

COURSE OVERVIEW IE0098

Advancement in RTU Communication & Automation Systems

Course Title

Advancement in RTU Communication & Automation Systems

Course Date/Venue

October 19-23, 2026/Liwa 1 Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference

IE0098

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs



Course Description



This practical and highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.



This course is designed to provide delegates with a detailed and up-to-date overview of Advancement in Remote Terminal Unit (RTU) Communication & Automation Systems. It covers the purpose of RTUs, the key differences of RTU and PLC and the common industries using RTUs; the RTU hardware architecture, RTU communication protocol and advances in communication media; the common vulnerabilities in RTU system; the importance of data encryption, authentication and access control and cybersecurity standards; the modbus RTU & TCP/IP, DNP3 protocol and IEC protocols in RTUs; and the basics of MQTT protocol, publishing/subscribing model in RTU system and integrating MQTT with industrial IoT platforms.



Further, the course will also discuss the role of protocol converters and gateway configurations; the SCADA system integration and PLC and RTU interfacing; the remote monitoring and control covering real-time data acquisition, web-based RTU monitoring, cloud integration with RTUs and fault detection and diagnostics; the edge computing concepts and the benefits of edge analytics; the redundancy and reliability in RTU systems; the role of RTUs in data collection and basic principles of predictive maintenance; and integrating RTU data with analytics platforms and dashboard and reporting tools.

During the interactive course, participants will learn the artificial intelligence in automation systems, RTUs in smart grids and wireless sensor networks (WSN); reducing the RTU energy consumption, optimizing communication processes and design eco-friendly RTUs; the project management in RTU system deployment covering RTU system implementation, budgeting and resource allocation, risk management in RTU project and evaluating project success; the future trends in RTU communication comprising of advancements in IIoT for RTUs, integration of blockchain in RTU system, role of quantum communication in automation and predictions for RTU evolution; the preventive maintenance best practices, diagnosing communication failures, updating RTU firmware and software and remote troubleshooting techniques; and the system requirements, selecting hardware and protocols, design scalability and redundancy and building a cybersecurity strategy.

Course Objectives/Outcomes & Benefits for the Participants

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

- Apply and gain a comprehensive knowledge on the advancement in RTU communication and automation systems
- Discuss the purpose of RTUs, the key differences of RTU and PLC and the common industries using RTUs
- Explain the RTU hardware architecture, RTU communication protocol and advances in communication media
- Identify the common vulnerabilities in RTU systems, importance of data encryption, authentication and access control and cybersecurity standards
- Recognize modbus RTU & TCP/IP, DNP3 protocol and IEC protocols in RTUs
- Discuss the basics of MQTT protocol, publish/subscribe model in RTU systems and integrate MQTT with industrial IoT platforms
- Define the role of protocol converters and apply gateway configurations, SCADA system integration and PLC and RTU interfacing
- Employ remote monitoring and control covering real-time data acquisition, web-based RTU monitoring, cloud integration with RTUs and fault detection and diagnostics
- Describe edge computing concepts and the benefits of edge analytics as well as redundancy and reliability in RTU systems
- Discuss the role of RTUs in data collection, basic principles of predictive maintenance, integrating RTU data with analytics platforms and dashboard and reporting tools
- Recognize artificial intelligence in automation systems, RTUs in smart grids and wireless sensor networks (WSN)
- Reduce RTU energy consumption, optimize communication processes and design eco-friendly RTUs
- Apply project management in RTU system deployment covering RTU system implementation, budgeting and resource allocation, risk management in RTU project and evaluating project success

- Discuss the future trends in RTU communication comprising of advancements in IIoT for RTUs, integration of blockchain in RTU system, role of quantum communication in automation and predictions for RTU evolution
- Employ preventive maintenance best practices, diagnosing communication failures, updating RTU firmware and software and remote troubleshooting techniques
- Identify system requirements, select hardware and protocols, design scalability and redundancy and build a cybersecurity strategy

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

This course provides an overview of all significant aspects and considerations of advancement in RTU communication and automation systems for automation engineers, control systems engineers, electrical engineers, instrumentation engineers, SCADA system operators/engineers, telecommunication engineers, project managers, technical support and maintenance staff, system integrators 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.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

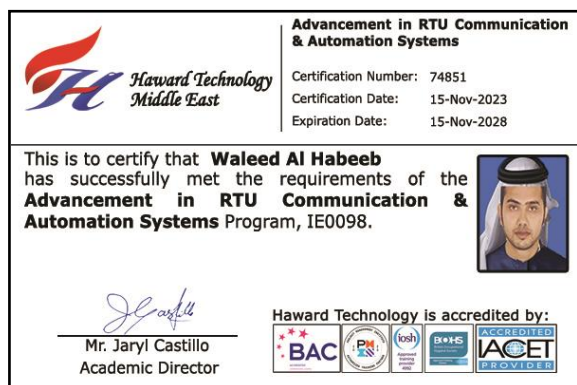
Course Certificate(s)

