TSA Surveying Course

with ProQual Level 3 in Engineering Surveying

A block by block outline

Introduction

The TSA Surveying Course comprises six study blocks, each of two weeks length, spread over two years and is held in at The Survey School premises in Worcester.

Successfully passing all six blocks fulfils100% of the academic requirement for those wishing to upgrade from Student to Technical membership of Chartered ICES. The student also requires 3 years' relevant experience, a detailed CV and experience report, 1 years' worth of CPD reports and a completed Principal Sponsor Form.

Completing the TSA Surveying Course, plus proof of two years of relevant experience (which can include pre-course experience) also meets the RICS eligibility requirements to apply for Associate (AssocRICS) assessment.

The TSA Course is run alongside the ProQual Level 3 Diploma in Engineering Surveying. This provides a successful student with a qualification and standard recognised by CSCS. Although this is billed and registered for separately, it requires minimal additional effort for a candidate completing all six blocks.

The course is an introduction to all the topics listed below. Further study and practise is needed to become proficient.

Competency (GSCE Pass) in Maths and English is recommended, although not compulsory. It is not necessary to have experience of surveying, although the ability to set up surveying equipment on a tripod accurately would be an advantage.

Each block includes assessed classwork and practical fieldwork and a written exam at the end. Blocks 1 to 5 also require students to undertake a written assignment.

Employers/Sponsors receive a written report on their student's performance after each block.

An Awards Day, where students receive their certificates, is held as part of the TSA Conference each November.

Block 1. Level and Total Station

- Learn how to use a level and a total station.
- Find a bench mark and transfer levels onto site.
- Carry out a two peg test to check a level.
- Adjust your levelling.
- Write a spreadsheet to calculate your own levelling.
- Use a tape to measure distances and know how to correct for slope and temperature.
- Solve a right angle triangle.
- Be able to compute bearings and distances from coordinates.
- Observe and book rounds of horizontal angles vertical angles and slope distances and know what to do with them.
- Compute a traverse from your observations.
- Find out about the history of surveying and units of measurement and how the equipment works.
- Learn about care of equipment and health and safety when surveying.
- See the latest total stations demonstrated.

Assignment to be undertaken between Block 1 and Block 2

Survey a short control traverse, and to provide a full written report of the work. The report should include a description of the work, a risk assessment for the site, traverse diagrams, station descriptions, observations, and calculations for plan and height. A separate level run loop around the stations tied to a local benchmark or TBM should be observed. The report should include a two peg test and a table to compare the results for levelling against the Trig heighting. The survey should be on a local grid.

Block 2. Topo Survey and Monitoring

- Learn how to apply atmospheric and prism corrections to a total station and be able to determine the correct prism offset.
- Survey an area by chain and offset using tapes and draw it up.
- Solve a non right angled triangle using the sine and the cosine rules.
- Observe and compute a trilateration network.
- Use a digital level for precise monitoring observations and write a spread sheet to present your results.
- Get the most from your calculator – how to use the Polar and rectangular functions to compute bearings and distances or co-ordinate differences in one go.
- Adjust a traverse using the Bowditch and transit methods and understand the differences from the equal shifts method of adjustment.
- Observe and plot radial (Stadia) detail taken with a level and staff.
- Find out about how height is represented on a map and interpolate your own contours and long section from field observations then process the data on computer.
- Observe radial detail with a total station compute and plot it by hand before processing it on the computer. See how well you have done!
- See the latest robotic total stations demonstrated.

Assignment to be undertaken between Block 2 and Block 3

Conduct and report on a small topographic survey based on a trilateration, cross-braced triangle. Detail surveyed using, total station, chain survey and stadia survey methods, contoured and with a long section through the site. The combined plot to be drawn by hand or in CAD.

Block 3. Advanced fixation, GNSS, the National Grid, Photogrammetry +.

- Learn how the curvature of the earth and refraction affect observations.
- Be able to observe and calculate a 3D intersection from angle observations only – and how to get the best from your calculator.
- Be able to observe and calculate a resection from angle observations only and compare your results with the free station program on the total station. A chance also to brush up on your Geek letters and maths symbols.
- Have an appreciation of GNSS (GPS) theory and good practice when observing.
- Use GNSS receivers to locate your position in static control and RTK modes.
- Occupy an EA passive station and be able to find OS Passive & Active station data.
- See how to process your GNSS results and how OS Active stations and Network GNSS are used.
- See a demonstration of Network GNSS Capability.
- Learn why we have map projections and different survey grids and how to calculate and use scale factor for OSGB 36 co-ordinates.
- Be able to use software to convert from latitude and longitude co-ordinates to OSGB36. Be able to calculate by hand approximate distances down a meridian of longitude or along a parallel of latitude using a circular earth model.
- Learn about the relation between longitude and time and its importance in early navigation and Time zones.
- Learn about the development of stereo photogrammetry and how ortho-photos images are made.
- Be aware of how Lidar and satellite images can be used in Survey.
- Learn about the latest developments in SUAV's for photogrammetry.
- Plan coverage and chose suitable locations for ground controlling in air photography.

Assignment to be undertaken between Block 3 and Block 4

Establish two new stations, one inside and one outside a rectangle of known control. Fix each using both intersection and resection. Compute by hand with a number of different station combinations and compare against a direct radial or GNSS position of the points. Write a report describing the work and a comparison of the results obtained.

