Contents

Course Details

Course Code	L	T	P	C
SB8001	1	0	2	2

PRE-REQUISITE

Basic knowledge about isometric structures and Engineering Graphics fundamentals are preferred

COURSE LEARNING OBJECTIVES

To enable learners to understand the concept of Building Information Modeling and application of the same in the life cycle of the project.

KEY JOB ROLES

? BIM Manager
? BIM coordinator
? Design Team Leader
? Design Engineer
? Design Manager

OVERVIEW

In this course, learners will be guided through each of the major project stages, from the strategic definition of the project right through to handover, operations and end of use. At each stage, the trainer will

demonstrate how to balance technical requirements with project management skills, so the students are confident in implementing BIM methodology. The course covers the key skills and competencies required for implementing BIM-Building Information Modelling to AECO-Architecture, Engineering, Construction & Operation projects

SYLLABUS

UNIT I - EVOLUTION OF ENGINEERING, INTRODUCTION TO BIM CONCEPTS AND DESIGN AUTHORING (3T+6P)

- Evolution of Engineering from 2D drawings to BIM Model, BIM Model of various projects like commercial & residential structures, Water Treatment Plant and Substation, Transportation Isometric View ? Introduction to Isometric Drawings, Creation of isometric views from different 2D views and vice versa: example problems, Limitation of Isometric views and concept of 3D-Modeling Building Information Modeling ? Introduction & Process
- Design Authoring ? Concepts and workflow, Fundamentals of Discipline Based Modeling, Introduction to stages of BIM Modeling process as per ISO 19650- Architectural, Structural, MEP (HVAC, Electrical, Plumbing), WIP stage of ISO 19650, Shared stage concept, Interdisciplinary based modeling, Federated model- Introduction. concepts and demonstrations, Concept, and workflow of design coordination
- Engineering Analysis ? Concept and types of analysis, Workflow of structural analysis, energy analysis, lighting Analysis, Process and workflow of Design Review in BIM.

UNIT II - VISUALIZATION AND INTERFERENCE/CLASH CHECK (3T+6P)

- Views in BIM Model- plan, section, elevation, 3DVisualization Modes- Concept and viewing rendered, shaded, wore frame and hidden line mode, Walkthrough of the Model, Fly through the model
- Layers & Properties, Concept of viewpoints, Sectioning and Visualization through Tablet and Mobile Concept of BIM Kiosk & BIM Rooms, Visualization through Augment Reality (AR), Virtual Reality(VR) & Mixed Reality (MR)
- Clash Check, Types of Clashes- Hard Clash & Soft Clash, Federated Model - Clash avoidance process, Clash Detection Process ?Introduction, Clash Detection - Priority Matrix and Report Generation, Clash Detection ? Rules, Report, Grouping, Clash Detection - Roles & Responsibilities, Clash Detection Process ? Demo.

UNIT III - DOCUMENTATION & CDE & LEVEL OF DEVELOPMENT (3T+6P)

- Documentation and CDE (Common Data Environment) -2D drawings generation from BIM Model, Computer Network types, Concept of Cloud Computing, Concept and Application of CDE: Traditional Information Sharing, Definition, Reference, and Concept, Setting up the workflow and process for CDE- File naming convention, Roles and Responsibilities, Request for Information and Review Process
- Concept of LOD (Level of Development), preparation of LOD matrix and Progression matrix- Definition of LOD, Level of Detail and Information, LOD- Wall foundation, Precast Structural Inverted T-Beam, Domestic Water Piping, Plumbing Fixture, Packaged Generator Assembly, LOD-Chart, Matrix and Model Progression Matrix

UNIT IV - 4D / FIELD BIM & ITS APPLICATIONS (3T+6P)

- Introduction to 4D / Field BIM: Concept of 4D, Introduction to construction sequence and project schedule, Project scheduling using Gantt Chart and its limitation, 4D BIM Modeling-Project demo and workflow, Synchronization of 4D BIM Model with project schedule, Reviewing project progress w.r.t planned dates and actual dates, Generation of Reports
- Application of Field BIM/ 4D BIM: Understanding concept and usage of BIM in field for coordination- 3D Coordination and Visual Communication, Site utilization planning and Construction analysis, Application of wearables in coordination. 3D Control and planning
- Other Applications of Field BIM/ 4D BIM: Concept and usages of BIM in field for safety, disaster and risk analysis, digital fabrication and scan to BIM, Existing Condition Modeling, Phase Planning, As-built/ Record Models

UNIT V - 5D BIM, AIM & BEYOND BIM - EMERGING TRENDS (3T+6P)

- 5D BIM: Introduction concepts of 5D BIM, Quantity take off with UoM, Concept of QTO with UoM, 5D BIM with UoM with cost, Quantity take off exercise, Demo of Quantity take off: Understanding QTO for Wall, Plaster & Tile, BIM Maturity LOD and General Practice of QTO, Cost Breakup structures, 5D BIM and cost control
- AIM: Introduction to Asset Information Model (AIM), COBie structures and Asset Information Deliverables, Space Attributes and Asset Attributes- Examples with data, Asset requirement- Discipline wise Infrastructure System, Classification code and Information Exchange, Information Exchange with Facility Management
- Beyond BIM: Emerging Trends- Concepts of Industrialisation, IoT, Big Data, Data Analytics and their applications in BIM: Industrialisation of Construction through BIM- DfMA, IoT in BIM, BIM and Big data, Data Analytics using AI & ML
- Future scope of BIM Applications: Smart Infrastructure and the need for connected infrastructure, Digital twins- Concepts and benefits, National Digital Twin or a City level Digital Twin in a Smart City, Fundamental requirements for the success of a Digital Twin and its uses, Digital Twin applications in diverse industries.

TOTAL: 45 PERIODS

BIM model of various buildings like residential, commercial and industrial with all possible clashes shall be be provided by us

CASE STUDIES

?BIM model of multi-storey building structure
?BIM model of airports
?BIM model to study site utilization
?BIM model of material handling unit
?On site super imposition of BIM model
?5D BIM- Implement strategy for a building

ATTAINMENT OF LEARNING OUTCOMES STUDENT ASSESSMENT PLAN

1. The conceptualisation and comprehension level of learning outcomes intended through the course is measured through assessments conducted in multiple stages.

2. The understanding of concepts & principles, evolution of practices, codes & guidelines, emerging trends etc. are tested through assessment questions.
3. The skill outcome related to design, computation, workflow, report & work plan preparation, implementation etc. are assessed through assignments. Such assignment questions & answer keys will be shared to the college SPOC for enabling evaluation by respective faculties.

STUDENT ASSESSMENT 1

Students will have to create a clash detection matrix and analyse the clash report for a given BIM model of residential building.

STUDENT ASSESSMENT 2

Students will have to create a clash detection matrix and analyse the clash report for a given BIM model of industrial/Commercial building.

SOFTWARE EXPOSURE

- In this course BIM models of various industries such as shipping, airports, residential & commercial structures, water & sewage treatment plant, substation etc. are shown which were developed using software such as Revit, Civil 3D, Tekla, Aveva etc.
- These software companies provide free access to students & educators for academic & research purposes. For these structures the federated model including the field BIM application is shown using the software Navisworks, Synchro & Fuzor.

COURSE OUTCOMES

On completion of the course, the students will be able to perform the following operations for any one of the given BIM models.
?**LO.1:** Create a workflow for a building with all required deliverables to be covered in the project output.
?**LO.2:** Create the clash detection matrix for the federated structural, architectural and specialist designer project model.
?**LO.3:** Coordinate different discipline models with clash checking to arrive at the final design solution, inclusive of the deliverables from the model at each stage.