## Week 1: Bicycle Understanding – Foundation Phase

**Objective:** To gain a fundamental understanding of bicycle components and types.

A **bicycle** is a human-powered vehicle with two wheels attached to a frame, propelled by pedaling. It typically consists of components like a frame, wheels, pedals, chain, brakes, and handlebars.

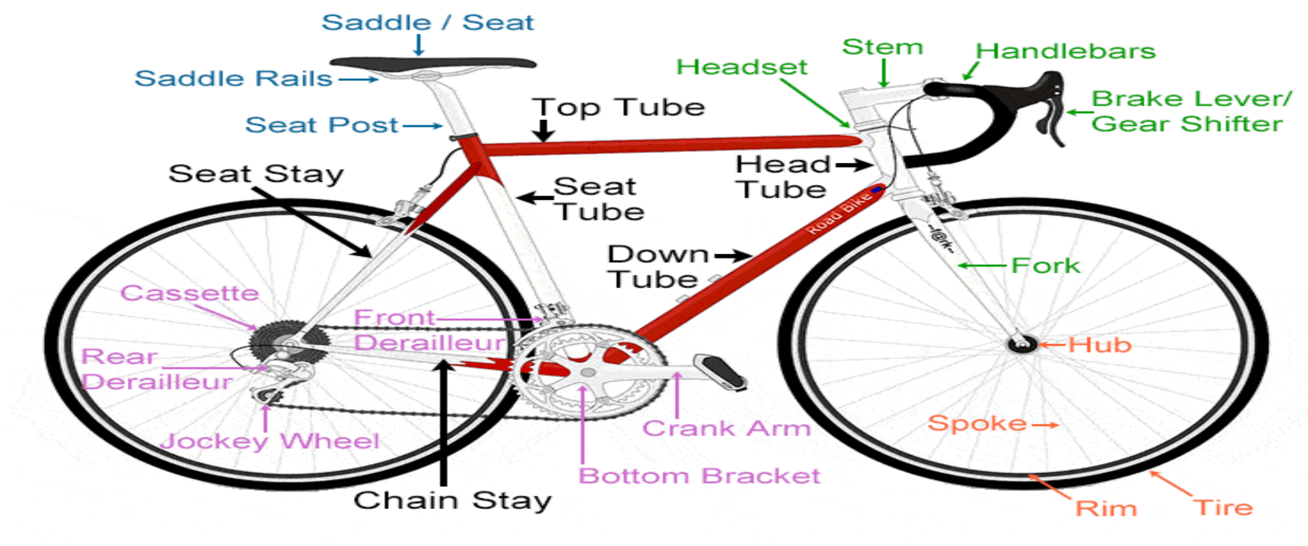
Uses of bicycle:

1. **Transportation:** An affordable and sustainable means of travel for short and medium distances.
2. **Fitness & Health:** Regular cycling improves cardiovascular health and builds muscle strength.
3. **Recreation & Leisure:** Popular for outdoor activities, sightseeing, and adventure sports.

Types :

1. **Road Bike** – Lightweight, built for speed on smooth roads.
2. **Mountain Bike (MTB)** – Sturdy, with suspension, suitable for off-road trails.
3. **Kids' Bike** – Specially designed in size and features for children.
4. **Electric Bike (E-bike)** – Powered by an electric motor for assisted pedaling.

Parts:




Key components of cycle studied:

1. **Frame**: The frame tube refers collectively to the main structural tubes of a bicycle's frame. It connects all key parts of the bike, providing strength and geometric stability.
   Typically made from materials like steel, aluminum, or carbon fiber.
   The frame determines the size, shape, and performance of the bicycle.

   i. **Fork**: The fork is the part of the bicycle that connects the front wheel to the frame, providing support and structure. It plays a vital role in absorbing shocks and vibrations caused by rough or uneven terrain, which enhances rider comfort and stability. Forks can be either rigid, offering a direct connection, or equipped with suspension systems that cushion impacts. The design and material of the fork influence the bike's handling and responsiveness. Proper fork function is essential for safe and smooth steering.

   ii. **Handlebars**: Handlebars are the component that allows the rider to steer and control the bicycle's direction. They come in various styles, including flat, drop, and riser bars, each tailored to specific riding preferences and conditions. Flat handlebars are common on mountain bikes, providing better leverage and control, while drop bars are favored by road cyclists for aerodynamic positioning. Riser bars offer a more upright posture, improving comfort on casual rides. In addition to steering, handlebars hold essential controls like brake levers and gear shifters.

