12d® Model
Civil and Surveying Software

12d Model Training

Training Courses

November 2023

12d® Model
Do more with your software.

12d Model Training Courses

November 2023

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12d Model is supplied without any express or implied warranties whatsoever.

No warranty of fitness for a particular purpose is offered.

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1.0 12D MODEL TRAINING OVERVIEW

The Civil and Surveying Institute has been training 12d Model users for over 30 years, and we've been refining our courses not only as the software is developed, but also from feedback we receive from training attendees and industry. We offer training in three different formats:

Instructor-Led Online Training

Instructor-Led Online Training courses are live courses run online, using Microsoft Teams, which are led by one of our 12d Model training instructors. We typically limit the training group size to 8 attendees to ensure quality of training and that all questions can be answered within the scheduled time.

Registration in each Instructor-Led course includes access to a 12d Model licence tailored to each course.

Due to privacy reasons, we do not record the training; however, all course attendees are issued with comprehensive course notes which can be used as reference material for reviewing the training content once the training has finished.

For Instructor-Led courses which are also offered as Self-Paced Online Training (SPOT) courses, access to the SPOT course is included in the registration to the Instructor-Led course.

You can view available Instructor-Led courses and register via this link: [Civil and Surveying Institute](#)

Self-Paced Online Training (SPOT)

A range of free and paid Self-Paced Online Training (SPOT) courses is offered by the Civil and Surveying Institute. SPOT courses offer the same content as Instructor-Led courses, but in a self-paced format which you can organise around your schedule.

Registration in each SPOT course includes access to a 12d Model licence tailored to each course as well as training videos, resources, and knowledge-check quizzes.

You can view available SPOT courses and register via this link: [Self-Paced Online Training](#)

In-House Training

If your company has multiple individuals requiring training in one or more of our courses, we can deliver In-House training.

If you would like a quote for In-House Training, or if you would like more information, please contact training@iscdt.com.au.

2.0 TRAINING PROGRESSION

The image below provides a summary of the training courses offered by the Civil & Surveying Institute. The complexity of course increases from left to right, and arrows indicate pre-requisite courses that are required to be completed before attending a more advanced course.
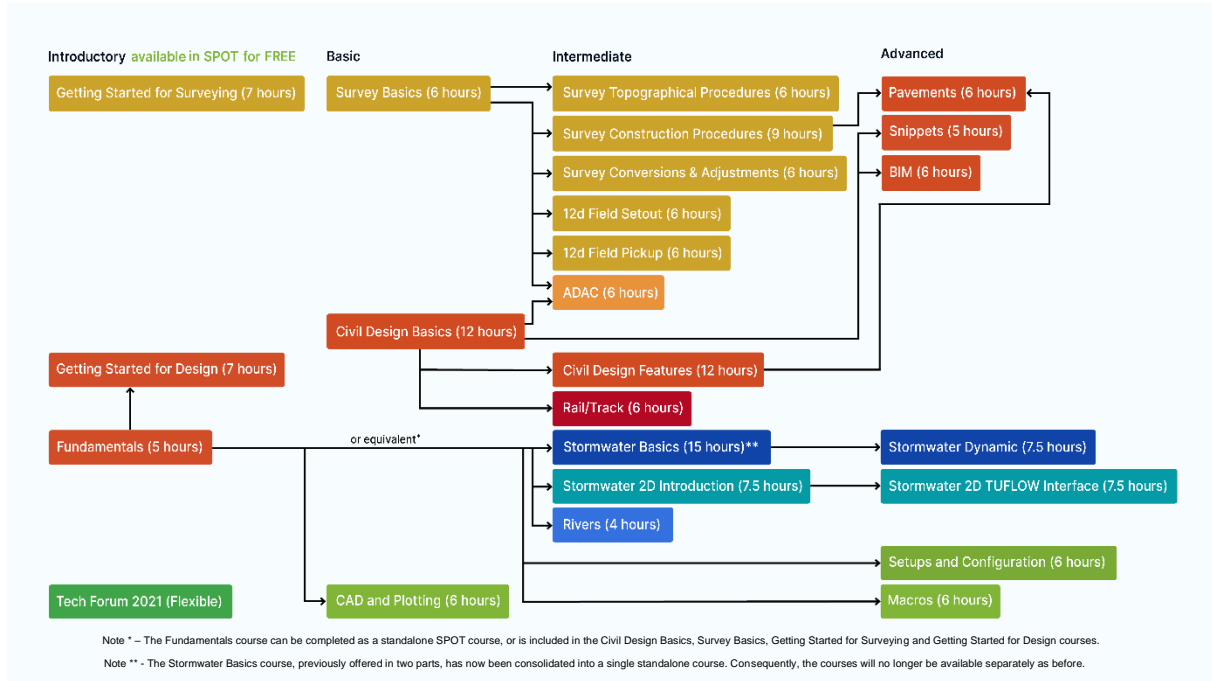
In-house Training courses are typically conducted in full day increments, whereas Instructor-Led courses are conducted in 3 or 4-hour increments, depending on the course, spread over multiple sessions and days.

