

RENCANA PEMBELAJARAN SEMESTER

PROGRAM STUDI S2 SAINS DATA

FAKULTAS SAINS DAN MATEMATIKA Universitas Kristen Satya Wacana

Form						
Semester	Ganjil 2026/2027					
Mata Kuliah	BD002 ARTIFICIAL INTELLIGENCE					
Beban	3	SKS	T/A/P:	1/2/0	W/P:	Wajib
Dosen Pengampu	1. Prof. Hanna Arini Parhusip, M.Sc.nat 2. Dr. Suryasatriya Trihandaru, M.Sc.nat 3. Dr. Bambang Susanto 4. Prof. Dr. Eko Soediyono, M.Kom Dosen Praktisi: Denny Indrajaya, S.Si., M.Si.D					

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)

CPMKBD00211	(CPL01) Mampu menunjukkan sikap mandiri dan bertanggung jawab dalam memahami serta menerapkan konsep dasar kecerdasan buatan untuk menyelesaikan permasalahan.
CPMKBD00222	(CPL02) Menguasai konsep teoretis kecerdasan buatan dan pendekatan pemecahan masalah berbasis AI secara sistematis.
CPMKBD00243	(CPL04) Mampu merancang sistem kecerdasan buatan yang sesuai dengan kebutuhan pengguna berdasarkan spesifikasi fungsional yang ditetapkan.

C. Prerequisite/Corequisite Courses /Prasyarat Mata Kuliah

Code	Course Name

D. Description/Deskripsi

This course introduces the fundamental concepts of Artificial Intelligence (AI) and their application in intelligent IoT (AloT) systems, covering: AI foundations and intelligent agents, problem solving and search, knowledge representation, a brief review of machine learning, IoT sensing with ESP32 microcontrollers, MQTT-based data communication, time-series and document data storage (InfluxDB, MongoDB), monitoring dashboards (Streamlit, Grafana), an introduction to Large Language Models (LLM) and agentic AI, and the integration of these components into an end-to-end intelligent system.

Mata kuliah ini membahas konsep dasar Artificial Intelligence (AI) dan penerapannya pada sistem IoT cerdas (AloT), meliputi: dasar-dasar AI dan intelligent agent, problem solving dan search, representasi pengetahuan, sedikit tinjauan machine learning, akuisisi data sensor IoT dengan mikrokontroler ESP32, komunikasi data berbasis MQTT, penyimpanan data time-series dan dokumen (InfluxDB, MongoDB), dashboard monitoring (Streamlit, Grafana), pengenalan Large Language Model (LLM) dan agentic AI, serta integrasi seluruh komponen tersebut menjadi sistem cerdas end-to-end.

E. Learning Stage/Tahap Pembelajaran

We ek	Final Ability	Material	Methods	Dura tion	Indicators	Assesment
1	<i>Have broad knowledge of Artificial Intelligence foundations, history, and intelligent agents.</i> Memiliki pengetahuan luas tentang dasar-dasar, sejarah, dan intelligent agent Artificial Intelligence.	Introduction to AI: History, Types & Intelligent Agents	Presentation Discussion Demonstration Practicum	150'	Provides information about AI foundations and intelligent agents; Discussion	Discussion
2	<i>Master problem solving and search techniques in AI (state space, BFS/DFS/A*).</i> Menguasai teknik problem solving dan search dalam AI (state space, BFS/DFS/A*).	Problem Solving & Search Algorithms	Presentation Discussion Demonstration Practicum	150'	Obtain information about search algorithms; Discussion and Practicum	Discussion
3	<i>Master knowledge representation and reasoning (rule-based and expert systems).</i> Menguasai representasi pengetahuan dan penalaran (rule-based dan expert system).	Knowledge Representation & Reasoning	Presentation Discussion Demonstration Practicum	150'	Obtain information about knowledge representation and reasoning; Discussion and Practicum	Discussion

4	<i>Have broad knowledge of machine learning as a foundation for AI systems (brief review).</i> Memiliki pengetahuan luas tentang machine learning sebagai dasar sistem AI (tinjauan singkat).	Machine Learning for AI: A Brief Review	Presentation Discussion Demonstration Practicum	150'	Obtain information about the role of machine learning in AI systems; Discussion and Practicum	Task: Submit a practicum report.
5	<i>Master practical work related to AI foundations, search, and knowledge representation.</i> Menguasai praktikum terkait dasar-dasar AI, search, dan representasi pengetahuan.	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 (15%)
6	<i>Master intelligent IoT data acquisition using the ESP32 microcontroller and sensors.</i> Menguasai akuisisi data IoT cerdas menggunakan mikrokontroler ESP32 dan sensor.	Intelligent IoT Systems: ESP32 Microcontroller & Sensor Data Acquisition	Presentation Discussion Demonstration Practicum	150'	Obtain information about ESP32-based sensor data acquisition; Discussion and Practicum	Discussion
7	<i>Master MQTT-based communication protocols for AI-IoT data pipelines.</i> Menguasai protokol komunikasi berbasis MQTT untuk data pipeline AI-IoT.	IoT Communication Protocols: MQTT for AI-IoT Data Pipelines	Presentation Discussion Demonstration Practicum	150'	Obtain information about MQTT for AI-IoT data pipelines; Discussion and Practicum	Discussion
8	<i>Master time-series and document data storage for AI systems using InfluxDB and MongoDB.</i> Menguasai penyimpanan data time-series dan dokumen untuk sistem AI menggunakan InfluxDB dan MongoDB.	Data Storage for AI Systems: InfluxDB & MongoDB	Presentation Discussion Demonstration Practicum	150'	Obtain information about InfluxDB and MongoDB for AI data storage; Discussion and Practicum	Task: Submit a practicum report.
9	<i>Master practical work related to ESP32, MQTT, and AI data storage.</i> Menguasai praktikum terkait ESP32, MQTT, dan penyimpanan data AI.	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 the development of AI monitoring dashboards using Streamlit and Grafana.</i> Menguasai pengembangan dashboard monitoring AI menggunakan Streamlit dan Grafana.	Data Visualization & Monitoring Dashboards: Streamlit & Grafana	Presentation Discussion Demonstration Practicum	150'	Obtain information about dashboard development with Streamlit and Grafana; Discussion and Practicum	Discussion

