

RENCANA PEMBELAJARAN SEMESTER

PROGRAM STUDI S2 SAINS DATA

FAKULTAS SAINS DAN MATEMATIKA Universitas Kristen Satya Wacana

Form						
Semester	Ganjil 2026/2027					
Mata Kuliah	BD030 LARGE LANGUAGE MODEL					
Beban	3	SKS	T/A/P:	1/2/0	W/P:	Pilihan
Dosen Pengampu	1. Dr. Suryasatriya Trihandaru, M.Sc.nat 2. Prof. Hanna Arini Parhusip, M.Sc.nat 3. Christine Dewi, PhD					

A. Program Learning Outcome / Capaian Pembelajaran Lulusan (CPL)

CPL01	Mampu menunjukkan sikap bertanggung jawab atas pekerjaan di bidang keahliannya secara mandiri.
CPL02	Menguasai konsep teoretis bidang pengetahuan dan keterampilan tertentu secara umum dan khusus untuk menyelesaikan masalah secara prosedural sesuai dengan lingkup pekerjaannya
CPL03	Mampu menganalisis kebutuhan perangkat lunak untuk menghasilkan spesifikasi yang tepat.
CPL04	Mampu merancang perangkat lunak yang sesuai dengan spesifikasi dan kebutuhan pengguna.
CPL05	Mampu mengimplementasikan perangkat lunak berdasarkan spesifikasi yang telah dirancang.
CPL06	Mampu berkomunikasi secara efektif, baik lisan maupun tulisan, dalam konteks profesional.
CPL07	Mampu bekerjasama dalam tim serta menunjukkan kemampuan kepemimpinan dalam konteks kerja kelompok.
CPL08	Mampu mengintegrasikan prinsip etika dan tanggung jawab sosial dalam pengambilan keputusan profesional.

B. Course Learning Outcome / Capaian Pembelajaran Mata Kuliah (CPMK)

CPMKBD03011	(CPL01) Mampu menunjukkan sikap bertanggung jawab dalam memahami, mengeksplorasi, dan menerapkan konsep dasar large language model secara mandiri dalam kegiatan pembelajaran dan penyelesaian tugas akademik.
CPMKBD03022	(CPL02) Menguasai konsep teoretis large language model dan mekanisme pemrosesan bahasa alami secara prosedural.
CPMKBD03033	(CPL03) Mampu menganalisis kebutuhan pemrosesan bahasa alami untuk merumuskan spesifikasi sistem large language model yang tepat.
CPMKBD03044	(CPL04) Mampu merancang sistem large language model sesuai kebutuhan pemrosesan bahasa dan spesifikasi pengguna.

C. Prerequisite/Corequisite Courses /Prasyarat Mata Kuliah

Code	Course Name

D. Description/Deskripsi

This course introduces the theoretical foundations and practical applications of Large Language Models (LLM), covering: NLP fundamentals, text representation (tokenization & embeddings), neural sequence models (RNN, LSTM, Attention), the Transformer architecture, LLM pretraining, fine-tuning and parameter-efficient fine-tuning (PEFT/LoRA), alignment (prompting & RLHF), Retrieval-Augmented Generation (RAG), LLM-based agents, LLM evaluation and responsible/ethical AI, and deployment of LLM-based systems.

Mata kuliah ini membahas konsep dasar dan penerapan Large Language Model (LLM), meliputi: dasar-dasar NLP, representasi teks (tokenisasi & embedding), model sekuensial berbasis neural (RNN, LSTM, Attention), arsitektur Transformer, pretraining LLM, fine-tuning dan parameter-efficient fine-tuning (PEFT/LoRA), alignment (prompting & RLHF), Retrieval-Augmented Generation (RAG), agen berbasis LLM, evaluasi LLM dan AI yang bertanggung jawab/etis, serta deployment sistem berbasis LLM.

