

Introduction to BIM for MEP Design

Instructor guide

Course duration: ~8 hours, depending on lecture time and slides used

Recommended student level: Students in intro-level BIM courses in architecture design and engineering programs.

Products: Autodesk Revit and Forma for Construction

This instructor guide is a comprehensive tool for facilitating this course in the classroom. Prepare to teach the course by thoroughly reviewing this document, as well as all related course materials and resources. You may also share this document with your students to guide them in their assignments. It's always recommended that you work through the course yourself in preparation for each module.

Learning objectives:

- Explain why Revit modeling services are crucial for BIM and MEP.
- Describe how BIM is used in Mechanical, Electrical, and Plumbing (MEP) design.
- Navigate and work within a Revit MEP project environment.
- Create Revit models for mechanical, electrical, and plumbing.
- Explain how MEP systems are connected, data-driven BIM elements.
- Create and manage basic MEP views, legends, and schedules.
- Collaborate with multidisciplinary project teams using BIM models.
- Support BIM coordination within a common data environment.

The overall course contains the following resources:

- 8 video modules covering all the topics in the course.
- Dataset files for use when following the video modules in imperial and metric.
- Quiz questions with timecodes for remedial knowledge check.
- Exam-style final test questions at the conclusion of the course.
- 7 practice exercises with exercise files and solutions.
- 1 challenge assignment with recommended assessment criteria.
- Lecture slides that introduce topics and themes covered in the course.

Pre-requisites:

In this course, learners will discover how to use Autodesk Revit and Autodesk Forma for Construction for the tasks they'll encounter during their BIM project development. The course offers students some of the core concepts to start using these tools and could be assigned in the first week or two of class. It is expected that the student has basic computer knowledge.

This course is designed to provide students with a foundational understanding of 3D modeling for MEP and Building Information Modeling (BIM) workflows. By exploring BIM principles and workflows in the context of MEP design using Revit, students will gain insights into how BIM drives efficiency, collaboration, and innovation across all project stages by professional teams.

To that end, students should be given access to the various products within the course. Instructions for granting students product licenses and setting up Forma for Construction in the classroom are included with the Teaching Supplements downloads.

Structure of the course:

The course is split into 8 modules and is designed to cover core Autodesk skills required for MEP design using BIM workflows.

Videos:

Each video begins with a list of learning objectives covered in the video. The dataset mentioned throughout all the videos are available if students wish to follow along or practice after the video.

Dataset:

The examples used in the videos are Revit models for the MEP discipline, with additional models for the structural and architectural disciplines to give learners hands-on experience in the model coordination section. The dataset is available to follow along with the instruction in both metric and imperial formats.

Practice exercises:

There are 8 practice exercises included, each exploring a different set of topics. The practice exercises are designed to give students an opportunity to test their knowledge and apply what they have learned. Each practice exercise is accompanied by a dataset and video solution.

Project challenge exercise:

A project challenge assignment is included, focusing on a set of topics covered in the course. Students are presented with a challenge in an applicable real-world situation, and they apply their skills and the techniques learned to solve the challenge. A grading rubric is provided for the instructor, giving guidelines on assessment criteria. You can also encourage students to work in small groups, first discussing the desired outputs and working collectively to derive the best process and execution in the software.

Video quiz questions:

Quiz questions are included with each video of the course and the timecodes are included so that students can review the related sections in the video for questions they have answered incorrectly.

Final test questions:

A cumulative set of exam-style questions are included at the conclusion of the course for students to measure what they have learned against realistic multiple-choice questions.

Lecture slides:

Lecture slides are offered to help facilitate in-class discussion.