Full course outlines are detailed further throughout this document.

3.0 FUNDAMENTALS – SPOT

Duration: Self-paced (~5 hours)   **Self-Paced Registration Link:** Fundamentals V15

Summary:

This course is for those that are new to 12d Model. Its aim is to teach you how to navigate the 12d Model workspace and use the Plan, Section and Perspective views, as well as create and import data for the purpose of creating surfaces, also known as TINs.

Prerequisites:

Basic computer skills are required, however experience with 12d Model is not necessary.

Course Content:

- Navigating 12d Model
    - The Workspace
    - Creating CAD Data and Picking
    - CAD Exercise
    - Training Folder Structure
- Creating a Surface
    - Importing Data
    - Plan View Operations
    - Triangulation
    - Section View Operations

4.0 GETTING STARTED FOR SURVEYING – SPOT

Duration: Self-paced (~7 hours)   **Self-Paced Registration Link:** GSFS V14

Summary:
This course is aimed at teaching you how to use 12d Model effectively, key terminology, and fundamental surveying practices.

Prerequisites:
Basic computer skills are required, however experience with 12d Model is not necessary.

Course Content:
- View and Toolbar Menus
  - Introduction to Views
  - Toolbars and Controls
- Importing and Managing Data
  - Importing Data and Analysis
  - Plan View Operations
  - Re-importing and Saving Model List
  - Triangulation and Analysis
  - String Inquire and Snaps
  - Creating Strings with CAD
- Survey Data Management
  - Survey Control Station Entry
  - Instrument Setup and Downloading
  - Survey Reduction
  - Field File Editing
  - Field File Graphical Editing
  - Triangulation
  - Plotting
- Volume Calculations
  - Stockpile Volumes
  - Multiple Stockpile Volumes
  - Dam Capacity
  - Surface Comparison
  - Progressive Volumes
- Setout Functionality
  - Building Setout
  - CAD House Setout
  - Setout Evenly Graded
  - Polyline Cul-de-sac String Setout
  - Triangulation Setout
  - Road Setout
  - Setout Report
- Subdivision Lots
  - Creating Road Boundaries
  - Creating Lot Boundaries
  - Lot Numbering
  - Lot Labelling
  - Lot Reporting

5.0 GETTING STARTED FOR DESIGN – SPOT

Duration: Self-paced (~7 hours)   **Self-Paced Registration Link:** GSFD V15

Summary:

This course continues on from the Fundamentals course and is aimed at teaching you how to use 12d Model effectively, key terminology, and the fundamentals of design through the lens of a simple road design project.

Prerequisites:

A basic understanding of 12d Model is required, with completion of the **Fundamentals** course.

Course Content:

- The Road Design Process
  - Horizontal Geometry
  - Vertical Geometry
  - Templates
  - Apply Template
  - Assessing the Design

- Design Showcase
  - Kerb Returns
  - Components
  - Design Quick Start
  - BIM Objects
  - Chains, Leaders and Dimensions

- Plotting
  - Quick Sheet Plots
  - Cross Section and Long Section Plots
  - Plan Plot Frames
  - Multipage Plots

6.0 CIVIL DESIGN BASICS

Duration: 12 hours **Instructor-Led Registration Link:** Design
                        Self-Paced Registration Link: CDB

Summary:
This course introduces the Fundamentals of 12d Model, and the use of 12d Model for introductory civil design tasks.

Prerequisites:
Basic computer skills are required, however experience with 12d Model is not necessary.

