COURSE OVERVIEW SE0049
Soil Mechanics Excavation & Compaction

Course Title
Soil Mechanics Excavation & Compaction

Course Date/Venue
July 06-10, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

Course Reference
SE0049

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes real-life case studies 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 Soil Mechanics Excavation and Compaction. It covers the importance of soil mechanics in construction in civil projects and its role in excavation and compaction operations; the soil classification systems, soil structure and composition and index properties of soils; the stress in soils covering effective stress principle, pore water pressure and total stress, stress distribution under load and capillarity and surface tension effects; the various types of excavation, equipment, suitability based on soil types; the depth, access and working space; the site investigation before excavation, excavation support and shoring systems; and the slope stability in excavations and groundwater control in excavation.

Further, the course will also discuss the fundamentals of soil compaction, benefits of compaction, factors affecting compaction, maximum dry density and optimum moisture content; the laboratory compaction tests covering standard proctor and modified proctor tests, compaction curves and interpretation, compaction energy calculations and moisture-density relationships; the field compaction equipment; and the compaction techniques and procedures including quality control in field compaction.

During this interactive course, participants will learn the permeability and drainage of compacted soils, shear strength and stability and settlement and consolidation; the expansive and collapsible soils and geosynthetics in excavation and compaction; the construction planning for excavation and backfill, health and safety in excavation works and troubleshooting soil-related site problems; and the proper documentation and reporting including sustainability and environmental considerations.

Course Objectives

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

- Apply and gain an in-depth knowledge on soil mechanics excavation and compaction
- Discuss the importance of soil mechanics in construction in civil projects and its role in excavation and compaction operations
- Recognize soil classification systems, soil structure and composition and index properties of soils
- Identify the stress in soils covering effective stress principle, pore water pressure and total stress, stress distribution under load and capillarity and surface tension effects
- Recognize the various types of excavation, equipment, suitability based on soil types and depth, access and working space
- Apply site investigation before excavation, excavation support and shoring systems, slope stability in excavations and groundwater control in excavation
- Discuss the fundamentals of soil compaction, benefits of compaction, factors affecting compaction, maximum dry density and optimum moisture content
- Apply laboratory compaction tests covering standard proctor and modified proctor tests, compaction curves and interpretation, compaction energy calculations and moisture-density relationships
- Identify field compaction equipment and apply compaction techniques and procedures including quality control in field compaction
- Discuss permeability and drainage of compacted soils, shear strength and stability and settlement and consolidation
- Recognize the expansive and collapsible soils as well as geosynthetics in excavation and compaction
- Carryout construction planning for excavation and backfill, health and safety in excavation works and troubleshooting soil-related site problems
- Apply proper documentation and reporting including sustainability and environmental considerations

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 soil mechanics excavation and compaction for civil and geotechnical engineers, construction and site supervisors, contractors and heavy equipment operators, government and regulatory personnel, laboratory and testing technicians and other technical staff.

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:

