

COURSE OVERVIEW SE0015
Structural Reliability Analysis in Civil Engineering

Course Title

Structural Reliability Analysis in Civil Engineering

Course Date/Venue

November 22-26, 2020/TBA Meeting Room, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference

SE0015

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.



The catastrophic collapse of the Minneapolis bridge in August 2nd, 2007 brought the attention of the world again to the importance of structural reliability analysis. The 581-meter entire length of the eight-lane bridge over the Mississippi River suddenly collapsed when less than 100 cars and buses were traveling on it. The American Society of Civil Engineers (ASCE) advised the authorities to carry out structural reliability analysis for all similar bridges in the USA and Canada. The fundamental aim of structural reliability analysis is the determination of a safety level of the structure. Under some hypotheses on the uncertain quantities, and by defining the state of failure, it can be possible to find the evolution of the failure probability of the structure along its life span and to verify that the design satisfies the safety considerations.



The reliability of a structure is traditionally achieved by deterministic methods using safety factors calculated generally under conservative estimators of influent parameters. Structural reliability analysis methods use probabilistic approaches for assessing safety factors or for optimizing maintenance and inspection programs. These methods become essential in the frame of long-term maintenance or life extension of the structure.

Structural reliability has become a discipline of international interest, addressing issues such as the safety of buildings, bridges, towers and other structures. This course is designed to address the important issue of predicting the safety of structures at the design stage and all other stages during the life span of the structures. Attention will be focused during the course on the development and definition of limit states such as serviceability and ultimate strength, the definition of failure and the various models which might be used to describe strength and loading. Much consideration will be given to problem formulation and to the various techniques which can be applied to problem solution. These include the First Order Second Moment method and their derivatives, as well as various Monte Carlo techniques. Each of these will be described in some detail and example applications will be given. Structural systems will also be described, as well as the effect of time on reliability estimation, and the development of design code rules on the basis of limit state principles as under-pinned by probability theory. Furthermore, procedures for the reliability estimation of existing structures will also be covered in the course.

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 dynamic analysis reinforced concrete structure under dynamic load
- Measure the structural reliability of the existing structures and during the design stage and perform structural reliability assessment
- Recognize various integration and simulation methods and explain the second-moment and the transformation methods
- Predict the reliability of various types of structural systems and calculate the time dependent reliability
- Define the load and load effect modeling and the resistance modelling
- Identify various codes and standards applicable to structural reliability and perform probabilistic evaluation of existing structures

Exclusive Smart Training Kit - H-STK®



*Participants of this course will receive the exclusive “Howard 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 dynamic analysis reinforced concrete structure under dynamic load for engineers, supervisors, superintendents, managers and scientists involved in design, construction, assessment, repair and maintenance of a wide range of public and industrial facilities. Personnel from authorities and major facilities operating companies will also benefit for attending this course.

Course Fee

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

Accommodation

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

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.

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)

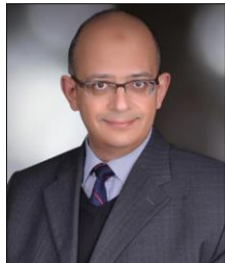
Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** 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 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:



Dr. Mostafa Eloyfi, PhD, MSc, BSc, Dip, NEBOSH, is a **Senior Project & Construction Management Consultant** with over **25 years** of extensive experience within the **Oil & Gas, Petroleum and Utility** industries. His expertise widely covers in the areas of **Construction Materials & Concrete Technology, Civil & Construction Engineering, Material Testing & Quality Control, Modern & Sustainable Construction Materials, Site Preparation & Construction Methods, Reinforced Concrete Construction, Structural Steel Construction, Masonry & Building Envelope Construction, Construction Equipment & Productivity, Construction Quality Management, Construction Safety Practices, Building Codes & Standards, Construction Planning & Scheduling, Prefabrication & Modular Construction, Sustainable Construction Practices, Repair, Rehabilitation & Retrofitting, Project Management, Project Planning & Scheduling, Project Economics, Risk & Decision Analysis, Asset Integrity Management for Oil & Gas Industry, Planning & Cost Management of Engineering Projects, Excavation Techniques, Contract Preparation & Management, Procurement Skills and Occupational Health & Safety.**

During his career life, Dr. Mostafa has gained his practical and field experience through his various significant positions and dedication as the **Chief Executive Officer (CEO), Business & Project Development Director, Projects Manager, Project Construction Manager, Deputy Construction Manager, Site Civil Supervisor, HSE Engineer, Senior Project Planning, Scheduling & Controlling Engineer, Project Planning, Scheduling & Controlling Engineer** and **Senior Instructor/Trainer** for numerous companies like the **GUPCO, BP, Consolidated Contractors International Company (CCIC), Burullus Gas Company, Pharaonic Petroleum Company (PhPC), Petroleum Integrated Services (PICO), North Sinai Petroleum Company (NOSPCO), MOG Energy, Premier Petroleum Supplier (PPS), ARWIMCO LLC, Zaporozhe Cement Factory, Technical Integrity Solutions (TIS) and Misr Cement Group.**

