

Coursework Specification – Semantic Web and Ontology Development – [Individual]

Assignment title: Intelligent Ontology-Guided RAG Application for Hospital Theatre Scheduling

Type: Individual Coursework

Submission Method: Learning Management System (LMS) **only**

Deadline: 3rd December, 2025 before 11.50PM

Coursework Overview:

This individual coursework requires you to design and implement an intelligent hospital theatre scheduling support system using:

- Streamlit for the user interface
- Ollama LLM as the local language model i.e. Any suitable LLM model inside the OLLAMA
- a Retrieval-Augmented Generation (RAG) architecture enhanced by a custom ontology to minimize hallucination

The system must reason over relationships among surgeons, patients, theatres, operations, and time slots. The ontology should act as a semantic filter supporting the RAG pipeline, ensuring factual, context-correct, and explainable LLM outputs.

Deliverables

1. Technical Report (PDF)

(Maximum 2500 words)

- Background
- System architecture with diagram
- Ontology design (competency questions, key classes, properties, reasoning)
- RAG pipeline operation and integration with Ollama
- Implementation description with annotated code fragments
- Screenshots showing successful execution
- Evaluation of hallucination mitigation and ethical issues
- Publicly accessible link to demonstration video

2. Demonstration Video (≤ 10 minutes)

- Student's face visible throughout
- Explanation of architecture and features

- Live execution of at least two example queries
- Uploaded to a cloud platform (Google Drive, etc.)
- Working URL included in technical report

Submission Details

- **Submission platform:** University LMS only (no email or external uploads).*
- **Submission format:** One PDF file containing report, screenshots, and video URL.
- **Deadline:** One month from tomorrow's date – e.g., 5 May 2024 (23:59 LMS time).*
- Late penalties apply according to course policy.

Suggested Report Structure / Marking Rubric

Section	Content Description	Weight (%)
1. Introduction & Background	Explains the problem context, motivation, objectives, and relevance of the chosen scenario.	10 %
2. System Design	Presents the overall architecture, integration of ontology with RAG, and Streamlit interface design and interaction flow.	25 %
3. Implementation	Provides implementation details, code structure, integration steps, and supporting evidence such as execution screenshots.	30 %
4. Evaluation & Discussion	Describes test scenarios, analyses hallucination reduction, compares performance, and discusses findings critically.	25 %
5. Reflection & Future Work	Highlights lessons learned, system limitations, and potential areas for enhancement.	10 %

Guiding Questions

1. How does your ontology formally model theatre scheduling constraints?
2. In what ways does it guide or filter retrieval in the RAG pipeline?
3. What hallucinations were observed before ontology integration?
4. How does the ontology quantitatively/qualitatively reduce them?
5. How intuitive is the Streamlit interface for end-users?
6. What metrics or reasoning indicators demonstrate factual reliability?

Academic Integrity

All work must be your own. Use only fabricated or anonymized data. Cite any reused ideas. Plagiarism or AI-generated content without acknowledgment will be penalized per university regulations.

Important Reminders

- Your face must be visible in the demo video.
- Ensure the cloud link remains accessible until marks are released.
- Only LMS submissions will be marked.
- Keep backups of all files and assets used.