Course Content:

B01: Introduction

- String Picking Concepts
- Creating and Editing Strings
- View Types
- Typical Project & Folder Structure

T01 & T02: Tins and Volumes

- Importing Data & Map Files
- TIN Triangulation
- TIN Information and Inquiry
- Contouring and Labelling
- Importing a Raster
- Pad Grading & Design
- Interface Design
- Cut & Fill Volume Calculations

B05: Sharing

- Share Out Models and TINs
- Share In Models and TINs

B06: Chains

- Screen Layout Files
- Create a Basic Chain

A01: Super Alignment, IP Method

- Create Super Alignments
- Create and edit horizontal alignments using IPs
- Create and edit vertical alignments using IPs

D01: Design Basics

- Create & Edit Templates
- MTF Creation
- Apply MTF Function
- MTF Modifiers

P02: Sections and Plotting

- Plotting Long Sections
- Plotting Cross Sections
- Customising Section Plots

Important Note:

This course teaches how to use 12d Model for civil design. It **does not** teach civil design principles.

7.0 CIVIL DESIGN FEATURES

Duration: 12 hours   **Instructor-Led Registration Link:** Design

Summary:

This course introduces tools used for advanced road design.

Prerequisites:

Experience in 12d Model, with completion of the **Civil Design Basics** course.

Course Content:

T02 & T01: TINs and Volumes

- Importing data – Map files
- TIN contours and range files
- Import raster

B05: Sharing

- Sharing Models and TINs In & Out

A02: Super Alignment, Element Design

- Design Toolbars/Workspace
- Create Super Alignment
- Horizontal element geometry
- Vertical element geometry
- Centre Line Options
- Named parts
- Named positions

A04: Super Alignment, Computators

- Using computator elements
- Computator kerb return tool
- Widening function
- Modifiers with computators

D02: Design, Advanced Modifiers

- Import templates
- Apply MTF defaults
- Apply MTF Manager
- MTF Seed Files

- Modifiers using smart chainages
- Modifiers using layers
- MTF features, Alias, Regions
- View Favourites and Positions
- BIM Apply object introduction

D03: Design, MTF Snippets

- What are Snippets?
- Basic Snippet edits
- Applying Snippets
- Pram Ramp Tool
- Design TIN and SuperTIN

B06: Chains

- Design Chain
- Panel Record Options

D06: Design, MTF Boxing

- Modifier boxing with layers for Asphalt surface, Kerb shapes and Subgrade layers

D07: Design, Tri-mesh Boxing

- Pavement Manager
- Boxing with Snippets
- Named grades
- Asphalt surface, Kerb shapes and Subgrade layers
- Pavement Widening and Overlay

Important Note:

This course shows how to use 12d Model for intermediate and advanced design. It **does not** teach civil design principles.

8.0 STORMWATER BASICS

Duration: 15 hours   **Instructor-Led Registration Link:** Drainage

Summary:

The Stormwater Basics course covers the skills required to create *Water* strings and turn them into models of stormwater networks comprising nodes, links, catchments and overland flow paths. A construction-ready design will be completed for specified minor and major storm events, using the Rational Method. This course also covers the customisation of node and link types and the production of deliverables (drawings, tables, BIM, etc).

Prerequisites:

A basic understanding of 12d Model is required, with completion of the **Fundamentals** course. This can be completed as a standalone SPOT course, or is included in the **Civil Design Basics, Survey Basics, Getting Started for Surveying** and **Getting Started for Design** courses.

Course Content:

W01: Project Setup and Network Creation

- Review survey data, geometric design and supertin of finished surface

- Identify locations of crests/sags, critical inlets and overland flow channels

- Create new *Water* models from Water Model Templates

- Create *Water* strings with the Water String Editor

- Convert *Super* strings to *Water* strings

W02: Introduction to the Water Network Editor

- Using the top (navigation), middle (tabbed) and bottom (control) sections of WNE panel

- Assigning string names and node/link types

- Set Node Names button

- Set Node Details button

- Regrade Links button

- Plot button

- Global, Default and Explicit settings

- Road design file: setout and centre strings

- Adjusting node locations laterally from setout strings

- Moving junction nodes and node connection points

- Cover levels vs Grate levels

- Details at network outlets

- Service clash file: grading to avoid crossing services

- Culverts & Channels vs Pits & Pipes

W03: Catchments, Rainfall and Introduction to Rational Method

- The Rational Method

- Turing IFD tables into 12d Model Rainfall files

- Assigning direct flow rates to nodes (Qdg) and links (Qdp)

- Catchment file: catchment polygons and Tc strings

- Set Catchments button

- Analysis button: introductory Rational Method analysis

- Review preliminary link sizes

W04: Network Import and Export

- Import/Export button

- Custom reports/tables

- Importing data from spreadsheet

- Attribute groups for minor and major results

W05: Rational Method Analysis with Overland Flow, Inlet Capacity and Flood Extents