iii. **Brakes**: Brakes are critical for safely slowing down or stopping the bicycle, helping the rider maintain control at all times. They work by applying friction to the wheels, either at the rim or the disc rotor, to reduce speed. Different types of brakes exist, such as rim brakes, disc brakes, and drum brakes, each with its advantages. Disc brakes, for example, perform better in wet and muddy conditions, providing more consistent stopping power. Regular brake maintenance is important to ensure they function reliably and respond quickly when needed.

Types of brake:

- **Caliper Brakes**: Caliper brakes are mounted above the wheel and use two arms that squeeze the brake pads against the rim. They are common in road bikes and offer a lightweight braking solution for smooth surfaces.
- **Disc Brakes**: Disc brakes use a rotor (disc) attached to the wheel hub and a caliper that squeezes brake pads against the disc to stop the wheel.
  They provide strong and consistent braking, especially in wet or muddy conditions.
- **V Brakes**: V-brakes have long arms mounted on the frame or fork and apply force directly to the wheel rim. They offer strong

braking power and are commonly used in mountain and hybrid bikes.

2. **Wheels**: Essential for movement and stability. Components include:

    1. **Rims**: Outer structure that holds the tire.
    2. **Spokes**: Provide structural integrity and support weight.
    3. **Tyre**: Can be tubeless or tube-based, designed for different terrains (road, gravel, mountain).

3. **Drive-train**: Converts pedaling power into motion. Includes:

    - **Pedals**: Pedals are foot-operated levers that allow the rider to apply force and initiate motion. When pushed, they rotate the crankset, starting the process of power transmission.
    - **Crankset**: The crankset includes the crank arms and chainring, connected directly to the pedals. It converts the rider’s pedaling force into rotational motion, transferring energy to the chain.
    - **Chain**: The chain is a flexible metal loop that connects the crankset to the cassette. It plays a key role in transmitting power smoothly from the front to the rear wheel.
    - **Cassette**: The cassette is a cluster of gears mounted on the rear wheel hub. It controls the bicycle's speed and torque depending on which gear the chain engages.
    - **Derailleur**: The derailleur is a gear mechanism that moves the chain across different sprockets. It enables the rider to shift gears easily, adapting to various terrains and speeds.

4. **Seat & Seat Post**: Provides comfort and can be adjusted for rider height and posture.

- **Seat**: The seat, also called the saddle, is the part of the bicycle where the rider sits. It is designed to provide support and comfort during rides, especially over long distances. Seats come in various shapes and cushioning levels, depending on the type of cycling. Performance-oriented saddles are usually narrow and firm, while comfort saddles are wider with more padding. Proper seat positioning is essential to maintain posture and reduce strain on the rider's back and legs.
- **Seat Post**: The seat post is the tube that connects the seat to the bicycle frame.
  It allows height adjustment of the saddle to match the rider's leg length. Seat posts come in different materials like aluminium, steel, or carbon for strength and flexibility. Some modern seat posts include suspension for shock absorption on rough terrain. Tightening the seat post clamp securely ensures stability and safety while riding.

5. **Head Tube:** The head tube is the short vertical tube at the front of the frame. It houses the headset bearings and connects the handlebars to the front fork. This tube allows the front wheel to steer smoothly when the handlebars are turned. Its angle affects the bike's handling and turning responsiveness.
6. **Down Tube:** The down tube connects the head tube to the bottom bracket shell. It's one of the largest and strongest tubes, supporting much of the bike's weight. This tube helps absorb stresses from pedaling and road vibrations.It also often holds mounts for water bottles or cables.
7. **Seat Tube:** The seat tube runs vertically from the saddle down to the bottom bracket. It supports the seat post and transfers rider weight to the frame. The angle and length of the seat tube affect the rider's position and efficiency. It usually has a clamp to secure the seat post in place.
8. **Chain Stay:** The chain stays are two horizontal tubes that run from the bottom bracket to the rear dropout. They help support the rear wheel and are located

on both sides of the rear wheel. They must be strong enough to handle pedaling forces and chain tension. Their length influences ride comfort and rear tire clearance.