Using the course in the classroom or self-paced

The Introduction to BIM for MEP Design course can be implemented as an independent, self-paced project, or can be completed in the classroom in a team setting. A couple of options are outline below:

Option 1: Self-paced

Each student will log into Autodesk.com/learn using their Autodesk Account credentials and follow along with the project instruction. (Alternatively, you may choose to assign the material through your LMS.) Students can work through the projects on their own by following the project steps and challenge instructions, and by exploring any supporting assets. This is a great way to allow students to move through the learning materials at their own pace and explore additional learning opportunities or increase shop time. The self-paced option can also be used for out of classroom or remote assignments. A certificate of completion is awarded once the course is completed.

Option 2: Instructor-led

In this option, instructors will log into Autodesk.com/learn using their Autodesk Account credentials and download the learning materials. Instructors can then guide the students through each project, using the accompanying lecture slides for instruction and practice exercises as handouts. This option allows for guided, step-by-step classroom engagement. This approach works well in a more traditional classroom setting and will allow instructors to easily keep students on the same pace. The challenge exercise can be used as a learning opportunity for students who complete their work early or are looking for additional hands-on opportunities.

Each section is listed below along with suggested time allocations for instruction. The referenced demonstrations are based on the step-by-step instruction included in the videos.

Course contents

Each module is listed below along with suggested time allocations for instruction. Review the video tutorials for the detailed instruction in each module.

Module 1: Use BIM for MEP Projects

Module 1-01 Use BIM for MEP design

Total time required for lesson: 10 minutes

Discuss course objectives: 2 minutes

Demonstrate: 6 minutes

- Describe the role of BIM in MEP design workflows.
- Explain how BIM supports engineering logic, coordination, and decision making in building services.
- Explain how BIM enables collaboration between MEP engineers and other project stakeholders.
- Describe the key benefits of BIM for engineers throughout the project life cycle.

Datasets:

No datasets for this video

Assignments (additional):

- **Quiz:** 2 minutes
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Module 1-02 Explore MEP roles in a BIM project

Total time required for lesson: 10 minutes

Discuss course objectives: 2 minutes

Demonstrate: 6 minutes

- Explain how MEP fits into a multidisciplinary BIM project.
- Describe the shared responsibilities across design disciplines.

Datasets:

No datasets for this video

Assignments (additional):

- **Quiz:** 2 minutes
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Module 1-03 Review the BIM Execution Plan (BEP)

Total time required for lesson: 15 minutes

Discuss course objectives: 2 minutes

Demonstrate: 5 minutes

- Identify key BEP information relevant to MEP workflows.
- Explain how project standards influence BIM modeling practices.

Hands-on time: 5 minutes

Datasets:

M1-03 folder

Assignments (additional):

- **Quiz:** 2 minutes
-

Module 2: Start a project in Revit for MEP**Module 2-01 Create a new Revit project and open existing Revit models**

Total time required for lesson: 15 minutes

Discuss objectives: 2 minutes

Demonstrate: 5 minutes

- Describe the role of templates (RTE files) in MEP projects for standardizing systems and families.
- Set up a basic MEP project using a template and define critical Project Information.
- Configure Project Units to ensure engineering data such as flow (GPM/CFM) matches regional standards.

Hands-on time: 5 minutes

Datasets:

M2-01 folder

Assignments (additional):

- **Quiz:** 2 minutes
-

Module 2-02 Navigate the Revit interface and review MEP tools

Total time required for lesson: 15 minutes

Discuss objectives: 2 minutes

Demonstrate: 4 minutes

- Locate and identify MEP-specific toolsets within the Systems tab.
- Open the System Browser to view MEP systems within the project.
- Switch between Architectural and MEP view disciplines to optimize visual clarity.

Hands-on time: 7 minutes

Review objectives: 2 minutes

Datasets:

M2-02 folder

Assignments (additional):

- **Quiz:** 2 minutes
-

Module 2-03 Link architectural models and CAD files

Total time required for lesson: 15 minutes

Discuss objectives: 2 minutes

Demonstrate: 4 minutes

- Link an architectural Revit model into your project with precise coordinate alignment.
- Import and manage CAD files as design references.
- Use pinning and selection toggles to prevent accidental movement of linked files.