- Overland flow model: downhill strings and utility string editor

- Inlet capacity factors affecting bypass flow

- The drainage.4d file editor

- Thorough review of WNE settings

- Analysis button: Rational Method analysis with bypass/overland flow and flood extents

- Checking major storm events

- Drawings: stormwater plans, long-sections and structure details

- Calculation tables: standard and custom

W06: Network Quantities

- Pit schedules

- Excavation quantities

- Network quantities

- BIM: trimeshes (of nodes, links, surface structures, headwalls, HGLs) and IFC export

- Visualisation in 3D views

Important Note:

This course shows how to use 12d Model for stormwater design. It **does not** teach stormwater or drainage principles.

9.0 STORMWATER DYNAMIC

Duration: 7.5 hours   **Instructor-Led Registration Link:** Drainage

Summary:

This course continues on from the **Stormwater Basics** course, to consider rainfall runoff models and dynamic flow in pipes (St Venant unsteady flow equations).

Prerequisites:

Experience in 12d Model, with completion of the **Stormwater Basics** course.

Course Content:

W07: Dynamic Drainage

Hydrology

- Rainfall runoff methods discussed will vary with regions (SCS, ILSAX or Laurenson)

- Moving from rational "C" to Soil types

- Additions to the 12d rainfall file including Rainfall fixed time and variable temporal patterns.

- Reviewing graphical outputs

- ARR 2019

Hydraulics

- Modelling diverging flow conditions

- Bypass flow using surface flows with section shapes cut from the design tin.

- Time series for tail water conditions.

- Modelling natural channels using section shapes cut from the design tin.

Detention Basin Design

- Creating detention basins and extracting elevation area curves from the tin,

- Multiple outlets design (combining spillway, control pipe, orifice)

Storage Tank Design

- Estimating storage to meet the pre development discharges via discharge control pipes and orifice plates.

Infiltration Basin Design

- Using Green-Ampt to model infiltration in basins/nodes.
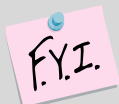
Important Note:

This course shows how to use 12d Model for dynamic stormwater design. It **does not** teach stormwater or drainage principles.

10.0 STORMWATER 2D INTRODUCTION

Duration: 7.5 hours   **Instructor-Led Registration Link:** Drainage

Summary:
This course provides an introduction to 2d surface flood modelling.

Prerequisites:
A basic understanding of 12d Model is required, with completion of the **Fundamentals** course. This can be completed as a standalone SPOT course, or is included in the **Civil Design Basics, Survey Basics, Getting Started for Surveying** and **Getting Started for Design** courses.

No previous flood modelling experience is required. The 2D quick start panel handles the management of all TUFLOW input files and results. Experience with the water network editor is helpful but not required.

Course Content:

W10: Creating a rainfall on grid 2d model

- Create and run a TUFLOW model using the 2D quick start panel.

- Add ridges, gullies to enhance the 2D grid.

- Add roughness polygons for a second roughness.

- Link a 12d drainage model to the 2d grid.

Review check files and results

- Review the grid z pts, ridges/gully, 1d-2d link and boundary control check files.

- Create and display tin varying grid tin results for water depths, velocity and hazard. This is done in plan, section and 3d perspective views.

- Create results legends and customise result colour bands.

Time Results

- Create time plots of results of velocity, depth, water level and hazard.

- Create flow measurement lines to total the flow over the line.

Visualisation and Fly Overs

- Create time lines viewing flooding from a stationary perspective

- Create flight and target paths for project flyovers of flood results.

Important Note:

This course introduces the use of 12d Model and TUFLOW. It **does not** teach stormwater or drainage principles.

11.0 STORMWATER 2D TUFLOW INTERFACE

Duration: 7.5 hours   **Instructor-Led Registration Link:** Drainage

Prerequisites:

Completion of the **Stormwater 2D Introduction** course, or experience in TUFLOW modelling using the TUFLOW control file commands.

Experience with the **Water Network Editor (WNE)**, as well as completion of the **Stormwater Dynamic** course would advantageous, but are not required.

Course Content:

W11: TUFLOW control file (TCF) editor

- Use the 12d model (tcf) editor to review and update the tcf, tbc and tgc files created by the 2D quick start panel.

- Modify active area polygons and boundary conditions.

- Use the String attribute editor for advance attribute manipulation and the attribute to spreadsheet tool for bulk changes.

TUFLOW string editor (TSE)

- Use the TSE to create and update string attributes and csv database files.

