

COURSE OVERVIEW IE0311
SIF-1 (Safety Instrumented Functions)

Course Title

SIF-1 (Safety Instrumented Functions)

Course Date/Venue

November 10-14, 2024/SAS Meeting Room,
 Holiday Inn Muscat al Seeb, an IHG Hotel, Muscat,
 Oman

Course Reference

IE0311

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 learnt 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 Safety Instrumented Function Conceptual. It covers the safety instrumented systems (SIS) and the importance of SIS in process industries; the difference between SIS and basic process control systems (BPCS); the safety lifecycle phases, safety instrumented function (SIF), safety integrity level (SIL) and risk reduction factor; the hazard identification methods, risk assessment and layers of protection analysis (LOPA); the basic concepts of redundancy and the types of redundant architectures; the levels and significance of SIL, SIL determination methods and SIL verification; and the failure modes of instrumentation, hardware fault tolerance and software considerations.



During this interactive course, participants will learn the key design principles of SIF and the common cause failures; the safety instrumented equipment, SIS logic solvers and field devices in SIF; testing and validating SIF and methods and frequency of testing; the proper documentation and testing and verification best practices for safe commissioning and planning; the execution of proof testing and periodic inspection; the functional safety management and competency in operation and maintenance; the change management, failure reporting and analysis; and the human factors in SIS, auditing and assessing SIS health and measuring and monitoring SIS performance.



Course Objectives

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

- Apply and gain an in-depth knowledge on safety instrumented function conceptual
- Discuss safety instrumented systems (SIS) and the importance of SIS in process industries
- Identify the difference between SIS and basic process control systems (BPCS)
- Illustrate safety lifecycle phases and define safety instrumented function (SIF), safety integrity level (SIL) and risk reduction factor
- Carryout hazard identification methods, risk assessment and layers of protection analysis (LOPA)
- Recognize the basic concepts of redundancy and the types of redundant architectures
- Discuss the levels and significance of SIL and apply SIL determination methods and SIL verification
- Identify failure modes of instrumentation, hardware fault tolerance and software considerations
- Identify the key design principles of SIF and avoid common cause failures
- Select safety instrumented equipment and recognize SIS logic solvers and field devices in SIF
- Test and validate SIF, apply methods and frequency of testing and perform proper documentation
- Apply testing and verification best practices for safe commissioning as well as planning and execution of proof testing and periodic inspection
- Employ functional safety management and ensure competency in operation and maintenance
- Carryout change management, failure reporting and analysis and the emerging technologies in SIS
- Recognize the human factors in SIS, audit and assess SIS health and measure and monitor SIS performance

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, sample video clips of the instructor’s actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.

Who Should Attend


This course provides an overview of all significant aspects and considerations of safety instrumented function conceptual for instrumentation engineers, control engineers, process engineers and process safety engineers.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations


Certificates are accredited by the following international accreditation organizations: -

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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.

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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.

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 **45 years** of extensive experience in **Oil, Gas, Petrochemical, Refinery & Power** industries. His expertise includes **Circuit Breaker, HV Switchgear Maintenance, HV/LV Electrical Authorisation, Basic Electricity, Electrical & Special Hazards, Personnel Protection, HV/LV Equipment, Motor Controllers, Electrical Switching Practices, Emergency Planning, Safety Management, Safety Instrumented Systems (SIS), 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's** and **Bachelor's** degree 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.

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 Program

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

Day 1: Sunday, 10th of November 2024

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Introduction to Safety Instrumented Systems (SIS) Background and History • Importance of SIS in Process Industries • Difference Between SIS and Basic Process Control Systems (BPCS)
0930 – 0945	Break
0945 – 1030	Safety Lifecycle Overview Definition and Importance • Safety Lifecycle Phases
1030 – 1130	Key Terminologies Safety Instrumented Function (SIF) • Safety Integrity Level (SIL) • Risk Reduction Factor
1130 – 1215	Hazards & Risks Hazard Identification Methods • Risk Assessment and its Significance
1215 – 1230	Break
1230 – 1330	Layers of Protection Analysis (LOPA) Basics of LOPA • Application in Determining SIL Requirements
1330 – 1420	Importance of Redundancy Basic Concepts • Types of Redundant Architectures
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: Monday, 11th of November 2024

0730 – 0830	SIL Definition and Importance • Levels and their Significance
0830 – 0930	SIL Determination Methods for SIL Determination • Risk Matrix and Risk Graph Methodologies
0930 – 0945	Break
0945 – 1100	SIL Verification Verifying SIL Meets Requirements • Calculating Probability of Failure on Demand (PFD)
1100 – 1215	Failure Modes of Instrumentation Safe Failure and Dangerous Failure • Fail-Safe Concepts
1215 – 1230	Break
1230 – 1330	Hardware Fault Tolerance Definition and Importance • Common Architectures in SIS (1oo1, 1oo2, 2oo3, etc.)
1330 – 1420	Software Considerations in SIS Software Lifecycle • Challenges in Software Design and Validation
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: Tuesday, 12th of November 2024