Mr. Steve Magalios, CEng, PGDip (on-going), MSc, BSc, is a **Senior Civil Engineer** with over **30 years** of extensive **On-shore & Offshore** experience in the **Oil & Gas**, **Construction**, **Refinery** and **Petrochemical** industries. His expertise widely covers in the areas of **Blast** Simulation, **Blast** Resistant & Resilient Design, Building Life Assessment & Retrofit Solutions for **Blast Resistance**, **Seismicity** Modelling, **Seismic Design** for Buildings, Advanced **Seismic & Wind Design** of **Reinforced Concrete**, Industrial Building Design, **Blast Resistance & Resilient** for Oil & Gas Field, **Concrete Structures & Building Rehabilitation**, **Reinforced Concrete Structures Protection**, **Concrete** Structure Inspection & Repair, **Concrete** Inspection & Maintenance, **Concrete Maintenance & Reliability Analysis**, Design and Behaviour of **Steel Structures**, **Advanced Steel Design & Stability** of **Structures Concrete Structural** Design, **Dynamic Analysis** of **Rotating Equipment** Foundations & **Structural Steel Piperacks**, **Concrete** Technology, **Construction** Planning, **Construction & Concrete Works** Maintenance, Advanced **Building Construction** Technology, **Geosynthetics & Ground Improvement** Methods, **Bench** Design, **Benching**, **Land Survey and ArcGIS for Earthworks & Management**, **ArcGIS** for Surveying, Computer Aided Design (**CAD**), **AutoCAD Civil 3D**, **GIS & Mapping**, **Structural Analysis & Design** (**STAAD PRO**), **Land Surveying** & Property Evaluation, **Earth Measurements**, **Earthwork** & **Structural Maintenance**, System Safety Program Plan (**SSPP**) Inspection, **Building & Road** Design Skills, **Civil Engineering Design**, **Structural Reliability** Engineering, **Road** Construction & Maintenance, **Road** Pavement Design, **Road** Maintenance, **Drainage** System Operations & Maintenance, **Blueprint** Reading & Interpretation, **Blue Print** Documentation, Mechanical **Drawings**, **P&ID**, **Flow Diagram** Symbols, **Cartographic** Representation, Soil Classification, **Cadastral Surveying** & Boundary Definition, **Project Engineering** & Design, **Construction** Management, **Project Planning** & Execution, **Site Management**, **Site Supervision**, Effective **Resource Management**, **Project Evaluation**, **FEED** Management, **EPC Projects** Design, **Project Completion & Workover**, Quality Control and Team Management. He is also well-versed in **Pipeline** Operation & Maintenance, **Pipeline** Design & Construction, **Pipeline** Engineering, Scraper Traps, Burn Pits, Risk Assessment, HSE Plan & Procedures, **Construction** Planning, Methods & Management, **Sloping**, **Embankments**, **Construction** Planning, **Construction Quality** Management, **Project Risk** Assessment, **Project Quality** Plans, **Excavation**, **Backfill & Compaction**, **Excavation & Reinstatement**, **Excavation Safety** for Construction, **Groundworks Supervision**, **Construction Quality** Remote Sensing, Construction Materials, Construction Surveying, **Detailed Engineering** Drawings, Codes & Standards Quality Plan & Procedures, Safety & Compliance Management, Permit-to-Work Issuer, ASME, API, ANSI, ASTM, BS, NACE, ARAMCO & KOC Standards, MS Office tools, **AutoCAD**, **STAAD-PRO**, GIS, ArcInfo, ArcView, Autodesk Map and various programming languages and software such as **SHOTPlus**, FORTRAN, BASIC and AUTOLISP. Currently, he is the **Chartered Professional Surveyor Engineer & Urban-Regional Planner** wherein he is deeply involved in providing exact data, measurements and determining properly boundaries. He is also responsible in preparing and maintaining sketches, maps, reports and legal description of surveys.

During his career, Mr. Magalios has gained his expertise and thorough practical experience through challenging positions such as a **Project Site Construction Manager**, **Construction Site Manager**, **Project Manager**, **Deputy PMS Manager**, **Head of the Public Project Inspection Field Team**, **Technical Consultant**, **Senior Consultant**, **Consultant/Lecturer**, **Construction Team Leader**, **Lead Pipeline Engineer**, **Project Construction Lead Supervising Engineer**, **Civil Engineer**, **Lead Site Engineer**, **Senior Site Engineer Lead Engineer**, **Senior Site Engineer**, **R.O.W. Coordinator**, **Site Representative**, **Supervision Head** and **Contractor** for international Companies such as the Penspen International Limited, Eptista Servicios de Ingeneria S.I., J/V ILF Pantec TH. Papaioannou & Co. – Emenergy Engineering, J/V Karaylannis S.A. – Intracom Constructions S.A., Ergaz Ltd., Alkyonis 7, Palaeo Faliro, Piraeus, Elpet Valkaniki S.A., Asprofos S.A., J/V Depa S.A. just to name a few.