- (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 * CEUs * Haward Technology * CEUs * Haward Technology * CEUs * Haward Technology *														
		Haward Technology Middle East Continuing Professional Development (HTME-CPD)												
		CEUs												
<u>CEU Official Transcript of Records</u>														
TOR Issuance Date:		15-Nov-23												
HTME No.		74851												
Participant Name:		Waleed Al Habeeb												
<table border="1"> <thead> <tr> <th>Program Ref.</th> <th>Program Title</th> <th>Program Date</th> <th>No. of Contact Hours</th> <th>CEU's</th> </tr> </thead> <tbody> <tr> <td>IE0098</td> <td>Advancement in RTU Communication & Automation Systems</td> <td>November 11-15, 2023</td> <td>30</td> <td>3.0</td> </tr> </tbody> </table>					Program Ref.	Program Title	Program Date	No. of Contact Hours	CEU's	IE0098	Advancement in RTU Communication & Automation Systems	November 11-15, 2023	30	3.0
Program Ref.	Program Title	Program Date	No. of Contact Hours	CEU's										
IE0098	Advancement in RTU Communication & Automation Systems	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														
* Haward Technology * CEUs * Haward Technology * CEUs * Haward Technology * CEUs * Haward Technology *														

Certificate Accreditations

Haward's 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**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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. Pan Marave, PE, MSc, BEng, is a Senior Electrical & Instrumentation Engineer with over **30 years** of extensive experience in **Oil, Gas, Petrochemical, Refinery & Power** industries. His expertise includes **Advanced RTU Operations & Maintenance, SCADA RTU Networking & Cybersecurity, RTU Data Acquisition & Control, Safety Instrumented Systems (SIS), Process Control, Instrumentation, Safety Integrity Level (SIL), Emergency Shutdown (ESD); DCS, SCADA & PLC; Measurement (Flow, Temperature, Pressure); Process Analyzers & Analytical Instrumentation; Process Control, Instrumentation & Safeguarding; Process Controller, Control Loop & Valve Tuning; Industrial Distribution Systems; Industrial Control & Control Systems, Power Systems Protection & Relaying; Earthing, Bonding, Grounding, Lightning & Surge Protection; Electric Power Substation & Systems; Electrical Engineering Principles; Motor Control Circuit; Electrical Fault Analysis; Electrical Networks & Distribution Cables; Circuit Breakers, Switchgears, Transformers, Hazardous Areas Classification and Detailed Engineering Drawings, Codes & Standards.** Furthermore, he is also well-versed in Microprocessors Structure, Lead Auditor (**ISO 9000:2000**), **ISO 9002**, Quality Assurance, and Projects & Contracts Management.

Presently, Mr. Marave is the **Technical Advisor** of **Chamber of Industry & Commerce** in Greece. Prior to this, he gained his thorough practical experience through several positions as the **Technical Instructor, Engineering Manager, Electronics & Instruments Head, Electrical, Electronics & Instruments Maintenance Superintendent, Assistant General Technical Manager** and **Engineering Supervisor** of various international companies such as the **Alumil Mylonas, Athens Papermill, Astropol** and the **Science Technical Education**.

Mr. Marave is a **Registered Professional Engineer** and has **Master** and **Bachelor** degrees in **Electrical Engineering** from the **Polytechnic Institute of New York** and **Pratt Institute of New York (USA)** respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and an active member of the **Technical Chamber** and the **Institute of Electrical and Electronics Engineer (IEEE)** in Greece. He has presented and delivered **numerous international** courses, conferences, trainings and workshops worldwide.

Accommodation

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

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: Monday, 19th of October 2026

0730 – 0800	<i>Registration & Coffee</i>
0800 – 0815	<i>Welcome & Introduction</i>
0815 – 0830	PRE-TEST
0830 – 0900	Introduction to RTU Systems <i>Definition & Purpose of RTUs • Historical Evolution of RTU Systems • RTU versus PLC: Key Differences • Common Industries Using RTUs</i>
0900 – 0930	RTU Hardware Architecture <i>RTU Processor Units • I/O Modules & Configurations • Power Supply Systems • Environmental Considerations (Temperature, Humidity, etc.)</i>
0930 – 0945	<i>Break</i>
0945 – 1100	RTU Communication Protocols Overview <i>Serial Communication (RS-232, RS-485) • Modbus Protocol Basics • DNP3 Protocol Fundamentals • Introduction to IEC 60870-5</i>
1100 – 1230	Advances in Communication Media <i>Fiber-Optic Communication • Wireless Communication in RTUs • Satellite Communication for Remote RTUs • Cellular Technologies (4G/5G)</i>
1230 – 1245	<i>Break</i>
1245 – 1330	Cybersecurity in RTU Communication <i>Common Vulnerabilities in RTU Systems • Importance of Data Encryption • Authentication & Access Control • Cybersecurity Standards (e.g., NERC CIP, IEC 62351)</i>
1300 – 1420	Hands-on Activity: Basic RTU Configuration <i>Setting up an RTU System • Connecting Basic I/O Devices • Monitoring Real-Time Data using Modbus</i>
1420 – 1430	Recap <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow</i>
1430	<i>Lunch & End of Day One</i>

