AMSS Lecture 8: UML Activity Diagrams

[Your Name]

2025

Welcome

- Course: Analiza și Modelarea Sistemelor Software (AMSS)
- Lecture 8: UML Activity Diagrams
- Duration: 100 minutes (two 50-minute sessions)

Agenda

Session 1: Fundamentals of Activity Diagrams
Session 2: Advanced Constructs and Applications

Session 1: Fundamentals of Activity Diagrams

What Are Activity Diagrams?

Definition:
Activity diagrams describe the **flow of control and data** between actions in a process.
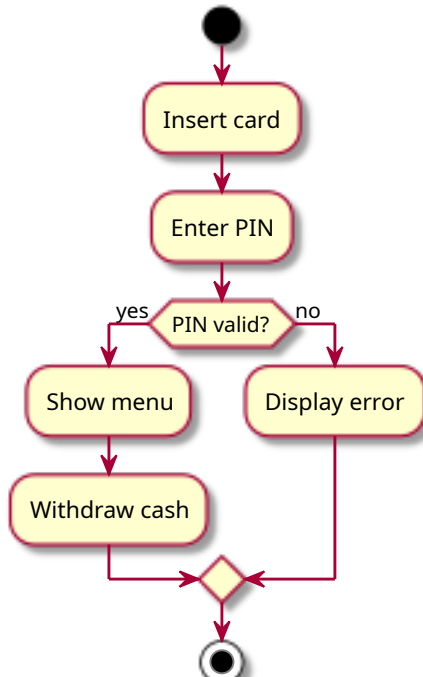
Use Cases: - Model business workflows or algorithms. - Detail use case realizations. - Represent concurrent behavior.

Comparison:

| Diagram	Focus
State Diagram	Object lifecycle
Sequence Diagram	Message order
Activity Diagram	Workflow logic

Core Elements

- ▶ **Action Nodes** – steps or tasks.
- ▶ **Control Flows** – arrows showing execution order.
- ▶ **Decision Nodes** – conditional branching.
- ▶ **Merge Nodes** – combine alternative flows.
- ▶ **Fork / Join Nodes** – manage parallel execution.
- ▶ **Initial / Final Nodes** – start and end points.

Example: ATM Transaction

```
● (start)
  │
  ▼
┌─────────────┐
│ Insert card │
└─────────────┘
  │
  ▼
┌─────────────┐
│  Enter PIN  │
└─────────────┘
  │
  ▼
yes ◇ PIN valid? ◇ no
  │              │
  ▼              ▼
┌───────────┐  ┌───────────────┐
│ Show menu │  │ Display error │
└───────────┘  └───────────────┘
  │              │
  ▼              │
┌───────────────┐│
│ Withdraw cash ││
└───────────────┘│
  │              │
  └──────◇───────┘
         │
         ▼
        ◉ (end)
```

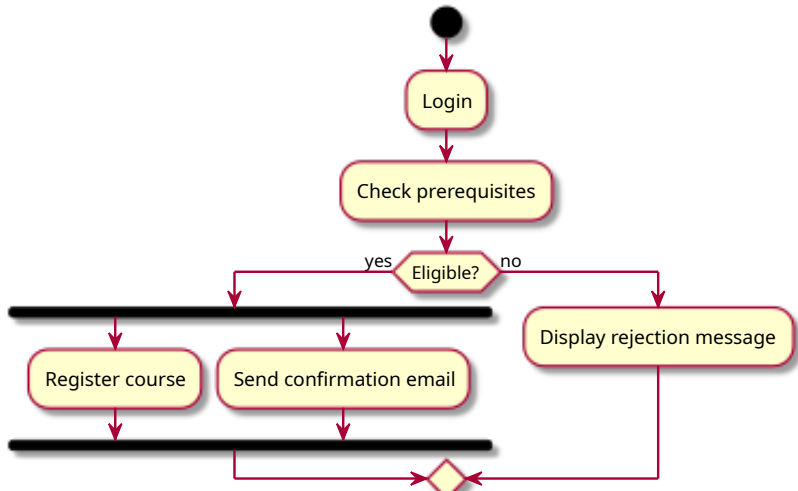## Example: Online Order Workflow
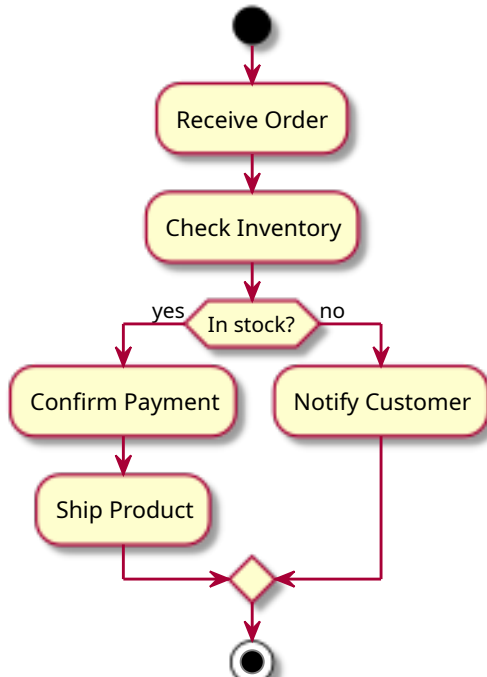
Interactive Exercise 1: Course Registration Process

Scenario: A student registers for a course.

