

OpenTunnel® Designer - Tunnel Modeling fully interoperable with analysis and design

Target Audience

This course is designed for tunnel engineers, geotechnical engineers, civil engineers, transportation engineers, BIM professionals, underground infrastructure designers, CAD specialists, project coordinators, and consultants involved in tunnel planning, design, construction, and analysis projects. It is also suitable for organizations seeking to implement model-based tunnel delivery workflows and digital engineering practices for underground infrastructure projects.

Course Objectives

This course aims to provide participants with the knowledge and practical skills required to model, analyze, coordinate, and document tunnel projects using OpenTunnel Designer. Participants will learn to create intelligent tunnel models, develop excavation and lining systems, model reinforcement, integrate geotechnical data, prepare analytical models for PLAXIS, and generate construction-ready deliverables. The course also emphasizes interdisciplinary collaboration, clash detection, design optimization, and BIM-enabled project delivery workflows.

Course Outcomes

Upon successful completion of this course, participants will be able to:

- Create intelligent 3D tunnel models using OpenTunnel Designer.
- Develop tunnel alignments, excavation profiles, and tunnel lining systems.
- Model reinforcement, segmental linings, and Universal Tapered Ring (UTR) components.
- Create and manage construction stage-based tunnel designs.
- Integrate geological and geotechnical information from OpenGround and Leapfrog.
- Prepare analytical models and exchange data with PLAXIS 2D and PLAXIS 3D.
- Perform clash detection and multidisciplinary coordination with roadway, railway, bridge, and utility systems.
- Generate automated drawings, reports, quantity take-offs, and cost estimates.
- Create high-quality visualizations and project deliverables using Bentley visualization tools.
- Deliver complete tunnel design projects following BIM and digital engineering best practices.

Course Outline

The course comprises **48 hours of theory and hands-on laboratory sessions** and is divided into **10 comprehensive modules**. Each module is followed by practical exercises and real-world site development workflows designed to reinforce learning and evaluate the participant's understanding of the concepts covered.

Table of Contents

Module 1: Introduction to OpenTunnel Designer and Tunnel BIM Workflows

- Overview of OpenTunnel Designer
- Tunnel Information Modeling (TIM) Concepts
- User Interface and Project Environment
- Project Setup and Standards
- Common Data Environment Workflows

Module 2: Tunnel Geometry and Alignment Design

- Tunnel Alignment Fundamentals
- Horizontal and Vertical Geometry
- Cross-Section Development
- Tunnel Templates and Libraries
- Rule-Based and Constraint-Driven Modeling
- Parametric Tunnel Components

Module 3: Excavation Modeling and Construction Staging

- Excavation Shape Creation
- Excavation Track Modeling
- Mechanized Tunnel Workflows
- Conventional Tunnel Workflows
- Construction Stage Modeling
- Design Change Management

Module 4: Tunnel Lining and Reinforcement Design

- Tunnel Lining Modeling
- Segmental Lining Systems
- Universal Tapered Ring (UTR) Concepts

- Reinforcement Modeling
- Rebar Detailing Workflows
- ProStructures Integration

Module 5: Tunnel Structures and Advanced Modeling

- Cross-Passage Modeling
- Tunnel Intersections
- Steel and Concrete Pile Modeling
- Interior Tunnel Components
- Void Creation and Tunnel Trimming
- Functional Components

Module 6: Geotechnical Integration and Analytical Model Creation

- OpenGround Integration
- Geological Data Management
- Leapfrog Geomodel Integration
- Soil Layer Modeling
- Analytical Model Preparation
- Geotechnical Data Validation

Module 7: Tunnel Analysis using PLAXIS Integration

- Introduction to Tunnel Analysis
- PLAXIS 2D Integration
- PLAXIS 3D Integration
- Soil-Structure Interaction
- Tunnel Reinforcement Analysis
- Construction Stage Analysis

Module 8: Coordination, Clash Detection and Collaboration

- Multidiscipline Coordination
- Road, Rail and Bridge Integration
- Clash Detection Workflows
- Design Review Processes
- Digital Collaboration

Module 9: Documentation, Drawings and Reporting

- Plan, Profile and Cross-Section Drawings
- Automated Drawing Production
- TBM UTR Unfolded View Drawings
- Ring Position Drawings
- Quantity and Cost Reporting
- Construction Stage Reports

Module 10: Visualization, Deliverables and Final Project

- Tunnel Visualization Techniques
- LumenRT Integration
- Design Verification in 3D
- Project Deliverables Generation