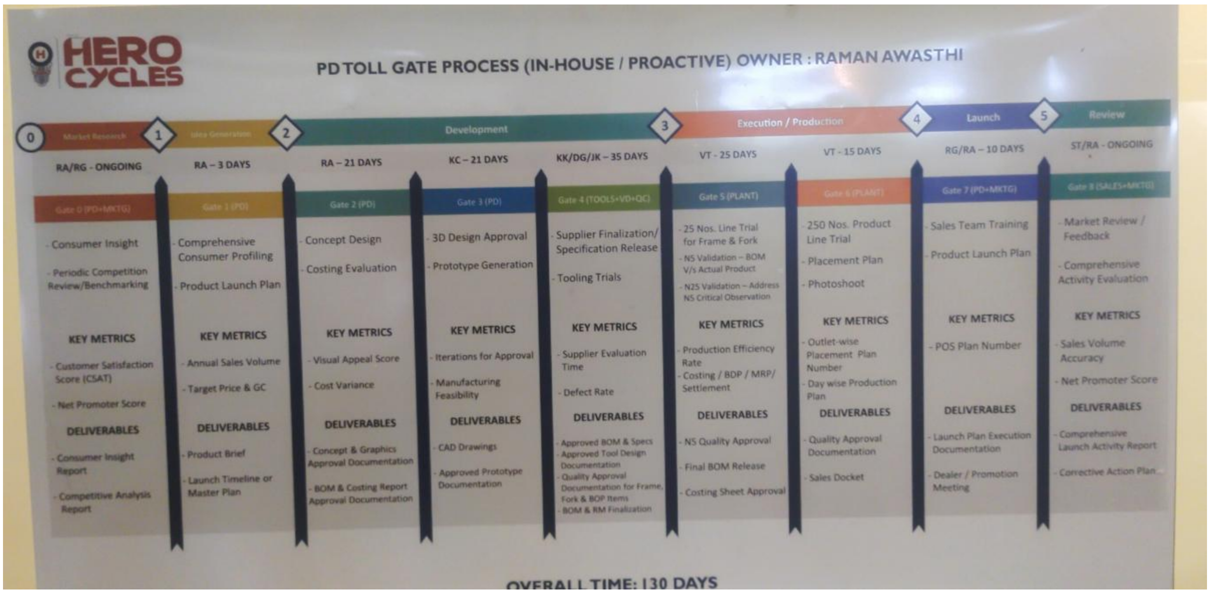
9. **Seat Stay:** Seat stays are the two thin tubes that run from the seat tube down to the rear axle. They help support the seat and connect the frame to the rear wheel.

   Seat stays also contribute to vibration absorption and rear triangle stiffness. Their design can influence frame compliance and braking mount options.

10. **Bottom Bracket (BB) Shell:** The bottom bracket shell is the cylindrical part of the frame that houses the bottom bracket. It connects the down tube, seat tube, and chain stays in one junction. The crankset rotates inside this shell, making it a critical power transfer point. BB shells come in different widths and threading standards depending on the bike type.

## Week 2: RESEARCH & DEVELOPMENT

**Objective:** To gain insight into the Research & Development (R&D) process at Hero Cycles and understand how new bicycle models are conceptualized, developed, and validated through tollgate system.




### Gate 0: Market Research

**Purpose:** To thoroughly understand the customer needs, market trends, and competitive landscape. This stage helps define what kind of bicycle the market actually needs before investing time or resources.

**Key Activities:**

- **Consumer Research**: Conducting surveys, interviews, feedback sessions, and online data analysis to understand what customers want in terms of design, features, price range, etc.
- **Competitor Benchmarking**: Studying what other cycle brands are offering. What are their strengths and weaknesses? What do customers love or hate about them?
- **Trends Analysis**: Looking at global trends in bicycle design (like electric bikes, foldable cycles, etc.)

**Outputs:**

- A detailed Consumer Insight Report.
- A Market and Competition Report with findings.
- Identification of target customer segments.

**Gate 1: Idea Generation**

**Purpose:** To take insights from Gate 0 and transform them into actual product ideas that meet customer needs and align with business goals.

