

Training For Site Engineering Excellence

SITE SURVEYING, SETTING OUT, ENGINEERING SOFTWARE AND MACHINE CONTROL COURSES

From Setting Out For Construction

Setting Out For Construction is a CITB Approved Training Organisation (ATO). All our courses are available as in-house training or as open courses across the UK and Ireland. We also offer bespoke training courses, training needs analysis for site-based technical staff, site set-up and ongoing support, impartial advice on Engineering software and surveying equipment, impartial advice and support with set-up and implementation of machine control technology and support with set-up of site quality management systems.

e: info@settingoutforconstruction.com

t: 0845 519 5632

- **Setting Out Course (5 days)**
- **Levelling and Taping Course (2 days)**
- **Total Station for Construction (3 days)**
- **Robotic Total Station (1 day)**
- **GNSS Awareness (1 day)**
- **Laser Scanning for Construction (3 days)**
- **Drone Use for Construction Surveying – Introduction (1 day)**
- **Drone Use for Construction Surveying – Intermediate (1 day)**
- **AutoCAD for Site Engineers (2 days)**
- **3D Mapping and Modelling for Site Engineers (2 days)**
- **Machine Control for Machine Operators (1/2 day)**
- **Machine Control for Site Engineers (1 day)**



www.settingoutforconstruction.com

A CITB Approved Training Organisation



5-day Setting Out Course

This 5-day course is for anyone who is involved in or would like to get involved in setting out on site. No previous experience of setting out is required. All relevant maths is taught on the course.

This 5-day course comprises the 2-day course 'levelling and setting out by taping' and the 3-day course 'Total station for construction'.

Who the course is aimed at:

- Students studying Civil Engineering or Construction Management at any level
- Trainee engineers
- Graduate Engineers or Construction Managers
- Others with relevant industry experience (please contact us to discuss your specific situation and we can offer advice)

Course Content

Levelling

By the end of the course, delegates will be able to:

- Record work correctly and in the industry standard way
- Incorporate robust checks into all levelling
- List the possible sources of error in levelling
- Carry out a level survey (existing features or as-built)
- Set elements out to a fixed level
- Measure the reduced level of ceilings and soffits

- Transfer a TBM (install a vertical control point network from scratch)
- Set up profile boards for level excavation
- Set up profile boards for drainage
- Set up batter rails for cut and fill

Taping

By the end of the course, delegates will be able to:

- List the sources of error in taping
- Incorporate checks when setting out using a tape measure
- Set out on sloping ground
- Set out right angles and rectangles

Total Station

By the end of the course, delegates will be able to:

- Set up the total station over a point
- Carry out the relevant calibration checks (horizontal and vertical collimation error, trunnion axis, prism constant, optical/ laser plummet, diaphragm orientation)
- List the possible sources of error when using a total station
- Use techniques for improving and checking your accuracy and precision
- View, edit, add and delete data
- Install a network of primary control points from scratch (traverse)
- Install accurate secondary control points (retro targets) using the correct procedure

/continued

- Create a local coordinate system for a building on gridlines
- Use the correct procedures for measuring and setting out reduced levels with the total station
- Describe a range of methods for plumbing columns and walls
- Set-up the position and orientation of the total station using the resection or occupied point programs
- Take a topographical survey and record the results systematically
- Measure the horizontal distance and level differences between points using the tie-distance function
- Set out points of known co-ordinates using the stake out function
- Set out points in relation to a baseline using the reference line function
- Set out points at given chainages and offsets along a radius e.g. road centrelines using the reference arc function
- Measure irregular areas and volumes
- Transfer large amounts of data from the total station to the computer and vice versa
- Describe the capabilities and limitations of GNSS equipment
- Describe the capabilities of robotic total stations

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices

2-day Levelling and Taping Course

This 2-day course comprises day 1 and day 2 of the 5-day course, **Setting Out for Construction**. It is aimed at anyone who uses or supervises the use of a level or laser level on a construction site.

