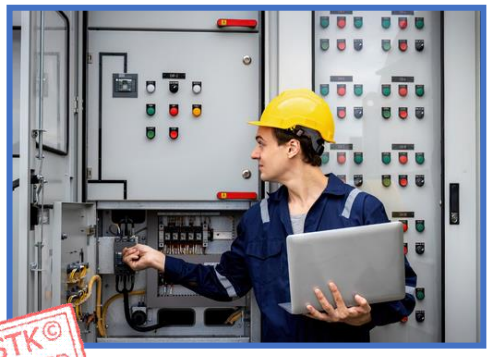
COURSE OVERVIEW IE0093
Fundamentals, System Maintenance and Troubleshooting of a SCADA System

Course Title
Fundamentals, System Maintenance and Troubleshooting of a SCADA System



Course Date/Venue
Session 1: February 10-14, 2025/Abu Dhabi Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: November 17-21, 2025/Abu Dhabi Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
IE0093

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description


This practical and highly-interactive course includes various practical sessions and exercises. Theory learned will be applied using our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of Fundamentals, System Maintenance and Troubleshooting of SCADA System. It covers the purpose, components and applications of SCADA systems in various industries; the SCADA system architecture, data acquisition and sensors, communication protocols in SCADA, human-machine interface (HMI) and cybersecurity in SCADA; the system design and planning and hardware installation; and installing SCADA software, configuring data acquisition parameters, creating tags and databases and setting up user roles and permissions.

Further, the course will also discuss the set-up of network infrastructure, configuring IP addresses and subnets, ensuring reliable and redundant communication and testing network connections; integrating SCADA with existing systems, configuring communication protocols, testing data flow between components and addressing compatibility issues; verifying hardware-software integration and initial data acquisition tests; checking HMI displays and alarms and documenting and resolving issues; developing maintenance schedules, cleaning and inspecting hardware components and verifying communication lines; and using diagnostic tools for PLCs and RTUs.

During this interactive course, participants will learn the hardware failures, faulty components and backup hardware maintenance; keeping software up-to-date and the database maintenance, alarm and event management and system documentation updates; the common issues of SCADA systems and troubleshooting communication failures, hardware issues, and software and HMI issues; the root cause analysis, emergency response procedures, advanced cybersecurity measures and system performance optimization; setting-up automated backups, testing recovery procedures, ensuring redundancy in critical components and developing\ comprehensive disaster recovery plan; and the future trends in SCADA covering integration with IOT and industry 4.0, cloud-based SCADA solutions, advances in machine learning and analytics and emerging protocols and standards.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain a comprehensive knowledge on the fundamentals, system maintenance and troubleshooting of SCADA system
- Discuss the purpose of SCADA, components of SCADA systems and its applications in various industries
- Identify the SCADA system architecture, data acquisition and sensors, communication protocols in SCADA, human-machine interface (HMI) and cybersecurity in SCADA
- Apply system design and planning through assess system requirements, selecting appropriate hardware and software, site assessment and preparation, developing system documentation
- Perform hardware installation by mounting PLCs & RTUs, connecting sensors and actuators, power requirements and backup systems and testing hardware connections
- Install SCADA software, configure data acquisition parameters, create tags and databases and set-up user roles and permissions
- Set-up network infrastructure, configure IP addresses and subnets, ensure reliable and redundant communication and test network connections
- Integrate SCADA with existing systems, configure communication protocols, test data flow between components and address compatibility issues
- Verify hardware-software integration, perform initial data acquisition tests, check HMI displays and alarms and document and resolve issues
- Apply regular maintenance, develop maintenance schedules, clean and inspect hardware components and verify communication lines
- Use diagnostic tools for PLCs and RTUs, identify hardware failures, test and replace faulty components and maintain backup hardware
- Explain the importance of keeping software up-to-date as well as identify and apply patches, test updates in a controlled environment and document changes and updates
- Employ database maintenance, alarm and event management and system documentation updates