Dr. Mostafa holds a **Doctor of Business Administration (DBA)**, a **Master's** degree and a **Bachelor's** degree in **Civil Engineering**, a **Master's** of **International Business Administration** in **Global Marketing**, a **Master's** of **Management** in **Global Management** and **Diploma** in **Law, Project Management, Occupational Health & Safety & Environmental Control (HSE), Hazard Analysis and Sales & Marketing**. He is also a Recognized **NEBOSH – International General Certificate** and a **Certified Planning & Scheduling Professional (PSP)** and a member of **Egyptian Engineering Syndicate, Institution of Civil Engineers (ICE), Engineering New Zealand, Arab Engineers and Egyptian Society for Corrosion Engineers**. He has further published several journals and papers and delivered numerous courses, seminars, trainings and workshops internationally.

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 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: Sunday, 22nd of November 2026

0730 – 0800	<i>Registration & Coffee</i>
0800 – 0815	<i>Welcome & Introduction</i>
0815 – 0830	PRE-TEST
0830 – 0930	Measures of Structural Reliability <i>What is Structural Reliability? • Deterministic Measures of Limit State Violation • A Partial Probabilistic Safety Measure – The Return Period</i>
0930 – 0945	<i>Break</i>
0945 – 1100	Measures of Structural Reliability (cont'd) <i>Probabilistic Measure of Limit State Violation • Generalized Reliability Problem</i>
1100 – 1215	<i>Structural Reliability Assessment</i> <i>Uncertainties in Reliability Assessment • Integrated Risk Assessment • Criteria for Risk Acceptability</i>
1215 – 1230	<i>Break</i>
1230 – 1420	Structural Reliability Assessment (cont'd) <i>Nominal Probability of Failure • Hierarchy of Structural Reliability Measures</i>
1420 – 1430	Recap
1430	<i>Lunch & End of Day One</i>

Day 2: Monday, 23rd of November 2026

0730 – 0900	Integration & Simulation Methods Direct & Numerical Integration • Monte Carlo Simulation • Importance Sampling
0900 – 0915	Break
0915 – 1100	Integration & Simulation Methods (cont'd) Directional Simulation • Practical Aspects of Monte Carlo Simulation
1100 – 1215	Second-Moment & Transformation Methods Second-moment concepts • First-Order Second-Moment (FOSM) theory
1215 – 1230	Break
1230 – 1420	Second-Moment & Transformation Methods (cont'd) The First-Order Reliability Method (FORM) • Second-order methods (SORM) • Application of FOSM/FORM/SORM
1420 – 1430	Recap
1430	Lunch & End of Day Two

Day 3: Tuesday, 24th of November 2026

0730 – 0900	Reliability of Structural Systems Systems Reliability Fundamentals • Monte Carlo Techniques for Systems • System Reliability Bounds
0900 – 0915	Break
0915 – 1100	Reliability of Structural Systems (cont'd) Implicit Limit States – Response Surfaces • Complex Structural Systems
1100 – 1215	Time Dependent Reliability Time-Integrated Approach • Discretized Approach • Stochastic Process Theory • Stochastic Processes & Outcrossings
1215 – 1230	Break
1230 – 1420	Time Dependent Reliability (cont'd) Time Dependent Reliability • Load Combinations • Dynamic Analysis of Structures • Fatigue Analysis
1420 – 1430	Recap
1430	Lunch & End of Day Three

Day 4: Wednesday, 25th of November 2026

0730 – 0900	Load & Load Effect Modelling Wind Loading • Wave Loading • Floor Loading
0900 – 0915	Break
0915 – 1100	Resistance Modelling Basic Properties of Hot-Rolled Steel Members • Properties of Steel Reinforcing Bars • Concrete Statistical Properties
1100 – 1215	Resistance Modelling (cont'd) Statistical Properties of Structural Members • Connections • Incorporation of Member Strength in Design
1215 – 1230	Break
1230 – 1420	Codes & Structural Reliability Structural Design Codes • Improved Safety-Checking Formats • Relationship Between Level 1 & Level 2 Safety Measures
1420 – 1430	Recap
1430	Lunch & End of Day Four

Day 5: Thursday, 26th of November 2026

0730 – 0900	Codes & Structural Reliability (cont'd) <i>Selection of Code Safety Levels • Code Calibration Procedure • Observations</i>
0900 – 0915	<i>Break</i>
0915 – 1015	Probabilistic Evaluation of Existing Structures <i>Assessment Procedures • Updating Probabilistic Information</i>
1015 – 1200	Probabilistic Evaluation of Existing Structures (cont'd) <i>Proof & Service Load Information • Analytical Techniques</i>
1200 – 1215	<i>Break</i>
1215 – 1345	Probabilistic Evaluation of Existing Structures (cont'd) <i>Acceptance Criteria for Existing Structures</i>
1345 – 1400	Course Conclusion
1400 – 1415	POST-TEST
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch & End of Course</i>

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