Hydrology Options

- Create strings for inflow hydrographs (SA & QT),

- Rainfall hyetograph regions (RF)

Boundary Conditions

- Tidal boundaries.

- Head discharge (HQ)

- Initial water levels

Soil Types

- Soils file.

- Infiltration methods.

Structures

- Storage Reduction factors.

- Form Loss Coefficients

- Variable Form Loss Coeff.

Variable Z Options (Dam break)

- Adding a culvert connecting to multiple 2D cells.

- Distributing 1D hydrology results onto a 2D grid.

Important Note:

This course is designed to for TUFLOW modellers who want to use the 12d Model interface. Although 2d modelling theory and concepts are discussed, it is only the start of TUFLOW 2d modelling.

12.0 RIVERS

Duration: 4 hours   **Instructor-Led Registration Link:** Upon Request

Summary:

This course covers the use of 12d Model's interface with HEC-RAS, allowing the creation of a HEC-RAS project from a digital terrain model. 12d Model also provides powerful tools for presenting the results of the HEC-RAS analysis.

Prerequisites:

A basic understanding of 12d Model is required, with completion of the **Fundamentals** course. This can be completed as a standalone SPOT course, or is included in the **Civil Design Basics, Survey Basics, Getting Started for Surveying** and **Getting Started for Design** courses.

Course Content:

- Identify the river strings required for the HEC-RAS project.

- Create and locate cross sections along the river.

- Export the data from 12d Model to HEC-RAS.

- Open the HEC-RAS Project, and analyse the river for a design discharge.

- Use HEC-RAS to interpolate cross sections.

- Export the river water levels and channel shape data from HEC-RAS

- Import the data from HEC-RAS into 12d Model

- Create an inundation map using the water levels from HEC-RAS

- Create plans and cross sections from the HEC-RAS data suitable for use in reports. This includes multiple water level results and depth

- Contours.

- Create a 'fly down the river' .avi movie file of a rendered 3d perspective view.

Important Note:

This course shows how to use 12d Model with HEC-RAS. It **does not** teach Rivers work principles or how to use HEC-RAS.

13.0 ADAC

Duration: 6 hours   **Instructor-Led Registration Link:** General

Summary:

This course covers the use of 12d Model for production of an ADAC XML file ('ADAC' refers to 'Asset Design and As Constructed'). The creation of assets and their validation are in accordance with IPWEA (Institute of Public Works Engineering Australasia).

Prerequisites:

Experience in 12d Model, with completion of either the **Civil Design Basics** course or the **Survey Basics** course.

Course Content:

C01: ADAC
- Examining the ADAC schema as provided by the IPWEA
- Looking at what is an ADAC Asset in **12d Model** is
- Assigning ADAC Assets to points, lines and polygons
- Explaining and running the 12d-ADAC chains and MetaConnex

- Validating the ADAC Assets
- Creating an ADAC Header
- Generating an ADAC Report
- Generating an ADAC.XML file
- Reading in an ADAC.XML file
- Label map files
- ADAC tools (MetaConnex) for data preparation

14.0 SURVEY BASICS

Duration: 6 hours   **Instructor-Led Registration Link:** Survey

Summary:

This course introduces the use of 12d Model and its concepts for surveying work.

Prerequisites:

Basic computer skills are required, however experience with 12d Model is not necessary.

Course Content:

- Overview of 12d concepts: File structure, On Line Help, Mouse configuration

- Screen Layout: Pull down menus, Icons, Views Models (Layers), Strings, String picking CAD Concepts

- Importing / Exporting data

- Editing String data

- Triangulation and analysis

- The completion of this course or the 'Getting Started for Surveying' manual is required before attending other survey courses

- Create and produce setout data

- Volume exercises

F.Y.I.

Important Note:

This course shows how to use 12d Model for surveying. It **does not** teach surveying principles.

15.0 SURVEY TOPOGRAPHICAL PROCEDURES

Duration: 6 hours   **Instructor-Led Registration Link:** Survey

Prerequisites:

Experience in 12d Model, with completion of the **Survey Basics** course or **Getting Started for Surveying** course.

Course Content:

- Field techniques: Feature coding, control coding for enhancements including pipes, image attachments and attributes

- Survey Control entry

- Total Station and GNSS survey reductions: Dynamic editing of data with full auditing

- Errors in coding, target heights and stringing

- Manual edits: Joining strings, point edits, tinability

- Triangulation: Creation, analysis, Section views, Perspective views, Raster draping

- Plotting: Contours, Text labelling, Grids, Plotter mapping files, ACAD map files,

- Quick plots, Plot frames, Plot to PDF file and AutoCAD.