- Identify the common issues of SCADA systems and troubleshoot communication failures, hardware issues, and software and HMI issues
- Apply root cause analysis, emergency response procedures, advanced cybersecurity measures and system performance optimization
- Set-up automated backups, test recovery procedures, ensure redundancy in critical components and develop a comprehensive disaster recovery plan
- Discuss the future trends in SCADA covering integration with IOT and
- industry 4.0, cloud-based SCADA solutions, advances in machine learning and analytics and emerging protocols and standards

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

The course provides an overview of all significant aspects and considerations of fundamentals, system maintenance and troubleshooting of a SCADA system for maintenance engineers, SCADA system engineers, automation engineers, project managers, maintenance supervisors, cybersecurity specialists, IT/network support personnel, field technicians and other technical staff.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

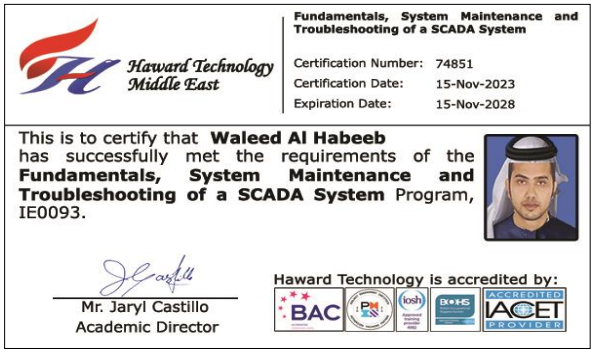
Course Certificate(s)

(1) Internationally recognized Competency Certificates and Plastic Wallet Cards will be issued to participants who completed a minimum of 80% of the total tuition hours and successfully passed the exam at the end of the course. Certificates are valid for 5 years.

Recertification is FOC for a Lifetime.

Sample of Certificates

The following are samples of the certificates that will be awarded to course participants:-



(2) Official Transcript of Records will be provided to the successful delegates with the equivalent number of ANSI/IACET accredited Continuing Education Units (CEUs) earned during the course.

Haward Technology Middle East

Continuing Professional Development (HTME-CPD)

CEU Official Transcript of Records

TOR Issuance Date: 15-Nov-23

HTME No. 74851

Participant Name: Waleed Al Habeeb

Program Ref.	Program Title	Program Date	No. of Contact Hours	CEU's
IE0093	Fundamentals, System Maintenance and Troubleshooting of a SCADA System	November 11-15, 2023	30	3.0

Total No. of CEU's Earned as of TOR Issuance Date **3.0**

TRUE COPY

Jaryl Castillo
Academic Director

Haward Technology has been approved as an Accredited Provider by the International Association for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this approval, Haward Technology has demonstrated that it complies with the ANSI/IACET 1-2018 Standard which is widely recognized as the standard of good practice internationally. As a result of their Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for programs that qualify under the ANSI/IACET 1-2018 Standard.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking Continuing Education Units (CEUs) in accordance with the rules & regulations of the International Association for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology is accredited by

P.O. Box 26070, Abu Dhabi, United Arab Emirates | Tel.: +971 2 3091 714 | E-mail: info@haward.org | Website: www.haward.org