Hands-on time: 7 minutes

Review objectives: 2 minute

Datasets:

M2-03 Folder

Assignments (additional):

- **Quiz:** 2 minutes
-

Module 2-04 Create basic MEP views

Total time required for lesson: 20 minutes

Discuss objectives: 1 minute

Demonstrate: 8 minutes

- Create basic MEP plan views.
- Provide some detailed discussion on view ranges.
- Discuss view templates.
- Apply discipline-specific view controls.

Hands-on time: 10 minutes

Review objectives: 1 minute

Datasets:

M2-03 Folder

Assignments (additional):

- **Quiz:** 2 minutes
 - **Practice Exercise Module 2:** Create an MEP project in Revit: 10 minutes
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Module 3: Build MEP systems in Revit**Module 3-01 Use MEP systems in BIM**

Total time required for lesson: 12 minutes

Discuss objectives: 1 minute

Demonstrate: 5 minutes

- Define intelligent MEP system connectivity.

- Verify network links between components.
- Update system data through component changes.

Hands-on time: 5 minutes

Review objectives: 1 minute

Datasets:

M3-01 folder

Assignments (additional):

- **Quiz:** 2 minutes
-

Module 3-02 Define MEP categories, families, and system types

Total time required for lesson: 10 minutes

Discuss objectives: 1 minute

Demonstrate: 4 minutes

- Identify the Revit hierarchy for MEP elements.
- Define element behavior through system classifications.
- Manage project graphics and system browser organization.

Hands-on time: 4 minutes

Review objectives: 1 minute

Datasets:

M3-02 folder

Assignments (additional):

- **Quiz:** 2 minutes
-

Module 3-03 Work with MEP views and discipline controls

Total time required for lesson: 10 minutes

Discuss objectives: 1 minute

Demonstrate: 4 minutes

- Apply discipline-specific view controls.
- Manage visibility graphic overrides to control view display.

Hands-on time: 5 minutes

Review objectives: 1 minute

Datasets:

M3-03 folder

Assignments (additional):

- **Quiz:** 2 minutes
 - **Practice Exercise Module 3:** Create a mechanical systems 3D view in Revit: 15 minutes
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Module 4: Build mechanical systems in Revit

Module 4-01 Place mechanical equipment

Total time required for lesson: 10 minutes

Discuss objectives: 1 minute

Demonstrate: 4 minutes

- Place mechanical equipment families in a Revit project.
- Configure equipment hosting, levels, and offsets.

Identify component connectors used for system connectivity.

Hands-on time: 5 minutes

Review objectives: 1 minute

Datasets:

M4-01 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 4-02 Use spaces and zones

Total time required for lesson: 18 minutes

Discuss objectives: 1 minute

Demonstrate: 8 minutes

- Differentiate between architectural rooms and MEP spaces.
- Define 3D spaces to track environmental and load data.
- Group multiple spaces into controlled HVAC zones.
- Modify space boundaries using separation tools.

Hands-on time: 8 minutes

Review objectives: 1 minute

Datasets:

M4-02 folder

Assignments (additional):

- **Quiz:** 2 minutes
-

Module 4-03 Place air terminals

Total time required for lesson: 18 minutes

Discuss objectives: 1 minute

Demonstrate: 8 minutes

- Navigate a Reflected Ceiling Plan to locate architectural layouts.
- Review differences between hosted and non-hosted air terminals.
- Place air terminals on a linked architectural ceiling grid.
- Verify component placement and vertical positioning in 3D.

Hands-on time: 8 minutes

Review objectives: 1 minute

Datasets:

M4-03 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 4-04 Create supply air systems

Total time required for lesson: 12 minutes

Discuss objectives: 1 minute

Demonstrate: 4 minutes

- Create a logical supply air system from placed components.
- Assign specific source equipment to a named network.
- Model physical duct routing using manual drawing techniques.