**Key Activities:**

- Create consumer profiles (e.g., urban commuter, mountain biker, budget buyer).
- Develop a Product Brief: What type of bicycle is it? Who is it for? What features will it have?
- Create a Launch Plan: Include timelines, marketing strategy, and expected outcomes.

**Key Metrics:**

- Target Price & Gross Contribution: Ensure the product will be profitable.
- Sales Forecast: Projected number of units to be sold in a year.

**Outputs:**

- A complete Product Brief (includes customer need, product USP, price, features).
- A Launch Timeline and initial costing estimate.

**Gate 2: Concept Design**

**Purpose:** To visualize and design the product conceptually, making sure it is innovative, cost-effective, and aligned with the brand identity.

**Key Activities:**

- Develop rough sketches or 3D mockups of the bicycle.
- Design graphics for branding and colors.
- Collaborate with costing team to create a BOM (Bill of Materials).
- Review design feasibility with engineering.

**Key Metrics:**

- Visual Appeal Score: Scored via internal reviews or mock customer testing.
- Estimated Cost Variance: Ensures early estimates don't overshoot target price.

**Outputs:**

- Finalized Concept Design.
- Graphics/Color Scheme.
- Preliminary BOM and Costing Document.

**Gate 3 – Development & Prototyping**

**Purpose:**

To turn the approved design concept into a functional prototype and finalize technical specifications.

**Key Activities:**

- CAD Drawing Finalization: All mechanical drawings and 3D models are created in software.
- Build the First Prototype: A working model made with all components.

- Conduct initial functional testing.

**Key Metrics:**

- Number of Design Iterations: Fewer changes indicate good planning.
- Prototype Test Score: Performance of the prototype during trial.

**Outputs:**

- A Working Prototype.
- Full CAD Documents and engineering drawings.
- Initial Product Review Report from testing.

**Gate 4 – Tooling & Supplier Finalization**

**Purpose:**

To set up the production ecosystem – including sourcing parts, building tools, and locking down suppliers.

**Key Activities:**

- Finalize vendors and suppliers for all parts (frames, brakes, gears, etc.)
- Perform tooling trials to ensure all machines and molds are functioning correctly.
- Finalize the full specification sheet.

**Key Metrics:**

- Tooling Readiness Score.
- Supplier Lead Time – how quickly vendors can supply parts.

**Outputs:**

- Approved Tooling Reports.

- Full BOM & Specs Sheet.
- Vendor and part-wise cost sheet.

**Gate 5 – Production Validation**

**Purpose:**

To validate that the production line can manufacture the bicycle at scale without issues.

**Key Activities:**

- Run a trial batch of 25 bicycles to test production quality.
- Address NS (New Series) issues – unexpected errors or process gaps.
- Test actual manufacturing timelines.

**Key Metrics:**

- Production Efficiency: Number of good units per hour.
- Defect Rate: Number of bikes failing quality check.

**Outputs:**

- NS Quality Approval.
- Finalized and approved BOM.
- Updated Costing Document.

**Gate 6 – Pre-Launch Trial**

**Purpose:**

To simulate the launch with a larger batch and test how it will function in real-world supply chain and marketing.

**Key Activities:**

- Produce a batch of 250 units.
- Perform product photoshoots for brochures and website.
- Develop dealer-wise placement plan and shipping schedule.

**Key Metrics:**

- On-Time Production Rate.
- Placement Plan Accuracy (matching forecast to actual).

**Outputs:**

- Sales Docket with all product info.
- Approved Pre-Launch Quality Report.

**Gate 7 – Launch**

**Purpose:**

To officially introduce the product to the market with full support from sales, marketing, and distribution teams.

**Key Activities:**

- Train sales and service teams on product features.
- Execute marketing campaigns (social media, showrooms, etc.).
- Distribute bicycles to dealers.

**Key Metrics:**

- Launch Completion Time.
- Sales Team Readiness Score.
- Number of POS (Point of Sale) Kits Prepared.

**Outputs:**

- Product Launch Packets.
- Meeting Records from Sales and Dealer Interactions.

**Gate 8 – Post-Launch Review**

**Purpose:**

To monitor the product's performance in the market and collect feedback for future improvements.

**Key Activities:**

- Collect customer reviews and dealer feedback.
- Analyze sales performance vs targets.
- Track warranty claims or technical issues.

**Key Metrics:**

- Net Promoter Score (NPS) – how likely customers are to recommend.
- Sales Accuracy – Forecast vs Actual.

