FPT SCHOOL OF BUSINESS & TECHNOLOGY

MASTER OF SOFTWARE ENGINEERING

SYLLABUS

Course Name:	**Natural Language Processing**
Course Code:	NLP501
No of credits:	03
Time Allocation:	Study hours (150h) *- Contact hours (45h)* *- Final assessment (3h)* *- Self-study (102h)*
Prerequisite:	PPR501

Students should have some basic knowledge of the concepts and terminology associated with database systems, statistics, and machine learning. Students should also have some programming experience. In particular, they should be able to read pseudocode and understand simple data structures such as multidimensional arrays.

I. DESCRIPTION

Natural Language Processing (NLP) uses algorithms to understand and manipulate human language. This technology is one of the most broadly applied areas of machine learning. As AI continues to expand, so will the demand for professionals skilled at building models that analyze speech and language, uncover contextual patterns, and produce insights from text and audio.

By the end of this course, students will be ready to design NLP applications that perform question-answering and sentiment analysis, create tools to translate languages and summarize text, and even build chatbots.

II. MAIN OBJECTIVES

After completing this course, students will be able to:

- Use logistic regression, naïve Bayes, and word vectors to implement sentiment analysis, complete analogies, and translate words.
- Use locality sensitive hashing for approximate nearest neighbors.

- Use dynamic programming, hidden Markov models, and word embeddings to autocorrect misspelled words, autocomplete partial sentences, and identify part-of-speech tags for words.
- Use dense and recurrent neural networks, LSTMs, GRUs, and Siamese networks in TensorFlow and Trax to perform advanced sentiment analysis, text generation, named entity recognition, and to identify duplicate questions.
- Use encoder-decoder, causal, and self-attention to perform advanced machine translation of complete sentences, text summarization, question-answering and to build chatbots.

Mapping CLOs to PLOs

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X								
CLO2	X	X							
CLO3	X	X							
CLO4	X	X							
CLO5	X	X					X		
CLO6	X	X					X		

III. TEACHING METHODS

In order to achieve the best course objectives, teaching methods and activities are used spontaneously, including:

- Teaching theory
- Group activities
- Group presentations

In addition, during the learning process, faculty can use different methods to achieve the teaching goals in the best way.

IV. STUDENT'S TASK

- Students are responsible to do all presentations and projects/problems assigned by

instructor and submit them on time.

- Promptly access to the FSB AP platform for up-to-date course information.

V. TEACHING & LEARNING MATERIALS

Instructors' presentation:

Chapters' Presentations

Textbooks:

1. https://www.coursera.org/learn/classification-vector-spaces-in-nlp?specialization=natural-language-processing
2. https://www.coursera.org/learn/probabilistic-models-in-nlp?specialization=natural-language-processing
3. https://www.coursera.org/learn/sequence-models-in-nlp?specialization=natural-language-processing
4. https://www.coursera.org/learn/attention-models-in-nlp?specialization=natural-language-processing

VI. SCHEDULE

Session	Content	CLO
1	Specialization Introduction Sentiment Analysis with Logistic Regression	CLO1
2	Sentiment Analysis with Naïve Bayes	CLO2
3	Vector Space Models	CLO2
4	Machine Translation and Document Search Programming Exercise 1	CLO2
5	Autocorrect Part of Speech Tagging and Hidden Markov Models	CLO1, CLO2

	Autocomplete and Language Models Programming Exercise 2	
6	Word embeddings with neural networks	CLO1
7	Neural Networks for Sentiment Analysis Recurrent Neural Networks for Language Modeling LSTMs and Named Entity Recognition	CLO2
8	Presentation 1 Siamese Networks Neural Machine Translation Text Summarization Question Answering	
9	Chatbot	CLO6
10	Assignment presentation	CLO1 – CLO6

VII. ASSESSMENT

Assessment type	Symbol	Weight
ON-GOING		50%
1. Participation	P	10%
2. Individual (3 exercises)	I	30%
3. Team (1 theory presentation)	T	10%
4. Quiz	Q	
FINAL ASSESSMENT (Assignment)	FE	50%
Completion Criteria: Average>=5 & Final assessment >=4 (Score:10) Detailed assessment in the Appendix		

APPENDIX: DETAILED ASSESSMENT

Assessment Category	Assessment Type	Weight	Minimum value to meet completion criteria	Duration	Learning outcomes	Number of questions	Scope of knowledge and skill of question	How
Participation	On-going	10	N/A					Evaluation based on the following criteria: - **Class Participation**: This includes the student's attendance, active engagement in class discussions, and contributions to the lessons, as well as providing constructive feedback to improve teaching quality. - **Completion of Evaluation Forms**: Timely and adequate completion of course evaluation forms + Do not complete any: Poor + Complete 1% - 50%: Average + Complete 51% – 90%: Good + Complete 91% – 100%: Excellent
Exercise	On-going	30	N/A		CLO1-CLO6	Depend on lecturer	The content of the topics under the module	Evaluation based on the specific requirements of the question
Theory presentation	On-going	10	N/A		CLO1-CLO6	1	studied chapters knowledge and skills	Evaluation based on the specific requirements of the question
Assignment	Final	50	4		CLO1-CLO6	1	Summary of the content of all topics	Evaluation based on the following criteria: - Accuracy and Correctness: Ensure the solutions are correct and error-free. - Creativity and Problem-Solving Ability: Demonstrate innovative solutions and critical thinking.

								- Completeness of the Product: Provide all required components and supporting documentation. - Presentation and Expression Skills: Present the assignment clearly with correct terminology. - Application of Theoretical Knowledge: Apply theory effectively to practical problems. - Timeliness and Adherence to Requirements: Submit on time and meet all assignment requirements.