Who the course is aimed at:

- Students studying Civil Engineering or Construction Management
- Trainee engineers
- Graduate Engineers or Construction Managers
- Joiners, groundworkers, supervisors and site managers
- Others with relevant industry experience (please contact us to discuss your specific situation and we can offer advice)

Course Content

Levelling

By the end of the course, delegates will be able to:

- Record work correctly and in the industry standard way
- Incorporate robust checks into all levelling

- List the possible sources of error in levelling
- Carry out a level survey (existing features or as-built)
- Set elements out to a fixed level
- Measure the reduced level of ceilings and soffits
- Transfer a TBM (install a vertical control point network from scratch)
- Set up profile boards for level excavation
- Set up profile boards for drainage
- Set up batter rails for cut and fill

Taping

By the end of the course, delegates will be able to:

- List the sources of error in taping
- Incorporate checks when setting out using a tape measure
- Set out on sloping ground
- Set out right angles and rectangles

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices

3-day Total Station for Construction

This 3-day course comprises days 3, 4 and 5 of the 5-day course, **Setting Out for Construction**. It is aimed at anyone who is required to use a total station for setting out or surveying on a construction site.

Who the course is aimed at:

- Students studying Civil Engineering or Construction Management at any level
- Trainee engineers
- Graduate Engineers or Construction Managers
- Those who are already using the total station on site but have not had structured training
- Others with relevant industry experience (please contact us to discuss your specific situation and we can offer advice)

Learning outcomes

By the end of the course, delegates will be able to:

- Set up the total station over a point
- Carry out the relevant calibration checks (horizontal and vertical collimation error, trunnion axis, prism constant, optical/ laser plummet, diaphragm orientation)
- List the possible sources of error when using a total station
- Use techniques for improving and checking your accuracy and precision
- View, edit, add and delete data
- Install a network of primary control points from scratch (traverse)
- Install accurate secondary control points (retro targets) using the correct procedure
- Create a local coordinate system for a building on gridlines
- Use the correct procedures for measuring and setting out reduced levels with the total station
- Describe a range of methods for plumbing columns and walls
- Set-up the position and orientation of the total station using the resection or occupied point programs
- Take a topographical survey and record the results systematically
- Measure the horizontal distance and level differences between points using the tie-distance function
- Set out points of known co-ordinates using the stake out function
- Set out points in relation to a baseline using the reference line function
- Set out points at given chainages and offsets along a radius e.g. road centrelines using the reference arc function
- Measure irregular areas and volumes
- Transfer large amounts of data from the total station to the computer and vice versa
- Describe the capabilities and limitations of GNSS equipment
- Describe the capabilities of robotic total stations

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices

1-day Robotic Total Station

This course is aimed at anyone who is required to use a robotic total station for setting out or surveying on a construction site.

Who the course is aimed at:

This course is for those who have a working knowledge of:

- Control points
- Total stations
- Coordinate systems
- General setting out and surveying principles
- Construction drawings

If you do not have a working knowledge of these topics, you should first attend the 3-day practical course 'Total Station for Construction'.

Learning outcomes

By the end of the course, delegates will be able to:

- Set the position and orientation of the total station
- Enter data into the controller manually
- Connect the controller with the total station
- Navigate around the menus and programs
- Navigate the stored information in list format and map view
- View, edit, add and delete data
- Enter the correct settings
- Select the correct prism constant
- Take a topographical survey and record the results systematically
- Set out points of known co-ordinates
- Set out points in relation to a given line
- Set out points at given chainages and offsets along a radius e.g. road centrelines
- Transfer large amounts of data from the total station to the computer and vice versa
- Extract line data e.g. the horizontal distance and level difference between two points
- Measure irregular areas and volumes such as stockpiles
- Import and work with DXF and DTMs
- Create and export DXFs and DTMs
- Import and export data to and from Excel and survey software

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices

1-day GNSS Awareness

This course is for anyone who would like to be able to set out construction elements on site or carry out surveys using GNSS.

Who the course is aimed at:

The course is aimed at those who have a working knowledge of:

- Control points
- Coordinate systems
- General setting out and surveying principles
- Construction drawings

If you do not have a working knowledge of these topics, you should first attend the 3-day practical course 'Total Station for Construction'.