Day 2: Tuesday, 20th of October 2026

0730 – 0830	Modbus <i>Modbus RTU versus Modbus TCP/IP • Addressing & Function Codes • Modbus Mapping • Troubleshooting Common Modbus Issues</i>
0830 – 0930	Understanding DNP3 Protocol <i>Role of DNP3 in SCADA System • Event-Driven versus Polling Mechanisms • DNP3 Object Groups & Variations • Secure Authentication in DNP3</i>
0930 – 0945	<i>Break</i>
0945 – 1100	IEC Protocols in RTUs <i>Introduction to IEC 61850 • Key Features & GOOSE Messaging • Comparison with IEC 60870-5 • Practical Applications in Substations</i>
1100 – 1230	MQTT & IIoT Integration <i>Basics of MQTT protocol • Publish/Subscribe Model in RTU Systems • Integration with Industrial IoT Platforms • Security Considerations in MQTT</i>
1230 – 1245	<i>Break</i>



1245 – 1300	Protocol Conversion & Gateways Role of Protocol Converters • Gateway Configurations • Challenges in Protocol Conversion • Case studies: Multi-Protocol RTU Systems
1300 – 1420	Hands-on Activity: Protocol Analysis Simulating Modbus & DNP3 communication • Capturing Data Packets using Wireshark • Analyzing Protocol Performance
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Two

Day 3: Wednesday, 21st of October 2026

0730 – 0900	SCADA System Integration RTU as a Data Source for SCADA • RTU-SCADA Communication Workflows • Alarm & Event Management • Data Visualization Best Practices
0900 – 0930	PLC & RTU Interfacing RTU-PLC Communication Methods • Protocol Compatibility • Case Study: Hybrid Automation Systems • Challenges in RTU-PLC Integration
0930 – 0945	Break
0945 – 1100	Remote Monitoring & Control Real-Time Data Acquisition • Web-based RTU Monitoring • Cloud Integration with RTUs • Fault Detection & Diagnostics
1100 – 1230	Edge Computing in RTUs Overview of Edge Computing Concepts • Benefits of Edge Analytics • Real-Time Decision-Making at the RTU Level • Use Cases for Edge RTUs
1230 – 1245	Break
1245 – 1330	Redundancy & Reliability in RTU Systems Dual Communication Paths • Hot Standby Configurations • Fault-Tolerant Designs • Testing & Maintenance Strategies
1330 – 1420	Hands-on Activity: SCADA-RTU Integration Configuring RTUs for SCADA Systems • Implementing Alarms & Notifications • Simulating System Failures & Recovery
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Three

Day 4: Thursday, 22nd of October 2026

0730 – 0830	Data Analytics & RTU Systems Role of RTUs in Data Collection • Basic Principles of Predictive Maintenance • Integrating RTU Data with Analytics Platforms • Dashboards & Reporting Tools
0830 – 0930	Artificial Intelligence in Automation Systems AI Applications in RTU-Based Automation • Machine Learning for Fault Prediction • Neural Networks for Process Optimization • Case Studies: AI-Driven RTU Systems
0930 – 0945	Break
0945 – 1030	RTUs in Smart Grids Role of RTUs in Smart Grid Automation • Load Balancing & Demand Response • Integration with Renewable Energy Sources • Standards & Regulations for Smart Grids
1030 – 1130	Wireless Sensor Networks (WSN) & RTUs Basics of WSN for Industrial Automation • RTU-WSN Integration Workflows • Power Management in Wireless Sensors • Emerging Technologies in WSN



1130 – 1230	Energy Efficiency in RTU Systems Reducing RTU Energy Consumption • Optimizing Communication Processes • Energy Harvesting Technologies • Designing Eco-Friendly RTUs
1230 – 1245	Break
1245 – 1420	Hands-on Activity: Advanced Configuration Configuring AI Tools with RTU Data • Implementing a Smart Grid Use Case • Deploying WSN with RTUs
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Four

Day 5: Friday, 23rd of October 2026

0730 – 0830	Project Management in RTU System Deployment Steps in RTU System Implementation • Budgeting & Resource Allocation • Risk Management in RTU Projects • Evaluating Project Success
0830 - 0930	Future Trends in RTU Communication Advancements in IIoT for RTUs • Integration of Blockchain in RTU Systems • Role of Quantum Communication in Automation • Predictions for RTU Evolution
0930 – 0945	Break
0945 – 1030	RTU Maintenance & Troubleshooting Preventive Maintenance Best Practices • Diagnosing Communication Failures • Updating RTU Firmware & Software • Remote Troubleshooting Techniques
1030 - 1230	Case Studies & Real-world Applications RTUs in Oil & Gas • RTUs in Water & Wastewater Management • RTUs in Transportation Systems • Lessons Learned from Industry Failures
1230 – 1245	Break
1245 - 1300	Designing a Robust RTU System Identifying System Requirements • Selecting Hardware & Protocols • Designing for Scalability & Redundancy • Building a Cybersecurity Strategy
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

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-



Course Coordinator

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