E. Learning Stage/Tahap Pembelajaran

We ek	Final Ability	Material	Methods	Dura tion	Indicators	Assesment
1	<i>Have broad knowledge of NLP fundamentals and the LLM landscape.</i> Memiliki pengetahuan luas tentang dasar-dasar NLP dan lanskap LLM.	Introduction to NLP & LLM Landscape	Presentation Discussion Demonstration Practicum	150'	Provides information about NLP fundamentals and the LLM landscape; Discussion	Discussion
2	<i>Master text representation techniques for NLP: tokenization and word/sentence embeddings.</i> Menguasai teknik representasi teks untuk NLP: tokenisasi dan embedding kata/kalimat.	Text Representation: Tokenization, Word & Sentence Embeddings	Presentation Discussion Demonstration Practicum	150'	Obtain information about tokenization and embedding methods; Discussion and Practicum	Discussion
3	<i>Master neural sequence modeling for language: RNN, LSTM, and the Attention mechanism.</i> Menguasai pemodelan sekuensial berbasis neural untuk bahasa: RNN, LSTM, dan mekanisme Attention.	Neural Sequence Models: RNN, LSTM & Attention Mechanism	Presentation Discussion Demonstration Practicum	150'	Obtain information about RNN, LSTM, and Attention; Discussion and Practicum	Discussion
4	<i>Master the Transformer architecture (self-attention, encoder-decoder) as the foundation of LLM.</i>	Transformer Architecture: Self-Attention & Encoder-Decoder	Presentation Discussion Demonstration Practicum	150'	Obtain information about the Transformer architecture;	Task: Submit a practicum report.

	Menguasai arsitektur Transformer (self-attention, encoder-decoder) sebagai dasar LLM.				Discussion and Practicum	
5	<i>Master practical work related to NLP fundamentals and the Transformer architecture.</i> Menguasai praktikum terkait dasar-dasar NLP dan arsitektur Transformer.	Practicum/Case Study related to Meeting 1-4	Presentation Discussion Demonstration Practicum	150'	Carrying out practicum and tutorials related to Meeting 1 to Meeting 4	Practical Assignment /Report - CPMK2 (10%)
6	<i>Master LLM pretraining concepts: training objectives, corpora, and model families (BERT/GPT).</i> Menguasai konsep pretraining LLM: tujuan pelatihan, korpus data, dan keluarga model (BERT/GPT).	LLM Pretraining: Objectives, Corpora & Model Families (BERT/GPT)	Presentation Discussion Demonstration Practicum	150'	Obtain information about LLM pretraining and model families; Discussion and Practicum	Discussion
7	<i>Master fine-tuning and Parameter-Efficient Fine-Tuning (PEFT/LoRA) techniques for LLM.</i> Menguasai teknik fine-tuning dan Parameter-Efficient Fine-Tuning (PEFT/LoRA) untuk LLM.	Fine-Tuning & Parameter-Efficient Fine-Tuning (PEFT/LoRA)	Presentation Discussion Demonstration Practicum	150'	Obtain information about fine-tuning and PEFT/LoRA; Discussion and Practicum	Task: Submit a practicum report.
8	<i>Master LLM alignment techniques: RLHF and prompt engineering.</i> Menguasai teknik alignment LLM: RLHF dan prompt engineering.	Alignment: RLHF & Prompt Engineering	Presentation Discussion Demonstration Practicum	150'	Obtain information about RLHF and prompt engineering; Discussion and Practicum	Discussion
9	<i>Master practical work related to LLM pretraining, fine-tuning, and alignment.</i> Menguasai praktikum terkait pretraining, fine-tuning, dan alignment LLM.	Practicum/Case Study related to Meeting 6-8	Presentation Discussion Demonstration Practicum	150'	Carrying out practicum and tutorials related to Meeting 6 to Meeting 8	Practical Assignment /Report - CPMK2 (15%)
10	<i>Master requirement analysis for Retrieval-Augmented Generation (RAG) systems.</i> Menguasai analisis kebutuhan untuk sistem Retrieval-Augmented Generation (RAG).	Retrieval-Augmented Generation (RAG)	Presentation Discussion Demonstration Practicum	150'	Obtain information about RAG system requirements; Discussion and Practicum	Discussion
11	<i>Master requirement analysis for LLM-based agents and tool-use/orchestration systems.</i> Menguasai analisis kebutuhan untuk agen berbasis LLM dan sistem tool-use/orchestration.	LLM-based Agents & Tool Use/Orchestration	Presentation Discussion Demonstration Practicum	150'	Obtain information about LLM agents and orchestration; Discussion and Practicum	Practical Assignment /Report - CPMK3 (10%)