**Outputs:**

- Launch Review Report.
- Corrective Action Plan for improvements.

**Softwares used:**

| S.No. | Software Used | Purpose |
|---|---|---|
| 1. | SAP HANA | Data analytics, inventory & production planning. |
| 2. | Crio | Creating bicycle designs including geometry, frame structure, and detailing. |

| | | |
|---|---|---|
| 3. | Blender | 3D modeling and rendering of bicycle concepts and graphics. |
| 4. | Photoshop | Editing and enhancing product visuals, marketing images. |
| 5. | MS Excel | Costing, BOM tracking, report generation, and data visualization. |

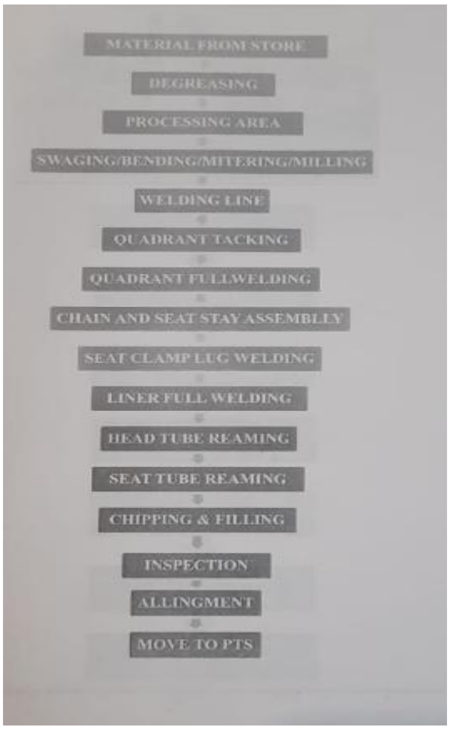
## Week 3: VISITED RANGER

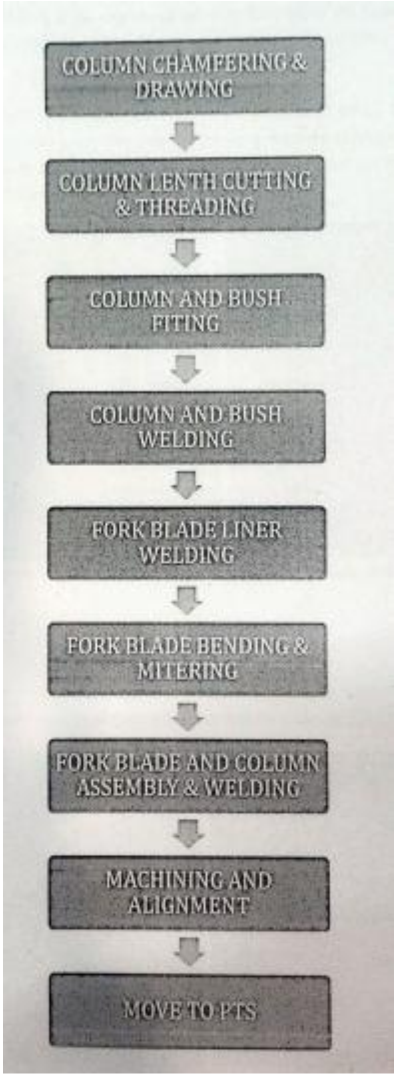
**Objective:** To observe the operations at RANGER, a leading cycle manufacturing company, and gain insights into bicycle production processes, quality control, assembly lines, and industry standards through real-world exposure.


1. **Swaging Section:** It is a forging process in which the dimensions of an item is altered using dies into which the item is forces. Swaging is a cold working process, used to reduce the diameter, produce a taper on chain stay and seat stay of bicycle. Basically, in the swaging section, tubes are reshaped by reducing or expanding their diameter using dies or rollers. This is done to ensure a perfect fit between tubes or components, improving the strength and alignment of joints.
2. **Mitering Section:** It is a process of beveling the ends of the tube for making miter joints between them. In metring department Taiwan horizontal mitering machine is used to punch the material. Basically, mitering involves cutting and shaping the ends of tubes to fit together precisely. This process ensures clean joints where tubes intersect (e.g., down tube to bottom bracket) for optimal welding and structural integrity.
3. **Bending Section:** Here, the straight tubes are bent into specific shapes as per the frame design. Controlled bending ensures the geometry of

the frame meets ergonomic and design standards, especially for parts like the seat stays and top tubes.

