

# Final Project Documentation: Advanced Operating System Simulator

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# **1 Introduction**

## **1.1 Problem Statement**

- Module 1: Process Simulation
- Module 2: Advanced Memory Management
- Module 3: Process Scheduling and Context Switching
- Module 4: Interrupt Handling and Dispatcher
- Module 5: Efficiency Analysis of Concurrency

## **1.2 Outline**

# **2 Key Concepts and Features**

## **2.1 Project 1**

## **2.2 Project 2**

## **2.3 Project 3**

Wasn't Assigned

## **2.4 Project 4**

Wasn't Assigned

## **3 Module 1: Process Simulation**

### **3.1 Problem Statement**

### **3.2 Implementation**

#### **3.2.1 Core CPU Components and Registers**

#### **3.2.2 Process Control Block**

#### **3.2.3 Fetch-Decode-Execute Cycle**

## **4 Module 2: Advanced Memory Management**

### **4.1 Problem Statement**

### **4.2 Implementation**

#### **4.2.1 Hierarchical Memory System**

#### **4.2.2 Memory Table**

#### **4.2.3 Dynamic Memory Allocation and Deallocation**

## **5 Module 3: Process Scheduling and Context Switching**

### **5.1 Problem Statement**

### **5.2 Implementation**

#### **5.2.1 Process Control Block Enhancements**

#### **5.2.2 Scheduling Algorithms**

Round-Robin

Priority-Based Scheduling

Shortest Time Remaining

Highest Response Ratio Next

First Come First Serve

Shortest Process Next

Feedback Scheduling

#### **5.2.3 Context Switching**

#### **5.2.4 Integration with Fetch-Decode-Execute Cycle**

## **6    Module 4: Interrupt Handling and Dispatcher**

### **6.1    Problem Statement**

### **6.2    Implementation**

#### **6.2.1    Types of Interruption**

#### **6.2.2    Interrupt Vector Table**

#### **6.2.3    Context Switching**



## **7 Module 5: Efficiency Analysis of Concurrency**

### **7.1 Problem Statement**

### **7.2 Implementation**

#### **7.2.1 Performance Metrics Setup**

#### **7.2.2 Implementation of Time Tracking**

#### **7.2.3 Data Comparison**

#### **7.2.4 Performance Comparison**

#### **7.2.5 Visualization and Reporting**

## 8 The Simulation

## 9 Testing and Debugging

## 10 Conclusion

## 11 Appendix A: Screenshots