| B. Tech. Civil Engineering | | | | |
|---|---|---|---|---|
| **Course code: Course Title** | **Course Structure.** | | | **Pre-Requisite** |
| **CE 407: Introduction to Building Information Modelling (BIM)** | L | T | P | Nil |
| | 3 | 0 | 2 | |

**Course Objective**: Fostering students' competence in the use of modern tools of Building Information Modelling, including software usage towards engineering, construction & operation projects of infrastructures.

| S. No | Course Outcomes (CO) |
|---|---|
| **CO1** | Introduction to the concept of Building Information Modelling. |
| **CO2** | To understand the workflow followed in the industry during the creation of a BIM 3D Model using Revit. |
| **CO3** | Proficiency for creating BIM models and Asset Information Model (AIM). |
| **CO4** | Proficiency in the application of the BIM model. |
| **CO5** | Students are able to implement BIM and digital solutions in engineering and construction projects. |

| S. No | Contents | Contact hours |
|---|---|---|
| **UNIT 1** | **Introduction to BIM Concepts and Design:** Engineering from 2D drawings to BIM Model, Isometric View, concept of 3D-Modeling, Design Authoring – Concepts and workflow, stages of BIM Modelling process as per ISO 19650, Federated model- concepts and demonstrations, workflow of design coordination, Engineering Analysis – Concept and types of analysis, Process and workflow of Design Review in BIM, exposure to software, Revit. | 8 |
| **UNIT 2** | **Visualization and Interference/Clash check:** Views in BIM Model, Modes, Walkthrough, Fly through the model, Layers & Properties, viewpoints, Sectioning and Visualization through Tablet and Mobile, BIM Kiosk & BIM Rooms, Visualization through Augment Reality (AR), Virtual Reality (VR) & Mixed Reality (MR). Clash Check – Types, Clash avoidance/ detection process, Clash Detection Priority Matrix and Report generation. | 6 |
| **UNIT 3** | **Documentation & CDE & Level of Development**. Documentation and CDE (Common Data Environment) -2D drawings generation from BIM Model, Computer Network types, Concept of Cloud Computing, Setting up the workflow and process for CDE- Request for Information and Review Process. Concept of LOD (Level of Development), Progression matrix- Level of Detail and Information, LOD- Wall foundation, Precast Structural Inverted T-Beam, Domestic Water Piping, Plumbing Fixture, Packaged Generator Assembly. | 10 |

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|---|---|---|
| **UNIT 4** | **4D / Field BIM & Its Applications**. Introduction, construction sequence and project schedule, using Gantt Chart and its limitations, Modelling- Project demo and workflow, Synchronization with project schedule. Reviewing project progress, Generation of Reports. Application of Field BIM/ 4D BIM: for coordination- 3D Coordination and Visual Communication, Site utilization planning and Construction analysis, wearables in coordination. 3D Control and planning. Other Applications: for safety, disaster and risk analysis, digital fabrication and scan to BIM, Condition Modelling, Phase Planning, As-built/ Record Models | 8 |
| **UNIT 5** | **5D BIM, AIM & Beyond BIM - Emerging Trends:** Concepts of 5D BIM, UoM, QTO with UoM, QTO for Wall, Plaster & Tile, BIM Maturity LOD, Cost Breakup structures, cost control. AIM: Introduction to Asset Information Model (AIM), COBie structures and Asset Information Deliverables, Space Attributes and Asset Attributes- Examples. Discipline-wise Infrastructure System, Classification code, and Information Exchange, Information Exchange with Facility Management. Beyond BIM: Industrialisation, IoT, Big Data, Data Analytics and applications in BIM: Data Analytics using AI & ML. Smart Infrastructure and connected infrastructure, Digital twins- Concepts and benefits, National Digital Twin policy, in a Smart City, Digital Twin applications in diverse industries. | 10 |
| | **TOTAL** | **42** |

**REFERENCES**


| S. No. | Name of Books/Authors/Publishers | Year of Publication / Reprint |
|---|---|---|
| 1 | Building Information Modelling (BIM) in Design, Construction and Operations IV. WIT Transactions on The Built Environment | 2021 |
| 2 | Building Information Modelling: Global & Indian Perspective, Harshul Savla, Chandrahauns Chavan, Pallavi Patil. | 2021 |
| 3 | ISO 19650-1:2018 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling, Part 1: Concepts and principles. | 2018/ 2024 |
| 4 | Building Information Management. A Standard Framework and Guide to BS 1192. | 2007 |
| 5 | BIM Handbook: A Guide to Building Information Modelling for Owners, Designers, Engineers, Contractors, and Facility Managers, Rafael Sacks, Charles Eastman, Ghang Lee, Paul Teicholz, Wiley Co. | 2018 |
| 6 | Building Information Modelling- BIM, Ngibjörg Birna Kjartansdóttir et al., Erasmus, Construction Managers Library. | 2017 |