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations:-

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Fee

US$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Barry Pretorius is a **Senior Electrical & Instrumentation Engineer** with almost **45** years of extensive experience within the **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise widely covers in the areas of Programmable Logic Controller (**PLC**), **Siemens PLC** Simatic S7-400/S7-300/S7-200, **PLC & SCADA** for Automation & Process Control, **Artificial Intelligence**, **Allen Bradley PLC** Programing and Hardware Trouble Shooting, Schneider **SCADA System**, **SCADA HMI & PLC** Control Logic, Distributed Control System (**DCS**), **DCS** Operations & Techniques, **Plant Control** and Protection Systems, **Process Control & Instrumentation**, **Liquid & Gas Flowmetering**, **Custody Measurement**, **Ultrasonic Flowmetering**, **Loss Control**, **Loss Control** & **Multiphase Flowmetering**, **Custody Measurement** & **Loss Control**, **Gas Measurement**, **Cascade Control Loops**, **Split-Range Control Loops**, **Capacity Control** & Other Advanced Control Schemes, **Safety Instrumented Systems**, **Plant Automation** Operations & Maintenance, **Wonder Ware**, **Emerson**, **Honeywell**, **Honeywell** Safety Manager PLC, **Yokogawa**, Advanced **DCS Yokogawa**, **Endress & Hauser**, Field Commissioning and Start up Testing Pre Operations, **Fire & Gas Detection** System, System Factory Acceptance Test (**FAT**), FactoryLink ECS, Modicon 484, Rockwell Automation, System Site Acceptance Test (**SAT**), **Cyber Security** Practitioner, **Cyber Security** of Industrial Control System, **IT Cyber Security** Best Practices, **Cybersecurity** Fundamentals, **Ethical Hacking & Penetration Testing**, **Cybersecurity** Risk Management, **Cybersecurity** Threat Intelligence, **OT Whitelisting** for Better Industrial Control System Defense, **NESA** Standard and Compliance Workshop, **OT**, **Cyber Attacks** Awareness - Malware/Ransom Ware / Virus /Trojan/ Philsing, **Information Security Manager**, **Security System** Installation and Maintenance, Implementation, Systems Testing, Commissioning and Startup, **Foxboro DCS & Triconics**, **SIS** Systems, Advanced **DC Drives**, Motion Control, **Hydraulics**, **Pneumatics and Control Systems** Engineering, **Electrical & Automation Control Systems**, **HV/MV Switchgear**, **LV & MV** Switchgears & Circuit Breakers, **High Voltage Electrical Safety**, **LV & HV Electrical System**, **HV Equipment** Inspection & Maintenance, **LV Distribution Switchgear & Equipment**, **Electrical Safety**, **Electrical** Maintenance, **Transformers**, **Medium & High Voltage Equipment**, **Circuit Breakers**, **Cable & Overhead Line** Troubleshooting & Maintenance, **Electrical Drawing & Schematics**, **Voltage Distribution**, **Power Distribution**, **Filters**, **Automation System**, **Electrical Variable Speed Drives**, **Power** Systems, **Power Generation**, **Diesel Generators**, **Power Stations**, Uninterruptible Power Systems (**UPS**), **Battery Chargers**, **AC & DC Transmission**, **CCTV** Installation, **Data & Fire Alarm** System, **Evacuation** Systems and **Electrical Motors & Variable Speed Drives**, & Control of Electrical and Electronic devices.

During Mr. Pretorius's career life, he has gained his practical experience through several significant positions and dedication as the **Technical Director**, **Automation System's Software Manager**, **Site Manager**, **Senior Lead Technical Analyst**, **Project Team Leader**, **Automation Team Leader**, **Automation System's Senior Project Engineer**, **Senior Project & Commissioning Engineer**, **Senior Instrumentation & Control Engineer**, **Electrical Engineer**, **Project Engineer**, **Pre-Operations Startup Engineer**, **PLC Specialist**, **Radio Technician**, **A.T.E Technician** and **Senior Instructor/Trainer** from various companies like the ADNOC Sour Gas, Ras Al Khair Aluminum Smelter, Johnson Matthey Pty. Ltd, Craigcor Engineering, Unitronics South Africa Pty (Ltd), Bridgestone/Firestone South Africa Pty (Ltd) and South African Defense Force.

Mr. Pretorius's has a **Bachelor** of **Technology** in **Electrical Engineering** (**Heavy Current**). Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), received numerous awards from various institutions and delivered numerous trainings, courses, workshops, seminars and conferences internationally.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to SCADA Systems*** *Definition & Purpose of SCADA • History & Evolution of SCADA • Components of SCADA Systems • Applications in Various Industries*
0930 – 0945	*Break*
0945 – 1100	***SCADA System Architecture*** *Hardware Components (PLCs, RTUs, HMIs) • Software Components (SCADA Software, Databases) • Network Communication in SCADA • Centralized versus Distributed Architectures*
1100 - 1200	***Data Acquisition & Sensors*** *Types of Sensors & Their Roles • Signal Types (Analog & Digital) • Signal Conditioning & Processing • Data Acquisition Systems (DAS)*
1200 – 1230	***Communication Protocols in SCADA*** *Common Protocols (Modbus, DNP3, OPC, Etc.) • Protocol Selection Criteria • Communication Standards & Interoperability • Security Considerations in Protocols*
1230 – 1245	*Break*
1245 – 1330	***Human-Machine Interface (HMI)*** *Purpose & Design of HMIs • Data Visualization & Trends • Alarm Management in HMIs • Best Practices for Intuitive Interfaces*
1330 - 1420	***Basics of Cybersecurity in SCADA*** *Threats & Vulnerabilities in SCADA Systems • Overview of Cybersecurity Standards (NIST, IEC 62443) • Basic Measures for SCADA Security • Importance of Secure Communication Channel*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***System Design & Planning*** *Assessing System Requirements • Selecting Appropriate Hardware & Software • Site Assessment & Preparation • Developing System Documentation*
0830 - 0930	***Hardware Installation*** *Mounting PLCs & RTUs • Connecting Sensors & Actuators • Power Requirements & Backup Systems • Testing Hardware Connections*
0930 – 0945	*Break*
0945 – 1100	***Software Installation & Configuration*** *Installing SCADA Software • Configuring Data Acquisition Parameters • Creating Tags & Databases • Setting Up User Roles & Permissions*