Block 4. Measured building surveys, underground utilities, hydrography

- Survey and draw up a room plan with a tape and Disto.
- Survey a building footprint and internal rooms with a total station and process this on the computer.
- Calculate the net internal area for the part of the building you surveyed.
- Calculate by hand a coordinate transformation from a topographic grid to a building grid.
- Survey a building elevation by different methods and draw it up.
- Draw a building cross section from points you have previously surveyed
- See a demonstration of scanning and discover what can be done with scanned data including that from mobile scanners.
- Learn how surveys are conducted underground and how to survey underground utilities.
- Hear how PAS128 is improving good practice in the way Utility surveys are conducted.
- Do your own drainage invert survey and have the opportunity to use a radio detection device and GPR for utility tracing.
- Learn how to survey a river cross section and long section to meet the requirement of the Environment Agency
- Be able to make simple tidal predictions and tidal offset calculations for surveys
- Be aware and be instructed on the additional health and safety and environmental risks when working on or in buildings, Surveying Utilities (Safe manhole Lifting) and when undertaking hydrographic surveys.

Assignment to be undertaken between Block 4 and Block 5

A practical measured building survey consisting of two floor plans with area calculation, a related cross section and an elevation of the building. Students may choose whichever method of survey and drawing they have access to.

Block 5. Setting out and engineering surveys

- Set out drainage run with a tape, level and staff.
- Be able to calculate gradients, batters and cross-falls.
- Set out a house foundation by angles and distances and check by tape and the tie distance program on the total station.
- Set out profiles for level by total station.
- Up load coordinates into a total station, set out the points by co-ordinates and check the set position against the design by downloading the surveyed points into a spreadsheet you have made.
- Use the reference line program to set out a structure.
- Learn how to compute points for a circular curve.
- Practice the setting out of curves from chords, by coordinates and by the reference arc program
- Use the free station program and height transfer programs to help setting out.
- Learn how to calculate vertical curves for a road and set out a vertical curve
- Calculate the location of cross section points to set out a road centre line channel and embankment / cutting batter rails with horizontal and vertical curves and super elevation.
- See how lasers and total stations are used in construction to give grade, level, or alignment.
- Find out how to transfer levels on high buildings.
- Awareness of how to plumb up control in a building.
- Learn about the importance of good record keeping and document control.
- Compute if a point is inside or outside a set tolerance.
- Learn how developments in Machine Control are changing setting out on site and the Surveyors changing role on site to service this.
- Appreciate the special health and safety risks likely to be encountered on a construction site.

Assignment to be undertaken between Block 5 and Block 6

A theoretical report on the setting out of a small housing estate from initial topo survey to completion. Including houses, a road and a drainage run with sample calculations and illustrative plan.

Block 6. Survey management, areas and volumes, legal surveys GIS +

- Learn how to plan and manage surveys and make your own survey plan.
- Learn the considerations for business costs, insurances, risk and making a profit
- Produce a quotation a survey with specification method statement and risk assessment.
- Understand how the RICS Specification deals with survey accuracy.
- Learn about quality assurance and quality control and the difference between accuracy and precision.
- Calculate the RMSE (Root Mean Square Error) of a set of data and the acceptance or rejection of observations.
- Carry out a spot height survey by different methods to achieve a given RMSE and compare results.
- Learn how to and practice computing an area from simple shapes and by the cross co-ordinate method.
- Carry out the survey of a simple area and portion it into plots of a specific size on a computer-set it out. – Check the work with the total station area function.
- Learn how to calculate volumes from cross sections.
- Survey an area and use the computer to produce a digital ground model and volume calculation.
- Use the alignment and cross section routines on the survey processing software.
- Write a spreadsheet program to calculate bearings and distances from co-ordinates.
- Write a spreadsheet program to calculate and adjust a traverse.
- Learn what you must do in a determined boundary survey for the Land Registry.
- Learn what is expected of an expert witness for a legal boundary dispute.
- See how GIS systems work and how to survey the asset data.
- Learn about how BIM is changing the way work is undertaken collaboratively on projects and what the Surveyors role in providing information is.
- Find out about industrial metrology and how high precision scanning is used.
- Be aware of the importance of continued personal development in your career.

After completion of all 6 Blocks

An Awards Day, where successful students receive their certificates, is held as part of the TSA Conference each November.

The ProQual Level 3 Diploma in Engineering Surveying is also assessed as the student progress through our course and a separate qualification certificate will be issued digitally.

Assessment

This course recognises the importance of continued professional development.

During each block, the students undertake a number of class and practical exercises. Some of these involve a formal assessment.

In addition, at the end of each block students sit a written exam that covers both theoretical and mathematical aspects of the subjects taught and which will accurately chart their achievement against the block aims.

These assessments, including the tutors' observations and comments, will highlight the student's strengths and limitations and are provided to the employer as a written report at the end of each block.

In blocks 1-5, the student is set a "work experience" assignment. This is marked and reported on. Students complete these assignments prior to commencing the next block. The assignments are an integral part of the course that reinforce what has been learnt and lead to further development. It is important that students are encouraged and assisted, where necessary, to complete their assignments.

Course Material

The material produced is intended for course use and as an aide memoir to the subjects covered. It is also a reference for general surveying; it is not meant to be a substitute textbook or an exhaustive coverage of the subject.

Use is also made of Client Guides and publications issued by the TSA, RICS, CICES and others. Students are issued with relevant copies either in their manual or digitally and are referred to relevant web sites for further information.