Learning outcomes

By the end of the course, delegates will be able to:

- Use GNSS terminology
- Explain the basic principles of GNSS technology
- List situations where GNSS is appropriate and situations where it is not
- Carry out a site calibration to create a local coordinate system
- List the potential sources of error in GNSS

- List the factors affecting accuracy
- Check and monitor the level of accuracy achieved
- Select the correct scale factor for the task
- Enter data into the controller manually
- Connect the controller with the GNSS rover
- Navigate around the menus and programs
- Navigate the stored information in list format and map view
- View, edit, add and delete data
- Enter the correct settings
- Take a topographical survey and record the results systematically
- Set out points of known co-ordinates
- Set out points in relation to a baseline
- Set out points at given chainages and offsets along a radius e.g. road centrelines
- Transfer large amounts of data from the controller to the computer and vice versa
- Extract line data e.g. the horizontal distance and level difference between two points
- Measure irregular areas and volumes such as stockpiles
- Import/export/create DXF, DTM, CSV and excel files

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices

3-day Laser Scanning For Construction

This 3- day practical training standard teaches the principles and practices of laser scanning for use in construction specific contexts and covers the practical elements, relevant theory, use of software and considerations when working in a public area

Who the course is aimed at:

The course is aimed at those who have a working knowledge of:

- 3D Coordinate Geometry
- Surveying and Setting Out Principals
- 3D Mapping and Modelling Software

If you do not have a working knowledge of these topics, you should first attend the 3-day practical course 'Total Station for Construction' and the 2-Day CAD For Site Engineers course.

Learning outcomes

By the end of the course, delegates will be able to:

- List the applications, advantages and limitations of laser scanning and describe scenarios where it can and cannot be used Explain the basic principles of GNSS technology
- Explain the IT requirements and restrictions
- Describe types of laser scanner and their uses e.g. (hand-held, terrestrial, mobile, aerial)
- Describe the capabilities and limitations of different types of laser scanning targets including spheres and checkerboards
- List different methods for establishing control points and their suitability in different situations
- Explain the difference between registration points and control points
- Explain when to use the inclinometer and when not to
- Explain how laser scanning technology works
- Explain factors which need to be considered when scanning in a public area with people and traffic
- Describe the effect of light conditions on image quality
- List factors which affect scan quality and image quality
- Use scanning terminology correctly including identifying and naming the parts of the scanner
- Explain the relationship between surveying with an optical instrument, GNSS use and laser scanning
- Identify the purpose and required deliverables of the survey
- Plan a laser scan survey from start to finish considering scanning requirements, type of equipment, placement of equipment and control, permits, safety measures, road closures
- Validate existing control points
- Establish control points
- Plan the safe work area
- Identify and plan for visual obstructions
- Place the spheres and checker boards correctly

- Plan the set-up positions considering target types, overlap and visual obstructions
- Set up the configuration/ profile for each scan
- Place the laser scanner appropriately
- Transfer the raw data from the equipment to the computer and prepare for processing
- Transform scan data to point cloud
- Explain the different methods of registration (target based, cloud to cloud, mixed)
- Clean the scan data (remove people, cars etc)
- Carry out checks on the data to check the instrument conforms with the manufacturer's specification
- Colourise the scan data
- Tie laser scan survey data in with drawings, local grid, previously created point clouds and existing features
- List the different file types used and explain how different file types interact
- Select the most suitable software based on the required deliverables and the capabilities and limitations of the different types of software available
- Superimpose a construction drawing onto scan data
- Convert the point cloud to 3D data for use in BIM
- Export a 3d visual tour which can be viewed anyone
- Carry out measurements, compute volumes

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices

1-day Drone Use For Construction Surveying - Introduction

This course teaches the basic theory and considerations for drone use for construction applications.

Who the course is aimed at:

This course is aimed at anyone who would like to understand how drones can be used in a construction environment and what is involved in carrying out a drone survey and preparing the deliverables.