4. **Milling Section:** Milling is used to machine flat surfaces, slots, and other precise features on frame components. This improves dimensional accuracy and prepares parts for final assembly, such as the bottom bracket shell or headset areas.
5. **Welding Section:** All the mitered and bent tubes are brought together and welded at the joints. Skilled welders (or automated welding machines) ensure strong and consistent welds, forming the main frame structure.
6. **Machining Section:** Post-welding, the frame undergoes finishing operations like reaming, tapping, and facing. These ensure that components like the seat post, headset, and bottom bracket fit perfectly into the frame.




COLUMN CHAMFERING & DRAWING
COLUMN LENTH CUTTING & THREADING
COLUMN AND BUSH FITING
COLUMN AND BUSH WELDING
FORK BLADE LINER WELDING
FORK BLADE BENDING & MITERING
FORK BLADE AND COLUMN ASSEMBLY & WELDING
MACHINING AND ALIGNMENT
MOVE TO PTS

## Week 4: VISITED MECHANICAL LAB

**Objectives:**

**Frame Impact Test**

- **Purpose**: To test the frame's ability to absorb shock without failing.
- **Method**:
  - A weight is dropped from a height onto the head tube area of the frame.
  - Frame is rigidly mounted during the test.
- **Pass Criteria**:
  - No visible crack or breakage.
  - No permanent deformation that affects function or safety.

**b. Frame Fatigue Test (Horizontal)**

- **Purpose**: To simulate long-term pedaling forces.
- **Method**:
  - A horizontal alternating force is applied to the bottom bracket area.
  - Cycles: 100,000 repetitions
  - Force: typically 600 N (varies by category: city, mountain, racing)
- **Pass Criteria**:
  - No fracture or damage.
  - No loosening of joints or welds.

**c. Frame Fatigue Test (Vertical)**

- **Purpose**: To simulate vertical loading during riding (bumps, terrain).

- **Method**:
  - Repetitive vertical load on saddle/post area.
  - Cycles: 100,000
  - Force: varies depending on bicycle category.
- **Pass Criteria**:
  - No fracture or damage.
  - No loosening of joints or welds.

**2. Fork Tests (ISO 4210-6)**

**a. Bending Test of Fork**

- **Purpose**: To check if the fork can resist forward bending forces.
- **Method**:
  - Force applied at the fork dropouts while the steerer is fixed.
  - Force: usually 600–1000 N
- **Pass Criteria**:
  - No cracking or permanent deformation beyond limit.
  - while fork is mounted.

**b. Fatigue Test of Fork**

- **Purpose**: To simulate thousands of cycles of riding stress.
- **Method**:
  - Repetitive loading at the fork ends.
  - Up to 100,000 cycles
- **Pass Criteria**: No damage, cracking, or loosening.

### 3. Handlebar and Stem Tests (ISO 4210-5)

#### a. Static Load Test

- Downward and upward force on handlebar grips to simulate pulling and pushing.
- Force: 1000–1200 N
- Pass: No visible crack or permanent deformation.

#### b. Fatigue Test

- Repeated load for 100,000 cycles applied to simulate continuous riding stress.
- No failure allowed.

### 4. Braking System Test (ISO 4210-4)

- Dry and wet braking performance is tested.
- Bicycle is loaded and brake force is applied at different speeds.
- Measure:
    - Braking distance
    - Stability during braking
    - Durability of brake pads and levers

### 5. Wheel and Tire Tests (ISO 4210-7)

#### a. Impact Test

- Drop-weight test on wheel.
- Simulates pothole or obstacle impact.

#### b. Fatigue Test

- Lateral and radial loading for 100,000 cycles.
- Ensure no cracking in rim, spokes, or hub.

**6. Pedal and Crank Tests (ISO 4210-8)**

**a. Crank Fatigue Test**

- Repetitive torque applied to crank arms.
- Simulates pedaling for thousands of cycles.

**b. Pedal Static Strength**

- High downward force on pedal.
- No crack or breakage allowed.