1100 – 1230	***Networking for SCADA Systems*** *Setting Up Network Infrastructure • Configuring IP Addresses & Subnets • Ensuring Reliable & Redundant Communication • Testing Network Connections*
1230 – 1245	*Break*
1245 - 1330	***System Integration*** *Integrating SCADA with Existing Systems • Configuring Communication Protocols • Testing Data Flow Between Components • Addressing Compatibility Issues*
1230 – 1420	***Initial System Testing*** *Verifying Hardware-Software Integration • Performing Initial Data Acquisition Tests • Checking HMI Displays & Alarms • Documenting & Resolving Issues*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Preventive Maintenance*** *Importance of Regular Maintenance • Developing Maintenance Schedules • Cleaning & Inspecting Hardware Components • Verifying Communication Lines*
0830 - 0930	***Hardware Diagnostics*** *Using Diagnostic Tools for PLCs & RTUs • Identifying Hardware Failures • Testing & Replacing Faulty Components • Maintaining Backup Hardware*
0930 – 0945	*Break*
0945 – 1100	***Software Updates & Patches*** *Importance of Keeping Software Up-to-Date • Identifying & Applying Patches • Testing Updates in a Controlled Environment • Documenting Changes & Updates*
1100 – 1230	***Database Maintenance*** *Monitoring Database Performance • Managing Data Storage & Backups • Optimizing Database Queries • Addressing Data Integrity Issues*
1230 – 1245	*Break*
1245 - 1330	***Alarm & Event Management*** *Reviewing & Optimizing Alarm Thresholds • Eliminating False Alarms • Ensuring Proper Event Logging • Training Staff Alarm Response Protocols*
1330 – 1420	***System Documentation Updates*** *Updating Hardware & Software Inventories • Revising System Diagrams & Schematics • Documenting Changes in Configurations • Maintaining a Comprehensive Log of Maintenance Activities*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Understanding Common Issues*** *Overview of Typical SCADA System Failures • Identifying Symptoms of Hardware versus Software Issues • Prioritizing Troubleshooting Efforts • Establishing Escalation Protocols*
0830 - 0930	***Troubleshooting Communication Failures*** *Diagnosing Network Connectivity Issues • Testing Protocol Configurations • Resolving Latency & Bandwidth Problems • Restoring Lost Communication with Devices*
0930 – 0945	*Break*
0945 – 1100	***Troubleshooting Hardware Issues*** *Identifying Faulty Sensors & Actuators • Testing PLCs & RTUs • Replacing Damaged Components • Validating Repairs with Test Procedures*
1100 – 1230	***Troubleshooting Software & HMI Issues*** *Resolving Data Acquisition Errors • Debugging HMI Visualization Problems • Addressing Database Connectivity Issues • Restoring Corrupted Software Configurations*
1230 – 1245	*Break*
1245 - 1330	***Root Cause Analysis*** *Documenting & Analyzing Incidents • Using Logs & Event Data for Investigation • Identifying Underlying Causes of Recurring Issues • Developing Preventive Measures*
1230 – 1420	***Emergency Response Procedures*** *Responding To System-Wide Failures • Restoring Backups & Disaster Recovery • Communicating with Stakeholders During Emergencies • Evaluating & Improving Response Plans*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Advanced Cybersecurity Measures*** *Implementing Intrusion Detection Systems • Conducting Vulnerability Assessments • Securing Remote Access Connections • Training Staff on Cybersecurity Protocols*
0830 - 0930	***System Performance Optimization*** *Identifying & Addressing Bottlenecks • Optimizing HMI Performance • Enhancing Data Acquisition Rates • Ensuring High System Availability*
0930 – 0945	*Break*
0945 – 1100	***Practical Troubleshooting Scenarios*** *Simulating Hardware Failures • Resolving Communication Breakdowns • Debugging Software Errors • Hands-On Exercises with Real-World Case Studies*
1100 – 1215	***Backup & Recovery Strategies*** *Setting Up Automated Backups • Testing Recovery Procedures • Ensuring Redundancy in Critical Components • Developing a Comprehensive Disaster Recovery Plan*