Learning Outcomes

By the end of the course, delegates will be able to;

- Describe what a drone can be used for
- List the relevant legislation that covers aerial operations and list the relevant points for construction use
- Explain the principles and uses of photogrammetry
- List the different payloads and sensors that can be fitted on drones
- List the software solutions available for capturing drone data
- List the software solutions for processing the captured data
- List the range of deliverables required for the construction industry and how to use them e.g. DSM, DTM, photographs, point clouds)

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices

1-day Drone Use For Construction Surveying - Intermediate

This course teaches the basic theory and considerations for drone use for construction applications

Who the course is aimed at:

Delegates must carry out the CITB Assured course "Drone Use For Construction Surveying – Introduction" before attending this course.

The course is aimed at those who have a working knowledge of:

- 3D Coordinate Geometry
- Surveying and Setting Out Principals
- 3D Mapping and Modelling Software

If you do not have a working knowledge of these topics, you should first attend the 3-day practical course 'Total Station for Construction' and the 2-Day CAD For Site Engineers course.

Learning Outcomes

By the end of the course, delegates will be able to:

- Identify customer requirements including required accuracy
- Select the placement of survey control points (ground markers)
- Establish take-off and landing zones
- Carry out a risk assessment (weather, permissions, obstructions, risks, risk to the public)

- Prepare a method statement
- Plan the flight
- Explain when it is appropriate to use manual flying vs automated flying techniques
- Plan access points
- Mark out aerial operations including ground control points and take-off and landing zone
- Notify the relevant people/ organisations
- Carry out the flight/s
- Set up the take-off and landing zone
- Set up the flight/s
- Execute the flight plan/s
- Check post-flight captured including brightness, clarity, coverage, amount of data
- Secure and clear the area
- Prepare the data for processing (including transferring and converting)
- Import the survey control points or list
- Run the photogrammetry processing engine
- Carry out a quality control check
- Export required deliverables

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices

2-day AutoCAD for Site Engineers

This course is aimed at people who want to learn to use AutoCAD within the construction industry.

Learning to use AutoCAD software correctly can boost your project productivity, demonstrate your competence as a business to external parties and allow Engineers to spend less time in the office and more time out on site.

Who the course is aimed at:

- Site engineers
- Trainee engineers
- Graduate engineers
- Site Managers

Learning Outcomes

By the end of the course, delegates will be able to:

- Describe the characteristics of different file types (e.g. DWG, DXF, CSV,)
- Import data from field controllers
- Create tables of relevant data
- Use CAD tools effectively
- Describe the potential technical and contractual pitfalls of working with electronic information as opposed to hard copy drawings

- Set up a logical filing system
- Create, edit and insert dynamic blocks (to annotate coordinates etc) and create block visibilities.
- Select points from the model and export them to a setting out schedule (CSV Format)
- Check and convert units
- Create setting out models using chainages and measurement intervals
- Check and amend corrupt files
- Remove all unused items from the model to reduce file size.
- Merge two AutoCAD models
- Create, edit and delete layers
- Use layers to isolate relevant information
- Import and align external files such as PDF's and images
- Create drawings and deliverables and present them correctly
- Compare changes between drawing revisions
- Associate drawing objects with hyperlinks
- Create, insert and delete revision clouds
- Insert, edit and delete text

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices

2-day 3D Mapping and Modelling Software for Site Engineers

Select from: Trimble Business Centre / Civil 3D / LSS / N4CE

This course is aimed at people who are confident using the total station and/or GNSS and would like to broaden their skill set to become vastly more flexible and productive.

Learning to use survey and 3D mapping software correctly can boost your project productivity, demonstrate your competence as a business to external parties and allow Engineers to spend less time in the office and more time out on site.

Who the course is aimed at:

- Site engineers
- Trainee engineers
- Graduate engineers

Learning outcomes

By the end of the course, delegates will be able to:

- Describe the characteristics of different file types (e.g. DWG, DXF, DTM, CSV, LandXML)
- Import data from field controllers
- Create tables of relevant data
- Use CAD tools effectively
- Retrospectively attribute codes to points or recode points
- Set up a logical filing system

