Systems Analysis & Design
Semester 2026-I
Workshop No. 1 — Systems Analysis

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Welcome to the first workshop of the *Systems Analysis and Design* course!

Your mission is to conduct a thorough **systems analysis** of a real-world system through primary data collection and systematic investigation. This workshop will introduce you to fundamental systems analysis methodologies while developing practical research and analytical skills.

This analysis will incorporate **systems engineering principles**, **element identification**, **inter-element relationships**, **system sensitivity analysis**, and aspects of **complexity theory**, among other key considerations.

General Workshop Definition: Systems analysis is a systematic approach to understanding complex systems through structured investigation, data collection, and relationship mapping. In this workshop, you will apply systems thinking to decompose a real-world system into its constituent elements, analyze their interactions, and evaluate system behavior under various conditions.

The goal is to develop competency in systems analysis methodologies while gaining hands-on experience with primary research techniques.

Workshop Scope and Objectives:

- **System Identification:** Define system boundaries, scope, and context within its operating environment.

- **Element Analysis:** Identify and categorize all critical system components, inputs, outputs, and processes.

- **Primary Data Collection:** Develop and execute data collection strategies using direct observation, measurements, surveys, and monitoring techniques.

- **Relationship Mapping:** Analyze and document interactions, dependencies, feedback loops, and information flows between system elements.

- **Systems Engineering Application:** Apply systems engineering principles including requirements analysis, architectural thinking, and lifecycle considerations.

- **Sensitivity and Complexity Analysis:** Examine system responses to parameter changes and identify chaotic, nonlinear, or emergent behaviors.

- **Critical Evaluation:** Assess system performance, identify bottlenecks, and propose optimization opportunities.

Project Assignment: The specific system to be analyzed will be assigned individually to each team. Project assignments will be distributed during class and will include detailed specifications, system boundaries, and particular focus areas relevant to your assigned topic.

Data Collection Requirements: You must collect primary data through at least three of the following methods (adapt techniques to your specific assigned system):

1. **Direct Observation:** Record system activities, behaviors, and operations within defined areas and time periods.

2. **Structured Surveys:** Collect data from relevant stakeholders (users, operators, administrators) regarding system usage patterns, experiences, and perceptions.

3. **Physical Measurements:** Use appropriate instruments to measure quantifiable system parameters (performance metrics, environmental conditions, resource consumption) with proper authorization.

4. **Usage Monitoring:** Track operational patterns, utilization rates, and temporal variations in system behavior.

5. **Environmental Correlation:** Gather contextual data and correlate with observed system performance or behavior patterns.

6. **Process Documentation:** Document workflows, procedures, and operational sequences through direct recording and analysis.

Methodology and Deliverables:

1. **System Overview and Scope Definition:**

   - Comprehensive system description including boundaries, context, and main components
   - Stakeholder identification and system purpose analysis
   - Operating environment characterization

2. **Data Collection Plan and Execution:**

   - *Methodology Design:* Detailed description of data collection strategies, tools, sampling methods, and timeline
   - *Primary Data Presentation:* Organized presentation of collected data using tables, charts, and statistical summaries
   - *Data Quality Assessment:* Critical evaluation of data limitations, potential biases, reliability issues, and collection challenges

3. **Systems Analysis Report:**

   - *Element and Relationship Analysis:* Systematic decomposition of system components and their interconnections
   - *Sensitivity and Variability Study:* Analysis of system responses to parameter changes, identification of critical factors and constraints
   - *Complexity and Emergent Behavior:* Discussion of nonlinear behaviors, feedback loops, chaos theory applications, and unexpected patterns
   - *Findings and Pattern Recognition:* Data-driven insights, trend analysis, anomaly identification, and behavioral patterns
   - *Critical Assessment:* System performance evaluation, bottleneck identification, optimization opportunities, and recommendations

4. **Visual System Representation:** Create one or more professional diagrams (system architecture, process flows, relationship maps, data visualizations) using tools such as *draw.io*, *Lucidchart*, *Visio*, or *TikZ* in LaTeX. All diagrams must be clearly labeled, referenced in the report, and contribute meaningfully to system understanding.

5. **Documentation and Repository Management:**

   - Create a dedicated folder structure in your `GitHub Course` repository for this workshop (to be used for all subsequent workshops)
   - Include all raw data files, analysis scripts or tools, methodology documentation, and supporting materials
   - Provide a comprehensive `README.md` file documenting your data collection process, analysis methodology, key findings, and links to deliverables

Submission Requirements:

- Submit your complete analysis as a single PDF document through the designated course platform

- Include your GitHub repository link in the submission

- All documentation must be in **English** and follow academic writing standards

- Ensure proper citations for any external sources, methodologies, or frameworks referenced

Important Guidelines and Considerations:

- **Ethics and Safety:** All data collection activities must comply with university policies. Do not access restricted areas or equipment without proper authorization from relevant authorities.

- **Privacy and Consent:** When collecting data involving individuals, ensure anonymity, obtain appropriate consent, and respect privacy guidelines and ethical research standards.

- **Academic Integrity:** This workshop emphasizes original analysis and primary research. While you may reference established methodologies, your data collection, analysis, and insights must be your own work.

- **Systems Thinking Focus:** Demonstrate your understanding of systems analysis principles, theoretical frameworks, and analytical approaches throughout your investigation.

- **Foundation Building:** Treat this analysis as the foundation for your semester-long project. You will revisit and expand upon these findings in subsequent workshops, so maintain thorough documentation.

- **Broader Context Integration:** Consider how your system analysis relates to larger themes such as sustainability, efficiency optimization, cost management, and organizational behavior.

- **Professional Development:** This workshop develops practical skills in research design, data collection, systems analysis, and technical communication that are valuable across engineering disciplines.

*Good luck, and remember that your goal is to apply rigorous **systems analysis** methodologies while developing essential research and analytical skills for your professional development!*