12	<i>Master evaluation methods and requirement specification for responsible/ethical LLM use (hallucination, bias, safety).</i> Menguasai metode evaluasi dan spesifikasi kebutuhan untuk penggunaan LLM yang bertanggung jawab/etis (halusinasi, bias, keamanan).	LLM Evaluation & Responsible/Ethical AI	Presentation Discussion Demonstration Practicum	150'	Obtain information about LLM evaluation and responsible AI; Discussion and Practicum	Discussion
13	<i>Master requirement specification for LLM system deployment (latency, cost, scaling, monitoring)</i> Menguasai spesifikasi kebutuhan untuk deployment sistem LLM (latensi, biaya, skalabilitas, monitoring).	Deployment & MLOps for LLM Systems	Presentation Discussion Demonstration Practicum	150'	Obtain information about LLM deployment and MLOps; Discussion and Practicum	Discussion
14	<i>Master practical work related to applied LLM systems: RAG, agents, evaluation, and deployment.</i> Menguasai praktikum terkait sistem LLM terapan: RAG, agen, evaluasi, dan deployment.	Practicum/Case Study related to Meeting 10-13	Presentation Discussion Demonstration Practicum	150'	Carrying out practicum and tutorials related to Meeting 10 to Meeting 13	Practical Assignment /Report - CPMK3 (15%)
15	<i>Able to design and build an applied LLM-based system.</i> Mampu merancang dan membangun sistem berbasis LLM secara terapan.	PROJECT WORK	Project Work	150'	Design and build an LLM-based project	Final Project Work - CPMK4 (25%)
16	<i>Able to present and defend the LLM-based project.</i> Mampu mempresentasikan dan mempertanggungjawabkan proyek berbasis LLM.	PROJECT PRESENTATION	Presentation Discussion	150'	Presenting the LLM-based project	Project Presentation - CPMK1 (25%)

Note/Catatan untuk Tabel E.

Abbreviation	Description
NLP	Natural Language Processing
LLM	Large Language Model
RNN	Recurrent Neural Network
LSTM	Long Short-Term Memory
RAG	Retrieval-Augmented Generation
PEFT	Parameter-Efficient Fine-Tuning
LoRA	Low-Rank Adaptation
RLHF	Reinforcement Learning from Human Feedback
MLOps	Machine Learning Operations

F. Learning Media and Tools

Python (Hugging Face Transformers, PyTorch), Jupyter Notebook/Google Colab, LLM APIs (open-source & commercial), Computer, Flearn (Online Learning Media), WAG and Google Meet/Zoom.

G. Student Learning Experience/Portfolio

Students gain experience in building NLP/LLM pipelines, fine-tuning and adapting pretrained language models, developing retrieval-augmented and agentic LLM applications, evaluating model quality and safety, and deploying an LLM-based system as a final project.

Mahasiswa memperoleh pengalaman dalam membangun pipeline NLP/LLM, melakukan fine-tuning dan adaptasi model bahasa terlatih, mengembangkan aplikasi LLM berbasis retrieval dan agen, mengevaluasi kualitas dan keamanan model, serta men-deploy sistem berbasis LLM sebagai proyek akhir.

H. References

1. [Jurafsky, D., & Martin, J. H. \(2026\). Speech and Language Processing \(3rd ed. draft\). Stanford University.](#)
2. [Tunstall, L., von Werra, L., & Wolf, T. \(2022\). Natural Language Processing with Transformers, Revised Edition. O'Reilly Media.](#)
3. [Vaswani, A., et al. \(2017\). Attention Is All You Need. Advances in Neural Information Processing Systems \(NeurIPS\).](#)
4. [Zhao, W. X., et al. \(2023\). A Survey of Large Language Models. arXiv:2303.18223.](#)
5. [Lewis, P., et al. \(2020\). Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks. NeurIPS.](#)
6. [Ouyang, L., et al. \(2022\). Training Language Models to Follow Instructions with Human Feedback. arXiv:2203.02155.](#)

I. Authorization

Pengembang	Tanggal	Koordinator	Kaprodi
Dr. Suryasatriya Trihandaru, M.Sc.nat	8 Agustus 2026	Prof. Hanna Arini Parhusip, M.Sc.nat	Prof. Hanna Arini Parhusip, M.Sc.nat