COURSE OVERVIEW SE0047
Civil Structural Theories

Course Title
Civil Structural Theories

Course Date/Venue
July 20-24, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
SE0047

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 participants with a detailed and up-to-date overview of Civil Structural Theories. It covers the scope of structural mechanics, basic principles of structural analysis and the importance in civil engineering; the types of structures and structural systems including forces, loads, and their effects on structures; the stress, strain, and material behavior as well as free body diagrams and equilibrium conditions; the ductile versus brittle failure, yielding and fracture mechanics and fatigue and creep in structures; the beams and bending moments; and the trusses, frames, structural deflections and deformations.

Further, the course will also discuss the axial deformation in bars and columns; the shear stress in beams, torsional effects in shafts and structural elements and combined stress effects in structural elements; the concept of influence lines, influence lines for beams and trusses; the application in bridge engineering and moving load analysis; the stability and determinacy of structures; the energy methods in structural analysis, moment distribution method and slope deflection method; and the matrix method of structural analysis, structural dynamics and vibrations and plastic analysis of structures.

During this interactive course, participants will learn the principles of structural design including factors of safety and design criteria, ultimate load and serviceability considerations and structural performance assessment; the limit state design, working stress design and buckling and stability of structural elements; the reinforced concrete structural design, steel structural design principles, bond and anchorage in concrete structures and corrosion and durability considerations; the seismic design and earthquake-resistant structures, structural health monitoring and rehabilitation; the bridge and high-rise building structural analysis and principles of sustainable structural design; and the recycled materials in structural engineering, energy-efficient structural systems and green building certifications.

Course Objectives

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

- Apply and gain a comprehensive knowledge on civil structural theories
- Discuss scope of structural mechanics, basic principles of structural analysis and the importance in civil engineering
- Identify the types of structures and structural systems including forces, loads, and their effects on structures
- Recognize stress, strain, and material behavior as well as free body diagrams and equilibrium conditions
- Discuss ductile versus brittle failure, yielding and fracture mechanics and fatigue and creep in structures
- Analyse beams and bending moments as well as the trusses and frames and structural deflections and deformations
- Identify axial deformation in bars and columns, shear stress in beams, torsional effects in shafts and structural elements and combined stress effects in structural elements
- Discuss the concept of influence lines, influence lines for beams and trusses, application in bridge engineering and moving load analysis
- Assess the stability and determinacy of structures and apply energy methods in structural analysis, moment distribution method and slope deflection method
- Carryout matrix method of structural analysis, structural dynamics and vibrations and plastic analysis of structures
- Discuss the principles of structural design including the factors of safety and design criteria, ultimate load and serviceability considerations and structural performance assessment
- Illustrate limit state design and working stress design and identify buckling and stability of structural elements
- Explain reinforced concrete structural design, steel structural design principles, bond and anchorage in concrete structures and corrosion and durability considerations

- Describe seismic design and earthquake-resistant structures and apply structural health monitoring and rehabilitation
- Carryout bridge and high-rise building structural analysis and discuss the principles of sustainable structural design, recycled materials in structural engineering, energy-efficient structural systems and green building certifications

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 civil structural for structural engineers, design engineers, researchers in civil/structural engineering, industry professionals, individuals preparing for professional certifications, civil engineering students 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.

Accommodation

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

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 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: -

- 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.

- 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. Don Mez, PhD, MSc, BSc, is a **Senior Structural & Civil Engineer** with over **30 years** of industrial experience in the field of **Concrete & Steel Structural Analysis & Design**, **Structural Dynamics**, **Structural Reliability Analysis**, **Damage Assessment & Rehabilitation of Concrete Structures**, **Matrix Structural Analysis**, **Earthquake Engineering**, **Reinforced Concrete Design**, **Construction** Planning & Design, **Infrastructure Seismic** Design, **Seismic** Hazard & Risk Analysis, **Seismic** Design Analysis, **Earthquake & Structural** Design Analysis, **Earthquake-Resistant Structures**, **Earthquake** Engineering, **Structural** Design, Maintenance & Reliability Analysis, **Durability & Damage** Assessment, **Reinforced Concrete Structures**, **Advanced Concrete** Technology, **Steel & Concrete** Technology, **Concrete Structure Repair & Inspection.**

