InRoads Geometry Fundamentals

Course Curriculum

Revised: January 2010

Duration:

Two days

Prerequisites:

Prerequisite courses are:

- ***MicroStation Essentials*** or work experience with MicroStation drafting tools

Course Objectives:

The student will learn how to create and utilize horizontal and vertical geometry and be introduced to fundamental surface concepts. More advanced surfacing concepts are covered in the course ***Roadway Design Using InRoads XM.*** Additionally, students will acquire an understanding of what is involved in completing a project in InRoads XM.

This is the base course for using InRoads in a design project. The objectives of this course are:

- Become familiar with the InRoads interface, project folders used to store InRoads data, and be able to verify the correct InRoads resources are being used
- Be able to identify all file types used and created by InRoads
- Understand what comprises a digital terrain model (dtm) and how to use the dtm to develop project geometry
- Understand the process of obtaining and using existing dtm data from ROW/Survey
- How to effectively manage geometry through the use of a *geometry project*
- Create and modify horizontal geometry using the curve set tool and importing geometry from graphics
- Develop profiles and create vertical geometry using the curve set tool and importing a vertical alignment from a surface
- Annotate horizontal and vertical geometry

Refer to the day-to-day schedule for additional objectives for the course.

What to Bring:

Instructor will provide all materials required to complete this class.

Resources:

Students will find electronic copies of the reference material and labs associated with this course online under the Manuals and Training page of the CADD and Engineering Innovation web page located at www.dot.state.co.us/DesignSupport/CADD and Engineering Innovation.

Instructional Media:

This is an instructor-led hands-on course. Each student will have a computer for the duration of the course. The instructor will utilize a whiteboard and projection system for demonstrating key topics

and techniques of the software. Students will access the reference material for this course electronically, either locally or online as noted under the section ***Resources***.

The instructor will provide each student a hard copy of the lab material. Course data files will be pre-loaded on the computer used in class. As with the reference material, course data files will also be available online for students to download and work through at their convenience.

Material Requirements:

A printed copy of the course labs will be provided in the class. The lab material will be used in conjunction with an electronic copy of the resource manual ***A Practical Guide for Using InRoads XM***. Students may be asked to refer to ***A Practical Guide for Using InRoads XM*** during the lecture portion of the class for detailed explanations of how to use specific InRoads commands and to gain an understanding of the command options.

CDOT Standards:

This course uses all CDOT standard configuration files, including the new standard CDOT_Civil.xin.

Class Schedule and Objectives

DAY 1

Objective:

The course will begin by demonstrating the proper setup of a project and usage of project resources. From there, the student will be introduced to digital terrain model (dtm) files, how to view them, and how to obtain existing topography from ROW/Survey. The student will then learn how to create and manage geometry projects and horizontal alignments.

1. **Introduction 0.5 hour**

   A brief discussion of the class format will be given. Other topics to be covered in this section are:

   - Discuss CDOT CADD Website
   - How to get support
   - How to access the course materials online

2. **Getting Started - 1.5 hours**

   Proper setup of the project will decrease the amount of time looking for files or trying to get the correct symbology for a feature to appear. Key topics covered in the introduction include:

   - Show how to use the Project Creation Utility
   - Introduction to the InRoads interface
   - Discuss file types used in InRoads XM
   - Project directory structure (show what files will be used by InRoads and where they are located) and introduce file sharing
   - Resources and design files (illustrate how to verify that all the correct files have been loaded)

   Lab - Getting Started in InRoads

3. **Introduction to DTMs and Surfaces - 2.5 hours**

   In this section students will gain an understanding of what comprises a dtm, what a surface is, and how to view and evaluate existing topography. Topics covered in this section include:

   - Introduction to features
   - Selecting and viewing features
   - Intelligent DTMs (Feature Names, Styles & Symbology)
   - Obtaining existing topography from ROW/Survey
   - How to view the surface perimeter, contours and features
   - Reviewing surfaces and understanding surface properties

   Lab - Digital Terrain Models

4. **Defining Horizontal Alignments - 3.5 hours**

   Students will learn what a geometry project is and how to create and modify horizontal alignments using two different methods. Topics covered in this section include:

   - Discuss the structure of a geometry project
   - View and review horizontal geometry
   - Import horizontal alignments from a graphic element
   - Create a horizontal alignment using the horizontal curve set tools

   Lab - Defining Horizontal Alignments

DAY 2

Objective:

Students will learn how to modify horizontal alignments. Next, students will learn how to create a profile in preparation for defining a vertical alignment. Using the profile, students will create and modify vertical alignments and annotate the horizontal and vertical geometry.

5. **Defining Horizontal Alignments (cont'd) - 3 hours**

   Students will learn how to modify horizontal alignments using various tools. Topics covered in this section include:

   - Trimming and extending alignments
   - Transposing (move, scale, rotate) alignments
   - Transform (switch direction) alignments
   - Find the direction and distance between two points (inverse direction)

   Lab - Modifying Horizontal Alignments

6. **Profiles - 2 hours**

   This section covers various methods for creating profiles and how to add data to the profile. In this section the student will learn how to:

   - Create a profile from an alignment
   - Create a profile from a graphic element
   - Add crossing features to a profile
   - Annotate a profile

   Lab - Creating Profiles

7. **Defining Vertical Alignments - 3 hours**

   This section covers two methods to create vertical alignments, the process of viewing and reviewing alignments, and how to modify them. Topics in this section include:

   - Creating vertical alignments using the Vertical Curve Set tools
   - Creating vertical alignments using the Import Vertical from Surface tool
   - How to generate a vertical geometry report and what to look for
   - Modifying vertical alignments

   Lab - Creating Vertical Alignments