**7. Saddle and Seat Post Tests (ISO 4210-9)**

- **Vertical loading** to simulate rider weight.
- **Impact test** to simulate jumping.
- **Fatigue testing** with cyclic loading.
- Seat post must not slip, bend, or break.

## Week 5: BASICS OF SOLIDWORKS

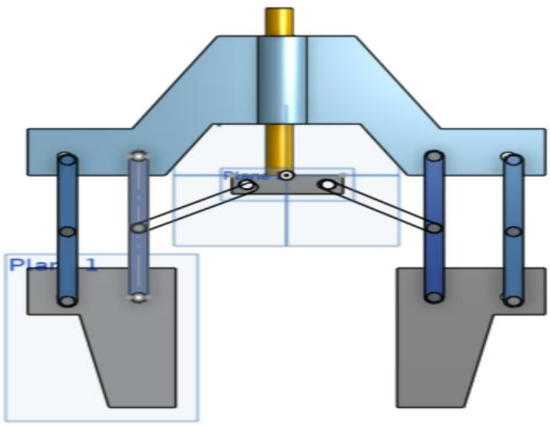
**Objective:** The objective of this week's learning was to gain foundational knowledge of SolidWorks, a leading CAD (Computer-Aided Design) software used extensively in product design, 3D modeling, mechanical parts simulation, and prototyping. This knowledge will support the design and visualization of the robotic arm prototype planned as part of my internship project.

SolidWorks is a solid modeling computer-aided design and computer-aided engineering application published by Dassault Systèmes. It is widely used in the mechanical, automotive, and manufacturing industries for creating 3D models, assemblies, and detailed technical drawings.

Some core modules in SolidWorks include:

- Part modeling – for designing individual 3D components
- Assembly modeling – for combining parts into a complete mechanical system
- Drawing creation – for producing technical documentation
- Simulation and motion analysis – for testing mechanical interactions

**Practice Designs:**



## Week 6: E-COMMERCE

During my internship at Hero Cycles, I had the opportunity to understand the backend processes involved in selling products on major e-commerce platforms such as Amazon. While I was not directly responsible for creating seller accounts or managing listings, I gained valuable insights into how the Amazon Seller ecosystem functions and supports Hero Cycles' online business.

Hero Cycles operates on platforms like Amazon, Flipkart, and others by registering as a seller under their official brand name. Through discussions with the e-commerce and logistics teams, I understood that a business account is first created on sellercentral.amazon.in, where official documents such as GST number, PAN, business details, and bank information are verified by Amazon. This process enables Hero Cycles to be listed as a verified seller with a professional business account.

One of the key areas I learned about was **product listing**. Hero Cycles lists multiple bicycle models tailored for various customer segments — such as kids' bikes, mountain bikes, and city bicycles. The listings are created using Amazon's dashboard, where each product entry requires detailed information including the model name, specifications, size, color, pricing (MRP and discounted), SKU codes, and high-resolution images. The categorization of bicycles also follows a structured format to improve visibility, for example: *Sports & Outdoors > Cycling > Bicycles*.

I observed that Hero Cycles often uses bulk upload methods through Excel templates to manage listings efficiently, especially when updating multiple models or seasonal stock. They also use inventory management software which helps sync real-time data with the Amazon portal.

Pricing and promotional strategies were another interesting aspect. I learned how the team sets competitive pricing, applies seasonal discounts, and takes part in

Amazon promotions such as Lightning Deals and coupons to increase visibility. Additionally, the pricing dashboard shows commission rates, referral fees, and other deductions Amazon applies, helping the business team make informed decisions.

Although I did not directly handle logistics, I learned about the Fulfillment by Amazon (FBA) model, where Hero Cycles sends selected models to Amazon's warehouses. Amazon then takes care of packaging, shipping, and even handling returns. This model reduces pressure on the in-house team and ensures fast delivery, especially for Prime customers.

Overall, this exposure to Hero Cycles' e-commerce operations provided me with a hands-on understanding of how large-scale product distribution works through Amazon and the strategic elements involved in running a successful online bicycle business.

## Week 7: 3D MODELING

**OBJECTIVE:** To learn 3D modeling and Blender s/w.

### What is 3D Modeling?

3D modeling is the process of creating a mathematical representation (mesh) of a three-dimensional object using specialized software. The result is called a 3D model.

