

# COMP 019 - Applications Development and Emerging Technologies

*Project Development Phase*

## SESSION 14: PROJECT SPRINT 2 - CORE FEATURES

### ACTIVITY 14.1: COMPLETE CRUD AND BUSINESS LOGIC

**Topic:** Implementing all core application features

**Description:** Build out all main features of your application

#### INSTRUCTIONS:

Implement all CRUD operations:

- Create functionality for all entities
- Read with filtering, sorting, pagination
- Update with proper validation
- Delete with confirmation

Add business logic:

- Application-specific rules
- Calculations and processing
- Data validation
- Status workflows (if applicable)

Complete API endpoints:

- All endpoints functional
- Proper error responses
- API documentation updated

Frontend integration:

- All CRUD working in UI
- Form validation
- Success/error feedback

**Deliverables:** Submit complete CRUD implementation

**30 Points**

### ACTIVITY 14.2: MCP SERVER IMPLEMENTATION

**Topic:** Building MCP tools for your application

**Description:** Create MCP server exposing your application's capabilities to AI agents

#### INSTRUCTIONS:

Design MCP tools for your project:

- Minimum 3 tools required
- Consider what AI agents would need

Example tools:

- search\_records(query) - semantic search
- get\_analytics(criteria) - data analysis

- generate\_report(type) - create reports
- get\_recommendations(user\_id) - AI suggestions

Implement MCP server:

- Create tools with proper types and docs
- Connect to your database
- Implement business logic in tools
- Handle errors gracefully

Test MCP server:

- All tools working correctly
- Test with MCP Inspector
- Document each tool's purpose and usage

**Deliverables:** Submit MCP server code and tool documentation

**40 Points**

### ACTIVITY 14.3: PGVECTOR AND RAG IMPLEMENTATION

**Topic:** Adding intelligent search to your application

**Description:** Implement vector search and RAG for AI-powered features

#### INSTRUCTIONS:

Set up vector storage:

- Add vector columns to relevant tables
- Create embedding generation pipeline
- Index existing content

Implement semantic search:

- Search endpoint using vector similarity
- Hybrid search (keyword + semantic)
- Ranking and relevance scoring

Add RAG capabilities:

- Retrieve relevant content for queries
- Format context for AI
- Generate AI-powered responses
- Display in user interface

Test AI features:

- Query accuracy
- Response quality
- Performance

Milestone: 50% complete

**Deliverables:** Submit RAG implementation and demo (50% completion)

**35 Points**

**TOTAL POINTS: 105**