11	<i>Have broad knowledge of Large Language Models (LLM) for intelligent applications.</i> Memiliki pengetahuan luas tentang Large Language Model (LLM) untuk aplikasi cerdas.	Introduction to Large Language Models (LLM) for Intelligent Applications	Presentation Discussion Demonstration Practicum	150'	Obtain information about LLM for intelligent applications; Discussion and Practicum	Discussion
12	<i>Have broad knowledge of agentic AI: AI agents and tool-use orchestration.</i> Memiliki pengetahuan luas tentang agentic AI: AI agent dan tool-use orchestration.	Introduction to Agentic AI: AI Agents & Tool-Use Orchestration	Presentation Discussion Demonstration Practicum	150'	Obtain information about agentic AI and tool-use orchestration; Discussion and Practicum	Discussion
13	<i>Master the design of an integrated AI system: from sensor to intelligent decision.</i> Menguasai perancangan sistem AI terintegrasi: dari sensor hingga keputusan cerdas.	Integrating AI Components: From Sensor to Intelligent Decision	Presentation Discussion Demonstration Practicum	150'	Obtain information about end-to-end AIoT system integration; Discussion and Practicum	Task: Submit a practicum report.
14	<i>Master practical work related to dashboards, LLM, agentic AI, and system integration.</i> Menguasai praktikum terkait dashboard, LLM, agentic AI, dan integrasi sistem.	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, integrated intelligent AIoT system.</i> Mampu merancang dan membangun sistem AIoT cerdas terintegrasi secara terapan.	PROJECT WORK	Project Work	150'	Design and build an integrated AI/AIoT-based project	Final Project Work - CPMK3 (20%)
16	<i>Able to present and defend the AI/AIoT-based project.</i> Mampu mempresentasikan dan mempertanggungjawabkan proyek berbasis AI/AIoT.	PROJECT PRESENTATION	Presentation Discussion	150'	Presenting the AI/AIoT-based project	Project Presentation - CPMK1 (35%)

Note/Catatan untuk Tabel E.

Abbreviation	Description
CPL	Capaian Pembelajaran Lulusan / Program Learning Outcome
CPMK	Capaian Pembelajaran Mata Kuliah / Course Learning Outcome
AI	Artificial Intelligence
AIoT	Artificial Intelligence of Things
ML	Machine Learning
LLM	Large Language Model

MQTT	Message Queuing Telemetry Transport
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F. Learning Media and Tools

Python (scikit-learn, LLM API), ESP32 Development Board & Arduino IDE/PlatformIO, MQTT Broker (e.g. Mosquitto), InfluxDB, MongoDB, Streamlit, Grafana, Computer, Flearn (Online Learning Media), WAG and Google Meet/Zoom.

G. Student Learning Experience/Portfolio

Students gain experience in building intelligent agents and search-based problem solvers, acquiring sensor data with ESP32 and MQTT, storing data in InfluxDB and MongoDB, building monitoring dashboards with Streamlit and Grafana, and integrating a lightweight LLM/agent AI component into an end-to-end intelligent IoT (AIoT) project.

Mahasiswa memperoleh pengalaman dalam membangun intelligent agent dan pemecah masalah berbasis search, melakukan akuisisi data sensor dengan ESP32 dan MQTT, menyimpan data pada InfluxDB dan MongoDB, membangun dashboard monitoring dengan Streamlit dan Grafana, serta mengintegrasikan komponen LLM/agent AI ringan ke dalam proyek AIoT end-to-end.

H. References

1. [Russell, S., & Norvig, P. \(2021\). Artificial Intelligence: A Modern Approach \(4th ed.\). Pearson.](#)
2. [OASIS. \(2019\). MQTT Version 5.0. OASIS Standard.](#)
3. [Espressif Systems. \(2024\). ESP32 Technical Reference Manual.](#)
4. [InfluxData. InfluxDB Documentation.](#)
5. [Yao, S., et al. \(2023\). ReAct: Synergizing Reasoning and Acting in Language Models. ICLR.](#)

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