Hands-on time: 6 minutes

Review objectives: 1 minute

Datasets:

M4-04 folder

Assignments (additional):

- **Quiz:** 2 minutes
-

Module 4-05 Create return air systems

Total time required for lesson: 20 minutes

Discuss objectives: 1 minute

Demonstrate: 8 minutes

- Create return air systems.
- Update graphic overrides for return air systems.
- Describe how multiple systems coexist in a model.

Hands-on time: 10 minutes

Review objectives: 1 minute

Datasets:

M4-05 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 4-06 Modify duct routing preferences and add duct accessories

Total time required for lesson: 12 minutes

Discuss objectives: 1 minute

Demonstrate: 4 minutes

- Configure routing preferences to automate duct fitting selection.
- Insert inline duct accessories manually into existing runs.

Hands-on time: 6 minutes

Review objectives: 1 minute

Datasets:

M4-06 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 4-7 Review duct system properties

Total time required for lesson: 15 minutes

Discuss objectives: 1 minute

Demonstrate: 6 minutes

- Access system properties using the contextual ribbon interface.
- Track dynamic data changes across components within the System Browser.
- Apply graphic filters to color-code ducts by system property.
- Leverage bidirectionally associative data tags to read parameter values.

Hands-on time: 7 minutes

Review objectives: 1 minute

Datasets:

M4-07 folder

Assignments (additional):

- **Quiz:** 2 minutes
 - **Practice Exercise Module 4:** Initialize and route an HVAC network in Revit: 20 minutes
-

Module 5: Build electrical systems in Revit

Module 5-01 Place lighting fixtures

Total time required for lesson: 15 minutes

Discuss objectives: 1 minute

Demonstrate: 5 minutes

- Place lighting fixtures in a project.
- Explain basic lighting fixture hosting concepts.
- Utilize tiled 3D views to verify component heights and spatial layout.

Hands-on time: 8 minutes

Review objectives: 1 minute

Datasets:

M5-01 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 5-02 Place receptacles and devices

Total time required for lesson: 12 minutes

Discuss objectives: 1 minute

Demonstrate: 4 minutes

- Place electrical devices in a model.
- Verify perimeter device spacing using aligned dimension tools.
- Audit device placement accuracy using 3D visual checks.

Hands-on time: 6 minutes

Review objectives: 1 minute

Datasets:

M5-02 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 5-03 Place electrical panels and create power circuits

Total time required for lesson: 12 minutes

Discuss objectives: 1 minute

Demonstrate: 4 minutes

- Place electrical panels.
- Create basic power circuits.
- Describe circuit connectivity concepts.
- Verify panel clearances and mounting heights within a 3D view.

Hands-on time: 6 minutes

Review objectives: 1 minute

Datasets:

M5-03 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 5-04 Creating lighting and switching circuits

Total time required for lesson: 12 minutes

Discuss objectives: 1 minute

Demonstrate: 4 minutes

- Create basic lighting and switching circuits.
- Map control logic by connecting a switch system to a physical device.
- Verify lighting system loads and control networks using the System Browser.

Hands-on time: 6 minutes

Review objectives: 1 minute

Datasets:

M5-04 folder

Assignments (additional):

- **Quiz:** 2 minutes

Module 5-05 Create panel schedules

Total time required for lesson: 12 minutes

Discuss objectives: 1 minute

Demonstrate: 4 minutes

- Create a panel schedule.
- Describe how model data drives schedule information.

Hands-on time: 6 minutes

Review objectives: 1 minute

Datasets:

M5-05 folder

Assignments (additional):

- **Quiz:** 2 minutes
 - **Practice Exercise Module 5:** Distribute power and lighting infrastructure in Revit: 20 minutes
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Module 6: Build plumbing systems in Revit

Module 6-01 Place plumbing fixtures

Total time required for module: 15 minutes

Discuss objectives: 1 minute

Demonstrate: 7 minutes

- Place plumbing fixtures.
- Describe how fixtures connect to systems.