Important Note:

This course shows how to use 12d Model for surveying. It **does not** teach surveying principles.

16.0 SURVEY CONSTRUCTION PROCEDURES

Duration: 9 hours   **Instructor-Led Registration Link:** Survey

Prerequisites:

Experience in 12d Model, with completion of the **Survey Basics** course or **Getting Started for Surveying** course.

Course Content:

- Importing Road design
  - 12d Archive
- Analysis and checking
- Cross section creation and checking
- Boxing Many Function
  - Boxing Volumes
  - Boxing layer surfaces
- Building setout
- Point cloud
  - Import
  - Thinning
  - Tinning
- Volumes
  - Stockpile volumes
  - Progressive volumes
  - Isopachs and shading
- Plotting
  - House setout
  - Road Construction
  - Long & Cross sections
  - Volume reports

Important Note:

This course shows how to use 12d Model for surveying. It **does not** teach surveying principles.

17.0 SURVEY CONVERSIONS AND ADJUSTMENTS

Duration: 6 hours   **Instructor-Led Registration Link:** Survey

Prerequisites:

Experience in 12d Model, with completion of the **Survey Basics** course or **Getting Started for Surveying** course.

Course Content:

- Helmert Transformations
  - 2d, 3d and 2.5d (12d Field Localisation)
- Linear Regression
- Centroid of 3d shape
- Copy to points (Copy template of strings to points)
- String filtering
  - String Filter
  - Vertex Filter
  - Regular distance filter
- Grid intersection points generator
- Traverse adjustments
  - Bowditch
  - Height adjustment
- Least Squares Adjustment
  - Total Station and Digital network
- Building Face survey
- Scale, rotate and translate chain
- Height Adjustments
- Geodetic Conversions
  - Australian Conversions
  - Cartographic
  - Different Datums
  - Projection and Geoid file creation
  - Geodetic Reporting

F.Y.I.

Important Note:

This course shows how to use 12d Model for surveying. It **does not** teach surveying principles.

18.0 12D FIELD PICKUP

Duration: 6 hours   **Instructor-Led Registration Link:** Survey

Prerequisites:

Experience in 12d Model, with completion of the **Survey Basics** course or **Getting Started for Surveying** course.

Course Content:

- Tablet setup
- Coding and mapfiles
- Instrument connection
  - Total Station
  - GNSS
- User Settings and Menus
- Total Station Control Bar
- Total Station Options
  - Station setup
  - Checks

- Coding
  - 12d Pickup editor
  - Mapfile
  - Favorites
  - Create Binary styles
  - Mapfile to pickup codes
- Total Station Pickup Menus
  - SDR
  - SDR Function
  - Reading and Coding
  - Favourites and Template
- Survey edits SDR
- GNSS Control Bar
- GNSS Options
  - Pickup

Important Note:

This course shows how to use 12d Model with 12d Field for surveying. It **does not** teach surveying principles.

19.0 12D FIELD SETOUT

Duration: 6hours   **Instructor-Led Registration Link:** Survey

Prerequisites:

Experience in 12d Model, with completion of the **Survey Basics** course or **Getting Started for Surveying** course.

Course Content:

- Tablet setup
- Menus and Settings
- Coding and mapfiles
- Instrument connection
    - Total Station
    - GNSS
- User Settings and Menus
- Total Station Control Bar
- Total Station Options
    - Station setup
    - Checks
- Setout options
    - point
    - basic String
    - Basic Segment

- Batter
- Surface
- Crossfall
- Grid

- Total Station Pickup Menu
    - Basic
- TPS Offset menu
- GNSS Control Bar
- GNSS Options
    - Localisation
    - Utilities
    - Checks
    - Setout
    - Pickup

Important Note:

This course shows how to use 12d Model with 12d Field for surveying. It **does not** teach surveying principles.

20.0 SETUPS AND CONFIGURATION

Duration: 6 hours   **Instructor-Led Registration Link:** Upon Request

Summary:

This course covers the setup and configuration process for a company's 12d Model environment.

Prerequisites:

No previous programming experience required.

A basic understanding of 12d Model is required, with completion of the **Fundamentals** course. This can be completed as a standalone SPOT course, or is included in the **Civil Design Basics, Survey Basics, Getting Started for Surveying** and **Getting Started for Design** courses.