During his career, Dr. Don Mez has worked globally for the numerous international companies in the **US**, **Europe** and the **Middle East**. He has gained his expertise and thorough practical experience through challenging positions both in technical and academic such as a **Structural & Project Manager**, **Construction Manager**, **Structural & Project Engineer**, **Research Manager**, **Design Engineer**, **Civil Engineer**, **Assistant Manager** and **Research Assistant**. During those stages, he was responsible for the **Design**, **Construction** and **Renovation** of new and existing **Steel** and **Reinforced Structures** as well as with the **Investigation** and **Rehabilitation** of damaged reinforced concrete.

Dr. Don Mez has a **PhD**, **Master's** and **Bachelor's** degree in **Civil Engineering** from the **Purdue University** in **USA**. He is an active member of the **Association Civil Engineers and Architects Chambers** and the Earthquake Engineering Research Institute (**EERI**). Further, he is a **Certified Instructor/Trainer** and he has **internationally published numerous papers** and **books** such as "Mechanical Behaviour of Polypropylene-Based Honeycomb-Core Composite Sandwich Structures", "Spatial Distribution of Damage Caused by the Earthquake" and many more.

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, 20th of July 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Structural Mechanics*** *Definition and Scope of Structural Mechanics • Historical Development of Structural Theories • Basic Principles of Structural Analysis • Importance in Civil Engineering*

0930 – 0945	*Break*
0945 – 1030	***Types of Structures & Structural Systems*** *Load-Bearing Structures vs. Frame Structures • Trusses, Beams, and Arch Structures • Rigid versus Flexible Structural Systems • Structural Forms in Modern Architecture*
1030 – 1130	***Forces, Loads & Their Effects on Structures*** *Types of Loads (Dead, Live, Wind, Earthquake) • Load Path and Distribution • Static vs. Dynamic Loads • Load Combinations and Safety Factors*
1130 – 1215	***Stress, Strain & Material Behavior*** *Stress-Strain Relationship • Elastic and Plastic Behavior of Materials • Hooke's Law and Modulus of Elasticity • Thermal Effects on Structural Materials*
1215 – 1230	*Break*
1230 – 1330	***Free Body Diagrams & Equilibrium Conditions*** *Concept of Free Body Diagrams • Equilibrium Equations (ΣF = 0, ΣM = 0) • Determinate versus Indeterminate Structures • Common Structural Supports and Reactions*
1330 – 1420	***Structural Failure Theories*** *Ductile versus Brittle Failure • Yielding and Fracture Mechanics • Fatigue and Creep in Structures • Case Studies of Structural Failures*
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, 21st of July 2025***

0730 – 0830	***Analysis of Beams & Bending Moments*** *Types of Beams (Simply Supported, Cantilever, Continuous) • Shear Force and Bending Moment Diagrams • Point Loads vs. Distributed Loads • Relationship Between Load, Shear and Moment*
0830 – 0930	***Analysis of Trusses & Frames*** *Assumptions in Truss Analysis • Method of Joints versus Method of Sections • Determinacy of Trusses • Influence of External Loads on Truss Stability*
0930 – 0945	*Break*
0945 – 1100	***Structural Deflections & Deformations*** *Types of Deflections in Beams and Frames • Moment-Area Theorem • Virtual Work Method • Influence Lines and Their Applications*
1100 – 1215	***Axial, Shear & Torsional Forces in Members*** *Axial Deformation in Bars and Columns • Shear Stress in Beams • Torsional Effects in Shafts and Structural Elements • Combined Stress Effects in Structural Elements*
1215 – 1230	*Break*
1230 – 1330	***Influence Lines & their Applications*** *Definition and Concept of Influence Lines • Influence Lines for Beams and Trusses • Application in Bridge Engineering • Moving Load Analysis*

1330 – 1420	***Stability & Determinacy of Structures*** *Conditions for Structural Stability • Degree of Static and Kinematic Indeterminacy • Stability in Beams, Frames and Arches • Buckling and Slenderness Ratio*
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, 22nd of July 2025***