Hands-on time: 5 minutes

Review objectives: 1 minute

Datasets:

M6-01 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 6-02 Create domestic water systems

Total time required for module: 15 minutes

Discuss objectives: 1 minute

Demonstrate: 6 minutes

- Create basic domestic water piping systems
- Analyze cumulative fixture units across connected pipe segments.
- Modify system flow conversion methods to match specific fixture load profiles.
- Size piping infrastructure automatically based on defined velocity parameters.

Hands-on time: 8 minutes

Review objectives: 1 minute

Datasets:

M6-02 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 6-03 Create sanitary drainage systems

Total time required for module: 15 minutes

Discuss objectives: 2 minute

Demonstrate: 5 minutes

- Create basic sanitary systems.
- Describe drainage system behavior conceptually.
- Discuss pipe sloping and how to make this work.

Hands-on time: 7 minutes

Review objectives: 2 minute

Datasets:

M6-03 folder

Assignments (additional):

- **Quiz:** 2 minutes
-

Modules 6-04 Create vent systems

Total time required for lesson: 18 minutes

Discuss objectives: 2 minute

Demonstrate: 6 minutes

- Create a new vent pipe type.
- Generate rule-based visibility filters to color-code specific pipe types.
- Route vertical vent lines using section views for accurate roof penetrations.

Hands-on time: 8 minutes

Review objectives: 2 minute

Datasets:

M6-04 folder

Assignments (additional):

- **Quiz:** 2 minutes
 - **Practice Exercise Module 6:** Create a sanitary plumbing system in Revit: 20 minutes
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Module 7: Prepare MEP information for documentation and coordination in Revit

Module 7-01 Create and modify views

Total time required for lesson: 20 minutes

Discuss objectives: 2 minute

Demonstrate: 6 minutes

- Generate new floor plans.

- Modify visibility graphics in views.
- Configure view property parameters including discipline, detail level, and visual style.
- Apply halftone and underlay overrides to architectural linked models.

Hands-on time: 10 minutes

Review objectives: 2 minute

Datasets:

M7-01 folder

Assignments (additional):

- **Quiz:** 2 minutes
-

M7-02 Duplicate sheets and apply View Templates

Total time required for lesson: 15 minutes

Discuss objectives: 1 minute

Demonstrate: 5 minutes

- Duplicate and organize multi-discipline sheet frameworks within the Project Browser.
- Assign discipline-specific View Templates to isolate relevant system graphics.
- Manage category visibility and model overrides directly inside a View Template menu.
- Update graphic properties globally across multiple project views simultaneously.

Hands-on time: 8 minutes

Review objectives: 1 minute

Datasets:

M7-02 folder

Assignments (additional):

- **Quiz:** 2 minutes
-

M7-03 Annotate MEP plans with tags and text

Total time required for module: 20 minutes

Discuss objectives: 2 minute

Demonstrate: 6 minutes

- Apply tags to MEP elements.
- Explain how tags reflect model information.
- Construct non-parametric project documentation using text with leaders.
- Align tags on view to maintain a standardized drawing appearance.

Hands-on time: 10 minutes

Review objectives: 1 minute

Datasets:

M7-03 folder

Assignments (additional):

- **Quiz:** 2 minutes
-

M7-04 Create basic MEP schedules

Total time required for module: 15 minutes

Discuss objectives: 2 minute

Demonstrate: 5 minutes

- Create basic MEP schedules.
- Describe how schedules update automatically from model data.

Hands-on time: 6 minutes

Review objectives: 1 minute

Datasets:

M7-04 folder

Assignments (additional):

- **Quiz:** 2 minutes
 - **Practice Exercise Module 7:** Create a mechanical floorplan sheet: 20 minutes
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Module 8: Use Autodesk Forma for Construction in multidisciplinary MEP collaboration

Module 8-01 Set up a Revit Cloud Worksharing project

Total time required for lesson: 15 minutes

Discuss objectives: 1 minute

Demonstrate: 5 minutes

- Create a new project in Autodesk Forma for Construction (education).
- Upload workshared Revit models in Forma Data Management.
- Execute synchronization commands to exchange real-time updates with a central cloud file.

