

Objective

I&E Systems' Functional Safety Engineering course provides the underpinning knowledge that is essential for engineers applying safety instrumented systems (SIS) in the process sector.

I&E Systems is an engineering consultancy specialising in systems engineering and systems integration. We bridge the gap between plant owners and the system suppliers. We work with the end-users from the initial early design concept right through design and implementation and on into long term support for operations, maintenance and modifications.

This **FS Engineer (TÜV Rheinland)** course is aimed specifically at engineers who work for:

- Engineering companies in the design, installation and commissioning of SIS
- 'End-user' companies who own and/or operate process plant.

It is not intended for engineers involved in the design of internal hardware for logic solver systems or for the design of field device components by OEMs. It is designed to provide candidates with a holistic view of the entire safety lifecycle from the user's perspective.

The course puts a strong emphasis on systematic integrity: Avoiding avoidable failures. These failures are primarily due to human error in the specification, design, installation, operation and maintenance of SIS. It also emphasises the importance of user-centred architectural design for safety instrumented systems.

The Standards

The course has been designed to provide the underpinning knowledge for competence as required by IEC 61511 and IEC 61508. It also supports the units of competence defined in the Institution of Engineering and Technology '*Competence Criteria for Safety-related System Practitioners*'.

The course material has been completely revised to cover the new 2nd edition of IEC 61511.

Course Structure

The course is presented over 4 days and includes classroom exercises. The exam is held on the 5th day, after a tutorial and review session in the morning. The 5th day is optional for candidates not intending to complete the exam.

All candidates will be provided with a set of homework exercises to do in their own time. The exercises will be reviewed in tutorial sessions at the beginning of each day of the course.

I&E Systems Pty Ltd - FS Engineer (TÜV Rheinland) Training and Certification

	Day 1	Day 2	Day 3	Day 4	Day 5
Session 1	Introduction	Exercises	Exercises	Exercises	Tutorial
Session 2	Risk management	SIL determination 1	Separation	Systematic capability, Human factors	
Session 3	Standards	Exercises	Fault tolerance	FS Management	Exam
Session 4	Planning & lifecycle	SIL determination 2	Architectural design	Quality management	
Session 5	SIS concepts	Exercises	Detailed design	Verification & validation	
Session 6	Failure modes	Safety requirements	Quantifying failure	Operation & maintenance	
Session 7	Review	Review	Exercises	Audit & assessment	

Assessment

Underpinning knowledge will be assessed in a 3 part exam:

- Part 1: Multiple choice questions, 50 questions assessing knowledge (worth 50%) and 20 calculation questions (worth 20%)
- Part 2: Written answer questions, 10 questions on functional safety principles (30%)

To complete the exam typically takes around 3 to 4 hours. The pass mark is 75%. Candidates that do not yet meet the grade may have a second attempt within a few weeks' time.

On successful completion of the exam candidates may apply for the FS Engineer (TÜV Rheinland) certificate. The following requirements have to be met qualify for this certificate:

- A minimum of 3 to 5 years' experience in the field of functional safety
- University degree (Master's or Bachelor's degree in Engineering) or equivalent engineer level responsibilities status certified by employer.

Candidates who have not yet gained at least 3 years of experience in functional safety may still participate in the training as well as the exam. If a candidate passes the exam successfully TÜV Rheinland will hold the results on file until the candidate can demonstrate achieving the necessary 3 years of business experience in the area of functional safety. The FS Engineer certificate will then be issued without the candidate needing to retake the exam.

Course Outline

- Introduction: What is 'Functional Safety'?
 - Regulatory framework
 - SIFs for risk reduction
 - Random and systematic failures

I&E Systems Pty Ltd - FS Engineer (TÜV Rheinland) Training and Certification

- Risk management principles, tolerable risk, ALARP
- Standards – history and structure
- The basics of planning and the ‘Safety Life-cycle’
- SIS fundamentals: Conceptual design, risk studies, SIFs and SIF allocation,
- Failure modes
 - Unrevealed and dangerous
 - Failure rate data
 - Hardware fault tolerance
 - SFF, Diagnostics
- SIL Determination
- Safety Requirements Specification
- SIS Architecture
 - Separation between layers
 - Fault tolerance
 - Design patterns
- System detailed design – documentation and traceability
- Quantification of failure rates and verification of compliance to standards
- Systematic capability, techniques and measures
- Human factors
- Functional safety management:
 - Policy and strategy
 - Safety management systems
 - Organisation and responsibilities
 - Managing competence
 - Safety Life-cycle planning
 - Issues management
 - Supplier management
 - Records management
 - Configuration management
- Quality management
- Verification and validation
- Operations and maintenance
 - Operations planning and management
 - Proof testing
 - Maintenance, inspection and testing
 - Issues and performance management
 - Modification management
 - Documentation
- Audit and assessment

I&E Systems Pty Ltd - FS Engineer (TÜV Rheinland) Training and Certification

Course Cost

The cost for each candidate on the full 5 day course is AUD 4,000 +GST. This includes course materials and the FS Engineer (TÜV Rheinland) certificate.

The cost per candidate for the 4 day course without the exam is AUD 3,300 + GST.

Course Schedule

Scheduled presentations of this course are listed on the TÜV Rheinland website at <https://www.tuvasi.com/en/trainings-and-workshops/schedule/schedule-trainings/termine-safety-instrumented-systems>

Contact mirek@iesystems.com.au to register or for further details.

Presenter

Mirek Generowicz is the Engineering Manager at I&E Systems, a company that specialises in control and safeguarding systems for the process industries. He first started working with functional safety systems in 1986. Mirek has worked in engineering management roles since 1992, focusing particularly on design integrity and quality management.

Mirek specialises in independent functional safety assessment and audit for end-users. Since 2004 he has carried out more than 35 functional safety audits and/or assessments for a wide variety of major SIS applications around the world. He was accredited by TÜV Rheinland as a FS Engineer in 2005, as a FS Expert in 2012 and as a FS Senior Expert in 2014.