0730 – 0830	***Energy Methods in Structural Analysis*** *Principle of Virtual Work • Castigliano's Theorems • Energy Concepts in Structural Analysis • Applications in Beam and Truss Analysis*
0830 – 0930	***Moment Distribution Method*** *Concept and Assumptions • Stiffness and Distribution Factors • Application to Continuous Beams • Application to Frames*
0930 – 0945	*Break*
0945 – 1100	***Slope Deflection Method*** *Introduction to Slope Deflection Equations • Application to Beams and Frames • Relationship Between Rotations and Moments • Comparison with Other Analytical Methods*
1100 – 1215	***Matrix Method of Structural Analysis*** *Concept of Stiffness and Flexibility Matrices • Direct Stiffness Method • Application to Beams and Trusses • Finite Element Method as an Extension*
1215 – 1230	*Break*
1230 – 1330	***Structural Dynamics & Vibrations*** *Introduction to Structural Dynamics • Free and Forced Vibrations • Damping in Structures • Applications in Earthquake Engineering*
1330 – 1420	***Plastic Analysis of Structures*** *Concepts of Plastic Hinges • Limit Load and Collapse Load • Plastic Moment and Redistribution of Moments • Applications in Structural Design*
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 Three*

Day 4: ***Wednesday, 23rd of July 2025***

0730 – 0830	***Principles of Structural Design*** *Design versus Analysis • Factors of Safety and Design Criteria • Ultimate Load and Serviceability Considerations • Structural Performance Assessment*
0830 – 0930	***Limit State Design & Working Stress Design*** *Concept of Limit State Design • Comparison with Working Stress Method • Load and Resistance Factor Design (LRFD) • Application in Reinforced Concrete and Steel Structures*
0930 – 0945	*Break*
0945 – 1100	***Buckling & Stability of Structural Elements*** *Euler's Buckling Formula • Factors Affecting Buckling in Columns • Buckling of Frames and Plates • Practical Design Considerations*

1100 – 1215	***Concrete & Steel Structures Design Theories*** *Reinforced Concrete Structural Design • Steel Structural Design Principles • Bond and Anchorage in Concrete Structures • Corrosion and Durability Considerations*
1215 – 1230	*Break*
1230 – 1330	***Seismic Design & Earthquake-Resistant Structures*** *Earthquake Loading and Response Spectrum • Seismic Design Codes and Guidelines • Ductility and Energy Dissipation in Structures • Base Isolation and Seismic Retrofitting*
1330 – 1420	***Structural Health Monitoring & Rehabilitation*** *Non-Destructive Testing (NDT) Methods • Structural Strengthening Techniques • Retrofitting Strategies for Aging Structures • Case Studies on Structural Failures and Rehabilitation*
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 Four*

Day 5: ***Thursday, 24th of July 2025***

0730 – 0830	***Structural Analysis Software*** *Overview of Structural Engineering Software (SAP2000, ETABS, STAAD.Pro) • Finite Element Analysis in Structural Design • Modeling and Simulation of Structures • Case Studies Using Software*
0830 – 0930	***Bridge & High-Rise Building Structural Analysis*** *Design Considerations for Bridges • Load Combinations in Bridge Engineering • High-Rise Structural Systems • Wind Load Analysis for Tall Buildings*
0930 – 0945	*Break*
0945 – 1100	***Sustainable & Green Building Structures*** *Principles of Sustainable Structural Design • Recycled Materials in Structural Engineering • Energy-Efficient Structural Systems • Green Building Certifications (LEED, BREEAM)*
1100 – 1215	***Case Studies of Structural Failures & Lessons Learned*** *Famous Structural Failures (Tacoma Narrows, Hyatt Regency Collapse) • Causes of Failures and Preventive Measures • Ethics in Structural Engineering • Improving Design Standards Based on Failures*
1215 – 1230	*Break*
1230 – 1300	***Structural Optimization Techniques*** *Introduction to Structural Optimization • Cost vs. Performance Optimization • Lightweight and High-Performance Structures • Applications in Aerospace and Marine Engineering*
1300 – 1345	***Future Trends in Structural Engineering*** *Smart Materials and Self-Healing Structures • 3D Printing in Structural Engineering • AI and Machine Learning in Structural Analysis • The Future of Sustainable and Resilient Structures*
1330 – 1345	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t Topics that were Covered During the Course*
1345 – 1415	***POST-TEST***
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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