Building Information Modelling

Code	Credit Hours
CEM-816	2+1

Course Description

This Building Information Modelling (BIM) course aims to educate and familiarize students with the fundamentals of BIM, elaborating on its various dimensions and applications for effective project performance. Students will understand the requirements, strategies, drivers, and barriers for successful BIM adoption and implementation in single and multi-stakeholder projects. The course provides hands-on experience with various BIM tools, including Dynamo, which is widely used for computational design and automation in BIM processes. Additionally, the course discusses case studies to illustrate the valuable application of BIM in construction projects. Upon completion, students will be able to define BIM and its motivations, apply advanced technologies, such as Dynamo, for visualizing, simulating, and optimizing construction plans within a BIM context, and support integrated project control and planning, including 4D, 5D, and nD planning for enhanced constructability analysis. They will also learn to extend BIM applications beyond the design and planning phases to manage a project throughout its lifecycle and evaluate BIM models in construction and design case studies.

Textbook(s):

1. Eastman, C., Teicholz, P., Sacks, R., & Liston, K. (2011). "BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors (2nd ed.)." Hoboken, NJ: Wiley.
2. Holzer, D. (2016). "The BIM Manager's Handbook: Guidance for Professionals in Architecture, Engineering and Construction." John Wiley & Sons.

Reference Book(s):

1. McNamara, A. (2020). "Dynamo Essentials: A Fast-Paced Course in Dynamo for Revit Users." CreateSpace Independent Publishing Platform.
2. Yori, R., Kim, M., and Kirby, L. (2019). "Mastering Autodesk Revit 2020." Sybex.
3. Dodds, J., & Johnson, S. (2013). Mastering Autodesk Navisworks 2013. Sybex.

Prerequisites

CE 388 (Computer Aided Civil Engineering Design and Graphics)
CE 371 (Construction Project Management)

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Mid Terms	25%
Term Project	10%
ESE	45%

ASSESSMENT SYSTEM FOR LAB

Quizzes	10% - 15%
Assignments	5% - 10%
Lab Work and Report	70% - 80%
Lab ESE/Viva	20% - 30%

Teaching Plan

Week No.	Topics	Learning Outcomes
1	Introduction	Course outline, objectives, teaching plan, assessment methods, and review of key concepts.
2-6	BIM Introduction, Parametric Modeling, BIM Dimensions, BIM LOD, BIM Tools	Understand the basic concepts and importance of BIM in the construction industry. Learn the principles of parametric modeling and how it applies to BIM. Explore the different dimensions of BIM (3D, 4D, 5D, etc.) and their applications. Comprehend the Levels of Development (LOD) in BIM and their significance in project phases. Gain hands-on experience with various BIM tools and software used in the industry.
7-8	Interoperability, BIM for Owners and Facility Managers, BIM for Architect and Engineers	Understand the importance of interoperability in BIM and how different systems integrate. Learn how BIM benefits owners and facility managers throughout the building lifecycle. Explore the role of BIM in architecture and engineering, including design coordination.
9	**MID-TERM EXAM**	
10-12	BIM for Contractors, BIM for Fabricators and Subcontractors, BIM Adoption	Understand how contractors use BIM for project management, scheduling, and execution. Learn the applications of BIM for fabricators and subcontractors in construction projects. Understand the factors driving BIM adoption and the common barriers faced.
13-17	BIM Task Team Members, BIM Standards, BIM Quality Assurance, BIM Information Management Plan, BIM Execution Plan	Identify the key members of a BIM task team and their roles and responsibilities. Learn about BIM standards and protocols that ensure consistency and quality in projects. Understand the processes for BIM quality assurance and maintaining data integrity. Develop a BIM Information Management Plan to handle data and information flow effectively. Create a BIM Execution Plan to guide the implementation of BIM processes in projects.

| 18 | **End Semester Exams** |

Practical:

Experiment No	Description
1~~1~~	Introduction to Revit: Basic concepts, interface navigation, and project setup. Creating and Modifying Walls: Techniques for creating and editing walls in Revit.~~Introduction to Revit: Basic concepts, interface navigation, and project setup.~~
2~~2~~	Working with Doors and Windows: Inserting, modifying, and scheduling doors and windows. Roofs and Floors: Creating and customizing roofs and floors in Revit.~~Creating and Modifying Walls: Techniques for creating and editing walls in Revit.~~
3~~3~~	Stairs and Railings: Designing and editing stairs and railings. Creating and Managing Views: Setting up and managing different views in Revit.~~Working with Doors and Windows: Inserting, modifying, and scheduling doors and windows.~~
4~~4~~	Annotations and Dimensions: Adding annotations, dimensions, and other detailing elements. Sheets and Plotting: Creating sheets, placing views, and plotting the project.~~Roofs and Floors: Creating and customizing roofs and floors in Revit.~~
5~~5~~	Introduction to Navisworks: Basic concepts, interface navigation, and project setup.~~Stairs and Railings: Designing and editing stairs and railings.~~
6~~6~~	Model Coordination: Techniques for combining and coordinating models in Navisworks.~~Creating and Managing Views: Setting up and managing different views in Revit.~~
7~~7~~	Clash Detection: Setting up and performing clash detection tests.~~Annotations and Dimensions: Adding annotations, dimensions, and other detailing elements.~~
8~~8~~	Introduction to Synchro: Basic concepts, interface navigation, and project setup. Creating 4D construction simulations and schedules.~~Sheets and Plotting: Creating sheets, placing views, and plotting the project.~~
9	Introduction to Dynamo: Basic concepts, interface navigation, and simple scripting.
10	Introduction to Visual Programming: Understanding and applying visual programming concepts in Dynamo.
11	Automating Simple Tasks: Building basic scripts to automate simple tasks in BIM workflows.
12	Data Import and Export: Importing and exporting data between Dynamo, Revit, and other platforms.
13	Geometry Creation: Generating basic geometries and forms using Dynamo.
14	Custom Node Usage: Using and managing custom nodes to extend Dynamo's functionality.
15	Practical Applications: Applying Dynamo in different scenarios.
16	Dynamo in Design Coordination: Using Dynamo to assist in design coordination and clash detection.