Mr. Magalios is a **Registered Chartered Engineer** and has a **Master's** and **Bachelor's** degree in **Surveying Engineering** from the **University of New Brunswick**, **Canada** and the **National Technical University of Athens**, **Greece**, respectively. Further, he is currently enrolled for **Post-graduate** in **Quality Assurance** from the **Hellenic Open University**, **Greece**. He has further obtained a Level 4B Certificates in Project Management from the National & Kapodistrian University of Athens, Greece and Environmental Auditing from the Environmental Auditors Registration Association (EARA). Moreover, he is a **Certified Instructor/Trainer**, a **Chartered Engineer** of Technical Chamber of Greece and has delivered numerous trainings, workshops, seminars, courses and conferences internationally.

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 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, 06th of July 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Soil Mechanics in Construction*** *Definition and Importance in Civil Projects • Role in Excavation and Compaction Operations • Soil as an Engineering Material • Key Parameters: Strength, Permeability, Compressibility*
0930 – 0945	*Break*
0945 – 1030	***Soil Classification Systems*** *Grain Size Distribution and Sieve Analysis • Atterberg Limits (LL, PL, PI) • Unified Soil Classification System (USCS) • AASHTO Soil Classification*
1030 – 1130	***Soil Structure & Composition*** *Three-Phase System: Solids, Water, Air • Soil Fabric: Flocculated versus Dispersed • Water Content and Degree of Saturation • Soil Consistency and Plasticity*
1130 – 1215	***Index Properties of Soils*** *Specific Gravity and Moisture Content • Bulk Density, Dry Density, Unit Weight • Void Ratio and Porosity • Determination Methods in the Lab*

1215 – 1230	*Break*
1230 – 1330	***Stress in Soils*** *Effective Stress Principle • Pore Water Pressure and Total Stress • Stress Distribution Under Load • Capillarity and Surface Tension Effects*
1330 – 1420	***Workshop: Soil Classification & Property Determination*** *Perform Sample Classification Using USCS • Calculate Index Properties from Field Data • Create Soil Profiles • Group Discussion on Construction Relevance*
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, 07th of July 2025***

