Title (Units):	**COMP4136 Natural Language Processing (3,2,1)**

Course Aims:	To introduce some essential knowledge of natural language processing and its application scenarios, such as fundamental concepts, critical thinking of methodologies, practical techniques and tools for textural information processing. Students after taking this course will be able to: 1) identify and apply advanced techniques of natural language processing to process textural information; and 2) build modules to design, implement and evaluate effective natural language systems in real-world contexts;

Prerequisite:	COMP3057 Introduction to AI and ML OR COMP3115 Exploratory Data Analysis and Visualization OR Year III standing or above

Course Intended Learning Outcomes (CILOs):
Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
	Knowledge
1	Describe the fundamental concepts and methodologies of natural language processing
2	Explain the advantages and limitations of methods developed for different scenarios
3	Identify relevant textural information processing techniques to meet real-world needs
	Professional Skill
4	Apply specific methods and techniques in a number of natural language applications
5	Evaluate the solutions designed to technical problems

Calendar Description:	This course introduces some essential knowledge of natural language processing and its application scenarios, such as fundamental concepts, critical thinking of methodologies, practical techniques and tools for textural information processing. Students will be given the opportunities to appreciate the needs and impacts of technical problem-solving with data and to develop real-world applications.

Teaching and Learning Activities (TLAs):

CILOs	Type of TLA
1 - 2	Students will learn essential concepts of natural language processing through lectures and tutorials. Besides, written assignments, quizzes and final examination will be designed to evaluate the students' level of understanding.
2 - 3	Students will learn critical algorithms and techniques of some traditional problems through lectures and tutorials. Laboratory sessions will also be designed so that students could apply what they have learnt in lectures. There will include laboratory exercises and quizzes.
4 - 5	Students are required to conduct a project based on a selected NLP topic individually and give a formal presentation on their proposed method. Instructor(s), teaching assistant and other students would ask questions related to their project.

Assessment:

No.	Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
1	Assessments and Labs	30%	1 - 4	Assignments and labs will be used to consolidate their knowledge and develop their skills in natural language processing.
2	Individual Project	20%	3 - 5	Individual project will further strengthen their understanding and problem solving skills.
3	Examination	50%	1 - 5	Examination will be used to assess students' overall understanding in the concepts, and their ability in applying these concepts to solve problems.

Assessment Rubrics:

Excellent (A)	• Achieve all CILOs, demonstrating a good mastery of both the theoretical and practical aspects of the knowledge and skills associated with textural information processing and techniques application • Able to develop correct solutions to problems, accompanied by critical thinking, analytical thinking and creative thinking • Demonstrate a thorough understanding and solid knowledge of textural analytics, concepts, methodologies, and techniques • Able to apply a variety of techniques and relevant knowledge for fulfilling the real-world needs
Good (B)	• Achieve most of the five CILOs, demonstrating a good understanding of the concepts and underlying methodologies • Able to develop correct solutions to problems, accompanied by adequate explanations • Demonstrate a competent level of knowledge of textural analytics, concepts, methodologies, and techniques • Ability to make use of appropriate techniques and knowledge and apply them to familiar situations and problems
Satisfactory (C)	• Achieve some of the five CILOs, demonstrating a basic level of understanding of the concepts and underlying methodologies • Able to provide acceptable solutions to problems • Demonstrate an adequate level of knowledge of natural language processing • Ability to make use of some techniques and knowledge and apply them to familiar situations
Marginal Pass (D)	• Achieve few of the five CILOs, with minimal understanding of the associated concepts and underlying methodologies • Able to provide solutions to simple problems • Demonstrate a basic level of knowledge of natural language processing • Ability to make use of limited knowledge or techniques and apply them to some simple cases
Fail (F)	• Achieve none of the five CILOs, with little understanding of the associated concepts and underlying methodologies • Unable to provide solutions to simple problems • Knowledge of natural language processing falling below the basic minimum level • Unable to apply techniques and knowledge to situations or problems

Course Content and CILOs Mapping:

Content		CILO No.
I	Introduction to natural language processing (NLP) and core concepts	1
II	NLP models and techniques	1, 2
III	NLP applications	3, 4, 5
IV	Selected NLP tasks with deep learning	3, 4, 5

References:
• Daniel Jurafsky and James H. Martin. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition. Prentice Hall. 2000.

- Christopher D. Manning and Hinrich Schütze. Foundations of Statistical Natural Language Processing. The MIT Press. 1999.
- Jason Brownlee. Deep Learning for Natural Language Processing. Machine Learning Mastery, 2018.
- Steven Bird, Ewan Klein, and Edward Loper. Natural Language Processing with Python. 1st edition, O'Reilly Media; 2009

Course Content:

Topic

I.   Introduction to natural language processing (NLP) and core concepts

II.   NLP models and techniques
    1. Segmentation, word-level analysis, N-grams
    2. POS tagging, syntactic parsing
    3. Data Mining in NLP
    4. NLP tools

III.   NLP applications
    1. Sentiment classification
    2. Machine Translation
    3. Question Answering
    4. Summarization

IV.   Selected NLP tasks with deep learning
    1. Word Embedding (Word2Vec)
    2. Sentiment analysis with Recurrent Neural Network (RNN)
    3. Parsing with Recursive Neural Network (RvNN)