Structural Design, Modelling & Detailing

COURSE OBJECTIVE	● Comprehend the details of Steel Structure. ● Analyse the details of Tekla Steel software tools ● Impart knowledge of necessary Techniques and components involved in the design, Modelling of Steel Structure using Tekla Steel software. ● Impart knowledge on generation of General Arrangement Drawing, Shop Drawing of Steel Structure ● Impart knowledge about CNC Code generation and Supporting file creation.
COURSE OUTCOME	● Design and model the complete Structure of Commercial and Industrial using Tekla Software. ● Design Buildings & generate Shop and Erection Drawings. ● Generate a 3D model and Fabrication Drawing with NC code. ● Performing quality control checks on drawings and reports.

Course Duration: 45 Hours

Course Content:

UNIT-1: Introduction to Tekla Structure and Staad Pro

Overview of Tekla Structure and Staad Pro – Project setup and configuration – Input drawing study – standards - Project specifications.

UNIT-2: Structural Elements Modeling

Numbering standards- Basic-3D modelling-System Components - Interactive Modelling & Building Custom Components - Modelling Techniques - Structural Profiles and materials - Structural grades - Structural Grid Lines settings.

UNIT-3: Connection Design

Introduction to connection design in Tekla - Detailing connections for steel structures - Connection Catalog - Connection custom Components - Connection Geometry and Positioning- Welding parameters- Bolt parameters – clash detection & Collaboration

UNIT-4: Generating Drawings

General arrangement drawings– Fabrication & erection drawings - Multi Drawings - Single part drawings - Drawing Layout Setup - Drawing Views - Viewport Arrangement - Dimensioning: Annotation and Marking: Title Blocks and Project Information - Drawing Templates- revision control & drawing management.

UNIT-5: Quality Control, Reports and Material Lists

Performing quality control checks on drawings and reports - Ensuring compliance with project standards – Addressing common errors and issues, generating material lists for fabrication - Generating NC & DXF files for fabrication - Customizing reports in Tekla Structures - Exporting files for fabrication purposes– Generating bolt list for erection – Generating assembly list.

Test Projects:

Use Cases

I - COMMERCIAL BUILDINGS:

- **What:** Tekla supports, design and detail the steel framework in places like offices, malls, and hotels.
- **How:** It creates 3D models, ensures connections are steady, and generates plans for erection and creates drawing for fabricators to build accurately.

Task 1: Create a 3D model and Generate Erection plan and shop drawings of the Shopping Complex (Four Floor) with Staircase and Lift.

Task 2: Create a 3D model and Generate Erection plan and shop drawings of the Hospital Building with Staircase, Barrier free access and Lift.

Task 3: Create a 3D model and Generate Erection plan and shop drawings of the Revenue Dept. Central office with Staircase, Barrier free access and Lift.

Task 4: Create a 3D model and Generate Erection plan and shop drawings of the School Building with Staircase, Barrier free access and Lift

Task 5: Create a 3D model and Generate Erection plan and shop drawings of the High Court Building with Staircase, Barrier free access and Lift

II- OIL AND GAS INDUSTRY:

1. **Offshore Platforms:**

What: Tekla supports detailed design of steel structures in offshore oil and gas industries platforms.

How: Staad and Tekla Structure ensures the structural integrity and safety of the platform, considering factors like wave loads and environmental conditions.

Task 1: Create a 3D model of the Pipe rack with ladder in Offshore and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 2: Create a 3D model of the Equipment supporting structure in Offshore and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 3: Create a 3D model of the Piping Support structures and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 4: Create a 3D model of the cable tray supports and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 5: Utilize Tekla Structures to create a 3D model of offshore miscellaneous support structure and generate Fabrication Drawing with NC code of the offshore support structure.

2. **Industrial Facilities:**

What: Tekla is used for complex structures in factories and warehouses.

How: It models intricate designs, customizes connections for safety, and supports collaboration among engineers and fabricators.

Task 1: Create a 3D model of the Bottle filling Industries and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 2: Create a 3D model of the Automobile Assembly Unit and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 3: Create a 3D model of the Ship Fabrication Shop and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 4: Create a 3D model of the Steel Industries and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 5: Create a 3D model of the Iron Ore Industries and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

3. **Petrochemical Plants:**

Pipe Rack Structures:

What: Tekla assists in detailing steel structures for pipe racks in petrochemical plants.
How: It ensures the proper arrangement and support of pipes throughout the facility.

