COURSE OVERVIEW IE0098
Advancement in RTU Communication & Automation Systems

Course Title
Advancement in RTU Communication & Automation Systems

Course Date/Venue
October 19-23, 2026/Sharjah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
IE0098

3.0 CEUs (30 PDHs) AWARD

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

Our courses employ an interactive, learner-centred methodology that integrates theoretical knowledge with practical application. The training is delivered through a suitable combination of some or all of the following methods, selected according to the course content and learning objectives:

- Instructor-led presentations and facilitated discussions
- Practical workshops and participant presentations
- Hands-on exercises and real-world case studies
- Equipment demonstrations and technical drawings
- Hardware- and software-based simulations
- Gamification & Role Play in soft-skills courses only
- Virtual Reality (VR) and Augmented Reality (AR)
- Instructional videos and other relevant training resources

This blended approach encourages active participation, strengthens practical skills and supports the effective application of acquired knowledge in the workplace.

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.

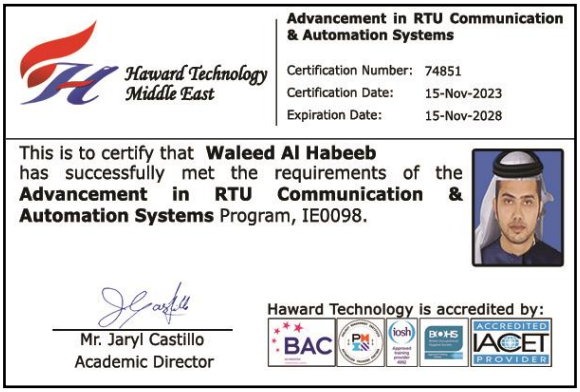
Course Certificate(s)

(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 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
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

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

Day 2: ***Tuesday, 20th of October 2026***

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

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

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