- Import and place images into a model
- Create cut/fill colourised models and create the cut/fill line for setting out purposes
- Export model information (linework, pints and surfaces) for use in Leica/Topcon/Trimble machine control systems and field controllers
- Annotate levels
- Georeference surveys
- Create annotated sections
- Select points from the model and export them to a setting out schedule
- Create a contoured plan
- Compare volumes between subsequent surveys and to datum levels.
- Carry out visual checks on 3D models
- Produce a level difference model and create a 'heat map' of as-built Vs design levels
- Insert, edit and delete text
- Isolate relevant information
- Check and convert units
- Describe the potential technical and contractual pitfalls of working with electronic information as opposed to hard copy drawings
- Create drawings and deliverables and present them correctly

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices

1/2 -day Machine Control for Machine Operators

Select from; Trimble Earthworks / Leica MC1/ Topcon 3DMC

This course teaches the principles of using machine control technology for small and large scale earthworks projects. This is an interactive course which utilises desktop simulators and survey software to enable delegates to complete the learning outcomes.

Who the course is aimed at:

The course is aimed at machine operators of all experience levels.

Learning outcomes:

- Use machine control for effective project implementation
- Work to surfaces and linework provided by others
- Understand and create offsets from design linework – horizontal, vertical and perpendicular
- Set avoidance zones
- Add/edit machine and bucket dimensions into the machine calibration file
- Check and set units
- Turn layers and surfaces on and off
- Select the active surface
- Select a line and navigate the machine to it.
- Set the required intervals for automatic as-built survey points
- Select the reference point on the bucket
- Select different views on the display unit
- Use the visual guidance indicators on the display unit
- Measure and record as-built information
- Take measurements using the blade or bucket
- Effectively communicate the critical information to the Engineer
- Explain the difference between manual and automatic guidance
- List the capabilities and limitations of machine control
- Describe the health and safety risks and benefits machine control
- Edit display colour
- Carry out position checks and set as required by engineer
- Name the file types compatible with machine control equipment
- Carry out fault finding checks

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices

1 -day Machine Control for Site Engineers

Select from; Trimble Earthworks / Leica MC1/ Topcon 3DMC

This course is aimed at people who are confident using the total station and/or GNSS and would like to broaden their skill set to include machine control responsibilities. This is an interactive course which utilises desktop simulators and survey software to enable delegates to complete the learning outcomes.

This course is aimed at people who have experience in setting up control points using total station or GNSS, and who are familiar with survey software for converting file types and editing data.

Who the course is aimed at:

- Site engineers
- Trainee engineers
- Graduate engineers

Learning outcomes

The end of the course, delegates will be able to:

- List the file types which are compatible with the cab display unit
- Convert design data into a compatible file type
- Isolate the critical information that the driver needs
- Create offsets from design linework – horizontal, vertical and perpendicular
- Create a 3d surface model
- Identify erroneous linework and edit accordingly

- List the pros and cons of using Robotic total station / Base and Rover / Network RTK and select the appropriate equipment for a job
- Set up grade lasers with 2D automatic grade control systems
- State the accuracies required for various construction activities
- Describe different methods of establishing coordinates and levels of control points
- Set avoidance zones
- Define extents of a 3D model
- List the steps in configuring the radios
- Create active surfaces
- Explain the difference between well distributed and poorly distributed control points and explain how poorly distributed control points affect the results
- Import the data into the cab display unit via USB or remotely
- Enter the machine and bucket dimensions into the machine calibration file
- Check and set units
- Turn layers and surfaces on and off
- Edit layer and line colour
- Show/ hide TIN mesh, boundaries, break-lines and contours

/continued

- Select the active surface
- Select a line and create a “steer to” reference.
- Set the required intervals for automatic as-built survey points
- Select the reference point on the bucket
- Select different views on the display unit
- Set the construction tolerances and set alerts
- Use the visual guidance indicators on the display unit
- Confirm that the position of the tip of the blade is correct in relation to the survey control
- Measure and record as-built information
- Carry out checks to validate that the control points are sufficiently accurate
- Effectively communicate the critical information to the machine driver
- List the capabilities and limitations of machine control
- List the commercial benefits of machine control
- Carry out a basic cost vs savings analysis
- Describe the health and safety risks and benefits machine control

Dates and prices:

www.settingoutforconstruction.com/training/dates-and-prices