Task 1: Utilize Tekla Structures to create a 3D model of the Heavy Pipe Rack structure for Offshore/Onshore gas industry

Task 2: With help of Tekla Structures to create a 3D model of the Supporting structure for Offshore/Onshore oil Industry

Task 3: Use Tekla Structures to check the Pipe Rack for Refinery industries design against relevant building codes and industry standards.

Task 4: Preparation of erection drawings and As-built drawings.

Task 5: Generating bolt report and NC files.

III- ONSHORE PROCESSING PLANTS:

- **Structural Components:**

What: Tekla is used for detailing structural components in onshore processing plants.

How: It ensures that buildings and structures onshore can

withstand process- related loads and environmental factors.

Task 1: Utilize Tekla Structures to create a 3D model of Condenser support structure and generate Fabrication Drawing with NC code of the Boilers support structure.

Task 2: Design and model the key components including process units, pipe racks and support structures of Gas Plant using Tekla Software and Provide Erection Drawing and Details components drawing with NC code.

Task 3: Design and Model key components of Sugar Cane process units and its support structures using Tekla Steel software and Provide Erection Drawing and Details components drawing with NC code.

Task 4: Design and Model key components of Water Treatment process units and its support structures using Tekla Steel software and Provide Erection Drawing and Details components drawing with NC code.

Task 5: Utilize Tekla Structures to create a 3D model of onshore support structure and generate Fabrication Drawing with NC code of the onshore support structure.

IV- INFRASTRUCTURE AND TRANSPORTATION:

1. **Railway Division**

- **What:** Designing structures for railway stations and pedestrian bridges.
- **How:** Tekla ensures the safety and stability of station buildings and pedestrian bridges over railway tracks.

Task 1: To create a 3D model and Fabrication Drawing with NC code of the Railway Station Platform (6 Nos) Hangers with staircase.

Task 2: To create a 3D model and Fabrication Drawing with NC code of the Railway Station Office Hangers with staircase

Task 3: To create a 3D model and Fabrication Drawing with NC code of the Multi-level Reservation Office

Task 4: To create a 3D model and Fabrication Drawing with NC code of the Multilevel Railway Administrative Office

Task 5: To create a 3D model and Fabrication Drawing with NC code of the Packaging and Transportation Section of Railway

2. **Bridges:**

- **What:** Tekla assists in designing steel structures for bridges.
- **How:** It handles advanced modelling for diverse bridge designs, ensures strong connections, and helps plan fabrication and construction.

Task 1: Create a 3D model of the Bridge between River and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 2: Create a 3D model of the Bridge between Road and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 3: Create a 3D model of the Bridge between Railway Track and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 4: Create a 3D model of the Bridge in Offshore and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures.

Task 5: Create a 3D model of the Bridge for Ore Industries and Generate General Erection Plan, Shop Drawing with CNC Codes using Tekla Structures

3. **Airports Division**

- **What:** Designing structures for Airport stations and pedestrian bridges.
- **How:** Tekla ensures the safety and stability of station buildings and pedestrian bridges, escalator and Lift.

Task 1: Generate a 3D model and Fabrication Drawing with NC code of the airport Platform (6 Nos) Hangers with staircase and Elevator.

Task 2: Generate a 3D model and Fabrication Drawing with NC code of the Aircraft Service Station with staircase and Escalator

Task 3: Generate a 3D model and Fabrication Drawing with NC code of the Multi-level Ticket Booking counter with Escalator, Lift and Staircase

Task 4: Generate a 3D model and Fabrication Drawing with NC code of the Multilevel Administrative Office for Airport authority

Task 5: Generate a 3D model and Fabrication Drawing with NC code of the Packaging and Transportation Section of Airways.

4. **Road Transport Division**

- **What:** Designing structures for Airport stations and pedestrian bridges.

How: Tekla ensures the safety and stability of station buildings and Pedestrian bridges, escalator and Lift.

Task 1: Generate a 3D model and Fabrication Drawing with NC code of the Multilevel Bus Platform (25 Nos) Hangers with staircase and Elevator.

Task 2: Generate a 3D model and Fabrication Drawing with NC code of the multilevel Transport Administrative Office Hangers with staircase and Lift.

Task 3: Generate a 3D model and Fabrication Drawing with NC code of the Multi-level Ticket Booking counters with Escalator, Lift and Staircase.

Task 4: Generate a 3D model and Fabrication Drawing with NC code of the Multilevel Administrative Office for Airport authority.

Task 5: Generate a 3D model and Fabrication Drawing with NC code of the Packaging and Transportation Section of roadways.