1215 – 1230	*Break*
1230 – 1300	***Future Trends in SCADA*** *Integration with IOT & Industry 4.0 • Cloud-Based SCADA Solutions • Advances in Machine Learning & Analytics • Emerging Protocols & Standards*
1300 – 1315	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1315 – 1415	***COMPETENCY EXAM***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using one of our state-of-the-art simulators "Allen Bradley SLC 500", "AB Micrologix 1000 (Digital or Analog)", "AB SLC5/03", "AB WS5610 PLC", "Siemens S7-1200", Siemens S7-400" "Siemens SIMATIC S7-300", "Siemens S7-200" "GE Fanuc Series 90-30 PLC", "Schneider Electric Magelis HMISTU", "Siemens SIMATIC Step 7 Professional Software", and "HMI SCADA".

Allen Bradley SLC 500 Simulator

Allen Bradley Micrologix 1000 Simulator (Digital)

Allen Bradley Micrologix 1000 Simulator (Analog)

Allen Bradley SLC 5/03

Allen Bradley WS5610 PLC Simulator PLC5

Siemens S7-1200 Simulator

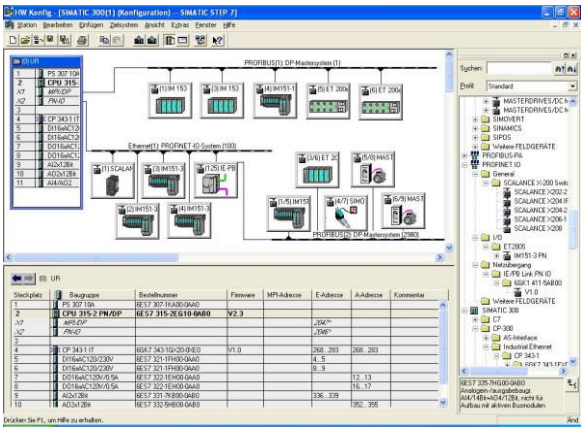
Siemens S7-400 Simulator

Siemens SIMATIC S7-300

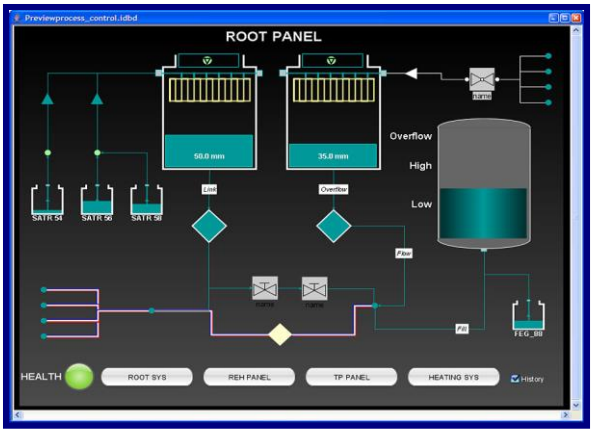
Siemens S7-200 Simulator

GE Fanuc Series 90-30 PLC Simulator

Schneider Electric Magelis HMISTU



Siemens SIMATIC Step 7 Professional Software



HMI SCADA

Course Coordinator
Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org