Course Content:

B04: Setup and Configuration
- Create a Project
  - Environment Configuration File
- Custom Files
  - User and Customer User Folders
  - User and Customer Libraries
- Folder Structure
- Environment Files

- Setup Files
  - Project Details
  - Workspace
  - Project Tree
  - Saving setup files
  - Defaults / Project settings
  - User defined function keys
- Linestyles
- Symbols
- Text Styles
- Toolbars
- Plotting

Important Note:

This course shows how to perform setup and configuration of 12d Model. It **does not** teach surveying or design principles, or integration with 12d Synergy.

21.0 MACROS

Duration: 6 hours   **Instructor-Led Registration Link:** General

Summary:
This course starts people writing, compiling and running 12d Model Macros.

Prerequisites:
No previous programming experience required.

A basic understanding of 12d Model is required, with completion of the **Fundamentals** course. This can be completed as a standalone SPOT course, or is included in the **Civil Design Basics, Survey Basics, Getting Started for Surveying** and **Getting Started for Design** courses.

Course Content:

- The 12d Programming Language (12dPL) is a powerful programming language designed to run from within 12d Model.

- Its main purpose is to allow users to enhance the existing 12d Model by writing their own programs (macros).

- 12dPL is based on a subset of the C++ language with special extensions to allow easy manipulation of 12d Model data. A large number of intrinsic functions are supplied which cover most aspects of civil modelling.

- 12dPL has been designed to fit in with the ability of 12d Model to "stack" an incomplete operation.

- This training course does not try to teach programming techniques but takes attendees through the basics

steps to start writing and running 12dPL programs (macros).

- This course covers

1. Using the 12d Model Programming Language manual.

2. 12dPL syntax and flow control.

3. The basic 12dPL variable types and "handles" to 12d elements (strings *etc.*).

4. How to create, compile and run 12dPL code.

5. How to retrieve and change basic element properties.

6. Creating 12d Model panels.

7. (Time permitting) Reading and writing files (creating reports).

8. (Time permitting) Including your 12dPL programs in the User Defined menus, function keys and toolbars.

F.Y.I.

Important Note:

This course is for showing how to use macros in 12d Model. It **does not** teach surveying/design principles.

22.0 RAIL/TRACK DESIGN

Duration: 6 hours   **Instructor-Led Registration Link:** Design

Summary:

This course introduces users to the 12d Track Design Tools for rail design.

Prerequisites:

Experience in 12d Model, with completion of the **Civil Design Basics** course.

Knowledge and application of element-based Super Alignments, and previous experience in rail design and rail terminology is recommended.

Course Content:

R01: Track

- Generation of a track centreline from surveyed rails.
- Use of super alignment regression. Regression is used to develop existing geometry from a survey when the original design data is unavailable.
- Use of Super Alignment parts, Computators, and the IP method within the HIP/VIP editor, part editor and edit parts panels.
- Design of a mainline and passing loop.
- Version control and revision of horizontal and vertical alignment geometry with centreline options.
- Assessment of track slew and various reporting methods.
- Application of chainage equalities and inquiries between raw chainages and chainage equalities.

- Generation of a rail formation, and a sub-ballast capping layer using snippets.
- Generation of a rail profile for 3D rail visualisation.
- Creation and placement of turnouts.
- Calculation of rail cant to speed limits and various design constraints. Reporting methods for rail cant.
- Creation of rails, ballast strings, sleepers and a circular bored tunnel.
- Generation of a structural clearance envelope.
- Generation of a longitudinal profile, labelling of an alignment with geometry boxes, and plotting a plan profile using the multipage plot.

Important Note:

This course shows the use of 12d's Track Tools, it **does not** teach Track Design or cover any of the Basis of Design Rules for Rail work.

23.0 CAD AND PLOTTING

Duration: 6 hours   **Instructor-Led Registration Link:** General

Summary:
This course covers the tools required for producing CAD drawings and plotting from 12d Model.

Prerequisites:
A basic understanding of 12d Model is required, with completion of the **Fundamentals** course. This can be completed as a standalone SPOT course, or is included in the **Civil Design Basics, Survey Basics, Getting Started for Surveying** and **Getting Started for Design** courses.