Steps: 1. Log in 2. Check prerequisites 3. If eligible → register for course 4. Update records & send confirmation (in parallel)

Task: Draw the activity diagram using PlantUML or by hand. Include one decision and one fork/join.
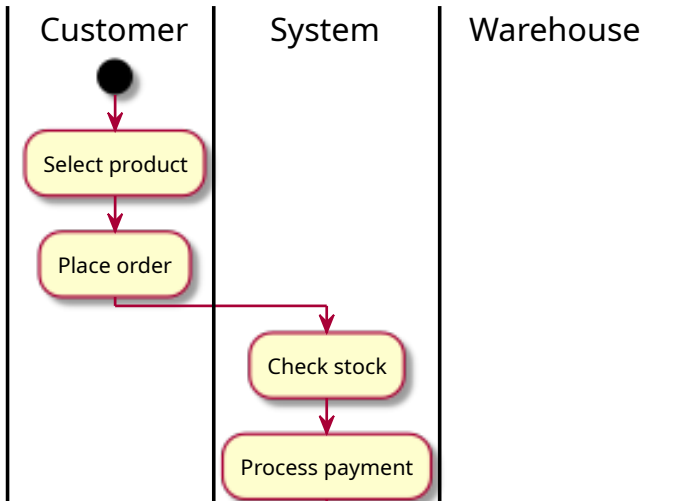
(Break - 10 minutes)
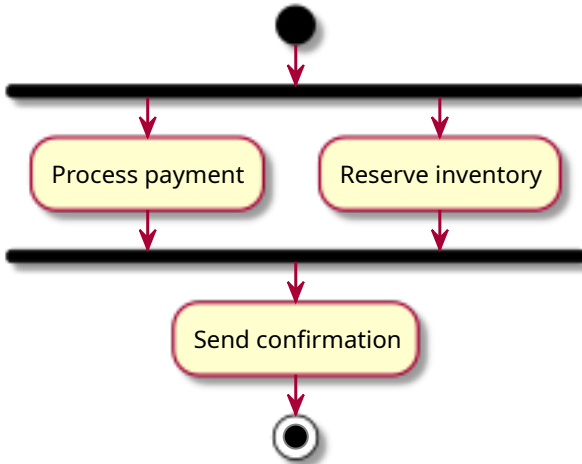
Swimlanes

Purpose: Show which actor or subsystem performs each action.
Notation: Vertical or horizontal lanes representing responsibilities.
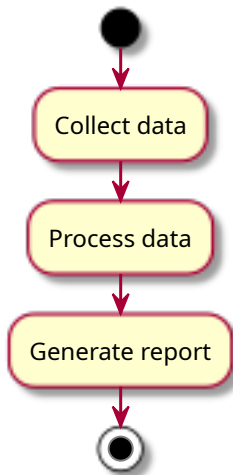**Example: Online Purchase Process**

Fork/Join Example:

Discussion: What happens if one parallel branch fails or is delayed?

Data Flow and Object Nodes

▶ **Object nodes** represent data produced/consumed by activities.

▶ Used to visualize data movement alongside control flow.

Example:

Add data objects like *Order*, *Invoice*, *Shipment* to visualize real workflows.

Actors: Passenger, System

Requirements: - Passenger checks in. - System verifies ticket. - If baggage overweight $\rightarrow$ pay fee. - In parallel: print boarding pass + update database.

Task: Create an activity diagram with two swimlanes and one parallel branch.
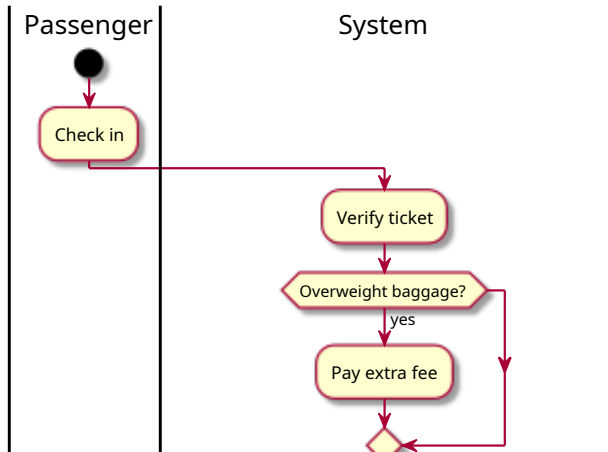
Wrap-Up

Concept	Description	Example
Action	Step in process	"Process payment"
Decision	Conditional branch	"Is stock available?"
Fork/Join	Parallel execution	"Ship + Notify"
Swimlane	Role-based grouping	"Customer vs. System"

Key Takeaways: - Activity Diagrams model workflows and concurrent processes. - Ideal for requirements and process-level modeling. - Useful bridge from analysis to system design.

Next Lecture: Sequence Diagrams (Advanced Scenarios and Interaction Modeling).