basic model usage (e.g., Naive Bayes)	Good model selection, basic evaluation metrics	Deep learning models with advanced evaluation metrics and fine-tuning	10