Course Content:

B02: CAD

- Creating a Project
- Drawing and CAD snaps
- Modification tools including:
  - Move, Rotate and Copy
  - Clip
  - Parallel
  - Trim, Extend and extend by length
- Properties
- Symbols
- Text

B03: CAD Tools

- Sharing
- Toolbars
- String Properties
  - Changing and Editing
  - View Settings
- Super String Tools
  - Tinability
  - String Symbols
  - Pipe / Culvert properties
- Measuring
- Raster
  - Importing
  - CAD Holes

- Creating a TIN
- Contouring and Labelling

P01: Plan Plot and Label

- Labelling data
- Plan plotting

P02: Sections and Plotting

- Plotting long sections
- Plotting Cross sections

P04: Plot Sheets

- CAD dimensions, leaders and tables
- Plot sheet

24.0 BIM

Duration: 6 hours   **Instructor-Led Registration Link:** [BIM](#)

Summary:

For a surveyor, engineer or information manager who wants to utilise the functionality inside 12d Model to collaborate and coordinate models from different project disciplines. Being able to import and share BIM (Building Information Modelling) model data, access and coordinate attribute/metadata information and trimesh models.

Prerequisites:

Experience in 12d Model, with completion of the **Civil Design Basics** course.

Course Content:

- Import and manage BIM data including open BIM IFC files

- 12d Model Data Management

- Mapping data with attributes

- Create and edit an attribute manipulator file

- Create and edit Global attributes with choices (BIM)

- Create and edit Project attributes (BIM)

- Create and apply attribute label map files

- Trimesh creation and editing tools

- Trimesh service chambers and BIM objects

- Trimesh services (conduits and trenching)

- Creating trimesh objects from 12d objects

- Recreate MTF files from design strings

- Pavement Manager and Snippets for trimesh BIM creation

- Trimesh reporting and volumes

- Export open BIM IFC files

- Investigate 3D clash detection rules; apply and report on 3D object clashes.

25.0 PAVEMENTS

Duration: 6 hours   **Instructor-Led Registration Link:** Upon Request

Summary:

For designers and construction surveyors looking to utilise the Pavement functionality within 12d Model.

Prerequisites:

Experience with the MTF and Snippets in 12d Model, with completion of the **Civil Design Features** course or the **Survey Construction Procedures** course.

Course Content:

D07: Design, Tri-mesh Pavement

- Pavement Manager
    - Creation of a Pavement Manager, that includes pavement definitions, kerb profiles and verge details.
    - Creation of attributes for each layer in the pavement definition
    - Explanations of pavement layer offsets and end slopes.
    - Model and tin naming conventions
- Pavement (Trimesh) Snippets
    - Detailed explanation and use of MTF snippets pertaining to design features
    - Pavement design with kerb and channel
    - Pavement design for freeway/arterial roads
    - Footpath/landscape design
    - Pavement design for kerb returns and cul-de-sacs
- Overlay & Widening
    - Cutback treatment and corrector
- Construction Pavement Preparation

- Re-creation of Design from strings
- Analysis and editing of supplied data strings
    - Understanding what is good and bad data
    - Identifying crossing and duplicated strings
- Pavement from tins
    - Preparation of tin surfaces, including surface colouring for:
        - Roundabouts
        - Intersections
    - Applying pavement definitions to the coloured areas of the tin
    - The extension of pavement using strings selected as "Edge Treatments"
- Creation of Tin surfaces from trimesh pavement
    - Use of the Pavement Manager and snippets to set and create the tins
    - Use of other options outside of the Apply MTF to create the tins

26.0 SNIPPETS

Duration: 5 hours   **Instructor-Led Registration Link:** <u>General</u>

Summary:

This course introduces users to writing and running snippets for design. A snippet is a collection of MTF modifiers that can be inserted as a single modifier into an MTF file. Unlike templates or MTF inserts, parameters can be used to customise snippet instances, and readability is enhanced, therefore snippets are superior to other methods for creating designs in the apply MTF function.

Prerequisites:

Experience in 12d Model, with completion of the **Civil Design Basics** course.

No previous programming experience is required.

Course Content:

D08: MTF Snippets

- What are snippets?

- Creating a snippet.

- Running a snippet.

- Snippet parameters. Customising a snippet instance by changing an element colour, width, height, crossfall etc.

- Automatic parameters. In-built parameters to help build powerful snippets e.g. get the tin name used from the apply MTF function.

- Snippet syntax and flow control. If, else statements.

- The creation of variables.

- How to apply mathematics.

- Creation of a road and a parking bay snippet.

- Snippet starting and ending position options.

- Debugging and error handling. Options that are available to fix errors.

- Snippet helper functions. Matching an existing crossfall value.

Important Note:

This course shows the use of snippets tools in 12d Model. It **does not** teach design principles.