Hands-on time: 8 minutes

Review objectives: 1 minute

Datasets:

M8-01 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 8-02 Link and coordinate multidisciplinary models

Total time required for lesson: 15 minutes

Discuss objectives: 1 minute

Demonstrate: 5 minutes

- Insert cross-discipline design files into an active MEP project using Forma Design Collaboration.
- Align external models precisely using origin-to-origin positioning coordinates.
- Manage linked models in Forma Data Management.

Hands-on time: 8 minutes

Review objectives: 1 minute

Datasets:

M8-02 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 8-03 Use the Forma model viewer for basic coordination

Total time required for lesson: 15 minutes

Discuss objectives: 1 minute

Demonstrate: 5 minutes

- Navigate 3D model geometry using standard orbit, pan, zoom, and first-person viewing modes.
- Isolate cross-discipline layouts by toggling external link visibility.
- Filter object categories to expose concealed plenum spaces and interstitial zones.

Hands-on time: 7 minutes

Review objectives: 1 minute

Datasets:

M8-03 folder

Assignments (additional):

- **Quiz:** 2 minutes
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Module 8-04 Create views and review clashes for MEP in Model Coordination

Total time required for lesson: 20 minutes

Discuss objectives: 1 minute

Demonstrate: 7 minutes

- Construct a multi-discipline federated coordination space in Model Coordination using cloud-hosted models.
- Isolate system components using browser-based level, discipline, and category filters.
- Publish public or private saved views to streamline recurring trade coordination tasks.
- Evaluate clashes to differentiate between valid interferences and actionable design conflicts.
- Generate trackable project issues complete with team assignments, due dates, and descriptive comments.

Hands-on time: 10 minutes

Review objectives: 1 minute

Datasets:

M8-04 folder

Assignments (additional):

- **Quiz:** 2 minutes

Module 8-05 Resolve clashes and issues in Revit and Model Coordination

Total time required for lesson: 20 minutes

Discuss objectives: 1 minute

Demonstrate: 8 minutes

- Retrieve cloud-hosted coordination issues directly within the Revit modeling environment.
- Isolate clashing systems using synchronized 3D and discipline-specific plan views.
- Manipulate equipment and connected distribution runs to clear structural interferences.
- Audit closed or pending resolution statuses within the cloud issue tracking dashboard.

Hands-on time: 10 minutes

Review objectives: 1 minute

Datasets:

M8-05 folder

Assignments (additional):

- **Quiz:** 2 minutes

Module 8-06 Manage bulk clashes and create reports in Model Coordination

Total time required for lesson: 15 minutes

Discuss objectives: 2 minute

Demonstrate: 6 minutes

- Create early stage concept proposals by modelling building volumes using sketch-based tools.
- Adjust dimensions using Form's input and snapping tools.
- Configure vertical massing parameters by setting the number and height of floors.
- Work with multiple conceptual design proposals.
- Describe how early massing can scale to larger projects using Forma's site automation tools and live area metrics.

Hands-on time: 7 minutes

Review objectives: 2 minute

Datasets:

M8-06 folder

Assignments (additional):

- **Quiz:** 5 minutes
 - **Practice Exercise Module 8:** Perform visual clash detection and inspection in Forma for Construction: 15 minutes
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Next steps (additional):

End-of-course exam questions: 20 minutes

Project Challenge exercise 1: 120 minutes

Create and coordinate the MEP systems for an office building using Revit and Model Coordination

In the challenge, students will assume the role of an MEP BIM Consultant and use a defined multi-discipline project workflow on a three-story office building with a roof (Level 0, Level 1, Level 2, and Roof). They will set up the project environment, link and rename cross-discipline models to match the BIM execution plan, construct fully connected HVAC, electrical, and plumbing infrastructure, and establish a cloud-based coordination space

Datasets:

Project challenge datasets