0730 – 0830	***Excavation Methods & Equipment*** *Types of Excavation: Open Cut, Trench, Pit • Equipment: Backhoes, Bulldozers, Excavators • Suitability Based on Soil Types • Depth, Access, and Working Space*
0830 – 0930	***Site Investigation Before Excavation*** *Boring, Trial Pits, Cone Penetration Test (CPT) • Interpreting Borehole Logs and Soil Reports • Identifying Groundwater Table • Determining Soil Bearing Capacity*
0930 – 0945	*Break*
0945 – 1100	***Excavation Support & Shoring Systems*** *Types: Soldier Piles, Sheet Piles, Bracing • Temporary versus Permanent Supports • Stability Analysis of Vertical Cuts • Safety Precautions and Monitoring*
1100 – 1215	***Slope Stability in Excavations*** *Factors Influencing Slope Failure • Safe Slope Angles Based on Soil Types • Benching and Sloping Techniques • Slope Stabilization Methods*
1215 – 1230	*Break*
1230 – 1330	***Groundwater Control in Excavation*** *Dewatering Methods: Well Points, Sump Pumps • Seepage Control and Cutoff Walls • Drainage Layers and Filter Fabrics • Risks of Excavation Below Water Table*
1330 – 1420	***Workshop: Excavation Planning Simulation*** *Design an Excavation Layout for a Small Project • Choose Support Systems and Dewatering Method • Identify Critical Risks • Present in Teams with Safety Considerations*
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, 08th of July 2025
0730 – 0830	***Fundamentals of Soil Compaction*** *Definition and Benefits of Compaction • Factors Affecting Compaction (Moisture, Type, Energy) • Laboratory versus Field Compaction • Maximum Dry Density and Optimum Moisture Content*
0830 – 0930	***Laboratory Compaction Tests*** *Standard Proctor and Modified Proctor Tests • Compaction Curves and Interpretation • Compaction Energy Calculations • Moisture-Density Relationships*
0930 – 0945	*Break*
0945 – 1100	***Field Compaction Equipment*** *Roller Types: Smooth, Padfoot, Sheepsfoot, Vibratory • Equipment Selection for Soil Type • Compaction Passes and Lift Thickness • Equipment Limitations and Productivity*
1100 – 1215	***Compaction Techniques & Procedures*** *Layer-by-Layer Approach (Lift Methodology) • Water Addition or Drying for Optimum Content • Uniformity Checks and Workmanship Control • Field Compaction Records and Logs*
1215 – 1230	*Break*
1230 – 1330	***Quality Control in Field Compaction*** *Field Density Testing (Sand Cone, Nuclear Gauge) • Acceptance Criteria (% Compaction) • Test Frequency and Zones • Troubleshooting Low Compaction Areas*
1330 – 1420	***Workshop: Compaction Curve & Equipment Selection*** *Interpret Lab Compaction Test Data • Select Suitable Equipment for a Given Soil • Plan Compaction Strategy by Layer • Troubleshoot Sample Poor Compaction Case*
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, 09th of July 2025
0730 – 0830	***Permeability & Drainage of Compacted Soils*** *Effect of Compaction on Permeability • Design of Drainage Blankets and Layers • Compacted Clay Liners and Barriers • Drainage Issues and Remedial Actions*
0830 – 0930	***Shear Strength & Stability*** *Shear Strength Parameters (Cohesion & Friction) • Direct Shear and Triaxial Test Methods • Impact of Compaction on Stability • Application to Embankments and Slopes*
0930 – 0945	*Break*
0945 – 1100	***Settlement & Consolidation*** *Immediate versus Long-Term Settlement • Compression Index and Modulus • Over-Compaction and Differential Settlement Risks • Controlling Settlement in Fills*
1100 – 1215	***Expansive & Collapsible Soils*** *Identification and Classification • Problems Caused by Swelling Clays • Treatment: Lime Stabilization, Pre-Wetting • Design and Construction Considerations*

1215 – 1230	*Break*
1230 – 1330	***Geosynthetics in Excavation & Compaction*** *Geotextiles and Geogrids: Types and Functions • Use in Separation, Reinforcement, Filtration • Applications in Embankments, Retaining Walls • Installation Precautions*
1330 – 1420	***Workshop: Engineering Analysis of Compacted Fill*** *Analyze Settlement Potential • Evaluate Strength and Permeability Targets • Apply Test Data for Decision-Making • Recommend Improvement Measures*
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, 10th of July 2025***

0730 – 0830	***Construction Planning for Excavation & Backfill*** *Activity Sequencing and Work Zones • Excavation, Bedding, Backfill, and Testing • Compaction Around Utilities and Structures • Manpower and Equipment Scheduling*
0830 – 0930	***Health & Safety in Excavation Works*** *Excavation Hazards and Risk Assessment • Cave-In Protection and OSHA Requirements • Access, Egress, and Emergency Planning • PPE and Site Housekeeping*
0930 – 0945	*Break*
0945 – 1100	***Troubleshooting Soil-Related Site Problems*** *Wet Soil Conditions and Pumping • Soft Spots in Fill • Erosion and Runoff During Construction • Mitigation of Unstable Slopes*
1100 – 1215	***Documentation & Reporting*** *Daily Compaction Logs and Test Results • Inspection and Quality Control Checklists • As-Built Documentation for Soil Works • Client and Third-Party Verification*
1215 – 1230	*Break*
1230 – 1300	***Sustainability & Environmental Considerations*** *Reuse of Excavated Materials • Dust and Sediment Control • Environmental Permits and Compliance • Impact of Poor Compaction on Sustainability*
1300 - 1345	***Capstone Workshop: Full Earthwork Plan*** *Plan Excavation, Dewatering, Compaction, and Testing • Select Suitable Equipment and Techniques • Identify Potential Failures and Risk Mitigation • Present Full Soil Management Plan to Class*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t Topics that were Covered During the Course*
1400 – 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

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org