0730 – 0830	Key Design Principles <i>Simplicity in Design • Avoiding Common Cause Failures</i>
0830 – 0930	Selecting Safety Instrumented Equipment <i>Certified versus Prior-Use Equipment • Equipment Lifecycle Considerations</i>
0930 – 0945	Break
0945 – 1100	SIS Logic Solvers <i>Functionality and Application • Hardware versus Software-Based Solvers</i>
1100 – 1215	Field Devices in SIF <i>Sensors and Final Elements • Proper Device Selection Criteria</i>
1215 – 1230	Break
1230 – 1330	SIF Testing & Validation <i>Importance of Testing and Validation • Methods and Frequency of Testing</i>
1330 – 1420	Documentation & Traceability <i>Importance of Proper Documentation • Requirements and Best Practices</i>
1420 – 1430	Recap <i>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</i>
1430	Lunch & End of Day Three

Day 4: Wednesday, 13th of November 2024

0730 – 0830	SIF Commissioning <i>Best Practices for Safe Commissioning • Testing and Verification During Commissioning</i>
0830 – 0930	Proof Testing & Periodic Inspection <i>Definition and Importance • Planning and Execution</i>
0930 – 0945	Break
0945 – 1100	Functional Safety Management <i>Role of Functional Safety Management in SIS • Key Components and Practices</i>
1100 – 1215	Training & Competency <i>Importance in SIS Lifecycle • Ensuring Competency in Operation and Maintenance</i>
1215 – 1230	Break
1230 – 1330	Change Management <i>Importance of Managing Changes • Impact of Changes on SIF and Overall SIS</i>
1330 – 1420	Failure Reporting & Analysis <i>Role of Failure Data • Methods for Capturing and Analyzing Failures</i>
1420 – 1430	Recap <i>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</i>
1430	Lunch & End of Day Four

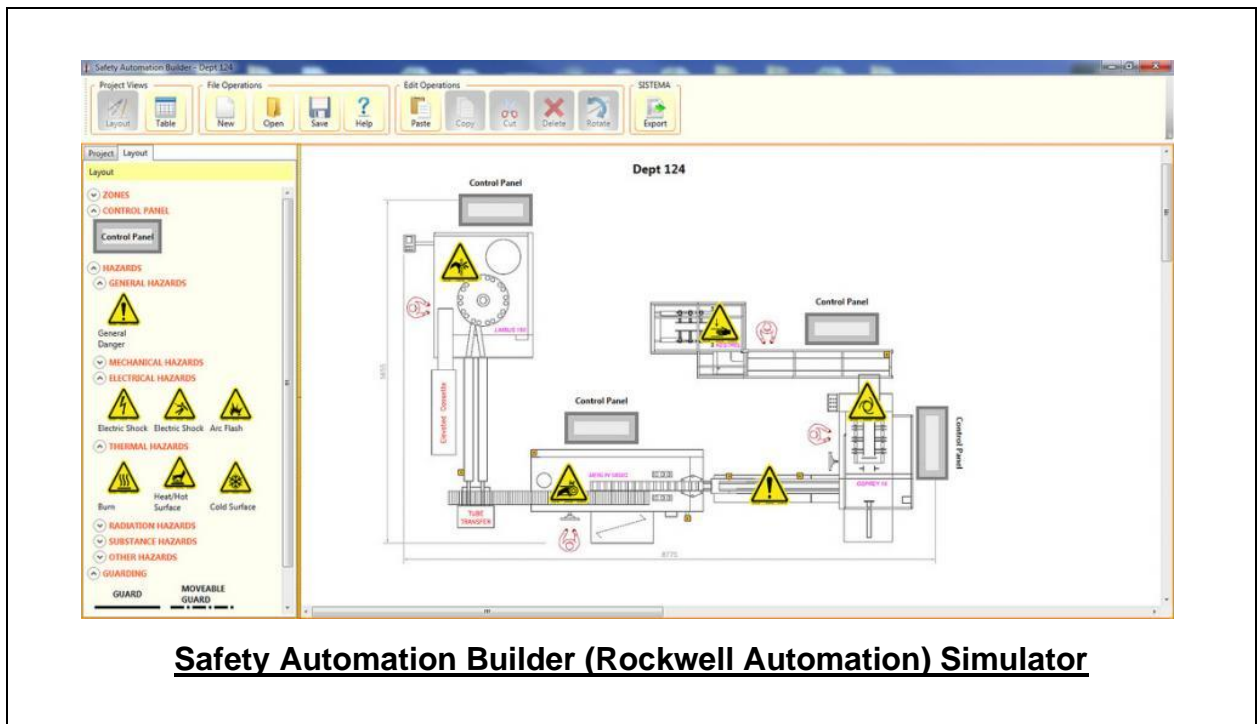


Day 5: Thursday, 14th of November 2024

0730 – 0830	Emerging Technologies in SIS <i>Impact of IIoT and Industry 4.0 on SIS • Cybersecurity in SIS</i>
0830 – 0930	Human Factors in SIS <i>Influence of Human Error • Designing with Human Factors in Mind</i>
0930 – 0945	Break
0945 – 1100	Auditing & Assessment of SIS <i>Role of Audits in Ensuring SIS Health • Key Components of an Effective Audit</i>
1100 – 1230	Safety Performance Indicators <i>Measuring and Monitoring SIS Performance • Role in Continuous Improvement</i>
1230 – 1245	Break
1245 – 1345	Case Studies <i>Real-life Incidents and Lessons Learned • Discussion on How Incidents could have been Prevented</i>
1345 – 1400	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1400 – 1415	POST-TEST
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch & End of Course</i>

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 the “Safety Automation Builder Software (Rockwell Automation)” simulator.



Course Coordinator

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