These models are used in:

- Animation
- Engineering and architecture (CAD)
- 3D printing
- Virtual and Augmented Reality

### Types of 3D Modeling

1. **Polygonal Modeling**: This technique uses vertices (points), edges (lines between points), and faces (flat surfaces) to create complex 3D shapes. It is the most common method used in games, animation, and visual effects due to its flexibility and control.
2. **NURBS Modeling**: NURBS (Non-Uniform Rational B-Splines) use smooth mathematical curves instead of flat polygons. This type of modeling is ideal for designing precision surfaces in automotive, industrial, and product design.
3. **Sculpting**: Similar to real-life clay sculpting, digital sculpting allows artists to push, pull, and shape a mesh into complex organic forms such as characters, creatures, or natural environments. It is useful for high-detail modeling.

4. **Procedural Modeling**: This approach uses algorithms and parameters (rules) to generate models automatically. It's especially useful for creating environments like forests, terrains, buildings, and other repetitive structures.
5. **CAD Modeling**: Computer-Aided Design (CAD) modeling focuses on high precision and is often used in engineering fields for manufacturing parts, machines, and architectural structures. Examples include AutoCAD and SolidWorks.

**Core Components of a 3D Model**

- **Vertex**: A vertex is the smallest building block in 3D modeling, representing a single point in space.
- **Edge**: An edge is a straight line connecting two vertices.
- **Face**: A face is a flat surface bounded by three (triangle) or four (quad) edges.
- **Mesh**: A mesh is a collection of vertices, edges, and faces that together form the complete shape of a 3D object.

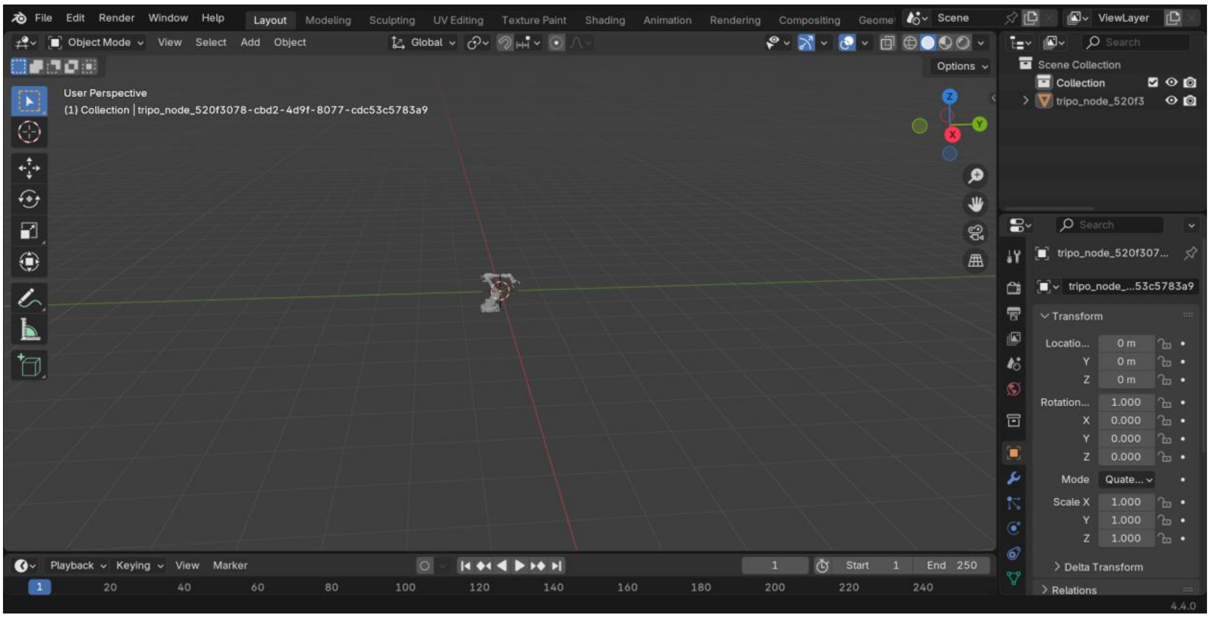
**What is Blender?**

Blender is a free and open-source 3D creation suite that supports:

- Modeling
- Sculpting
- Texturing
- Rigging and animation
- Rendering
- Compositing

Blender Basics

Interface:



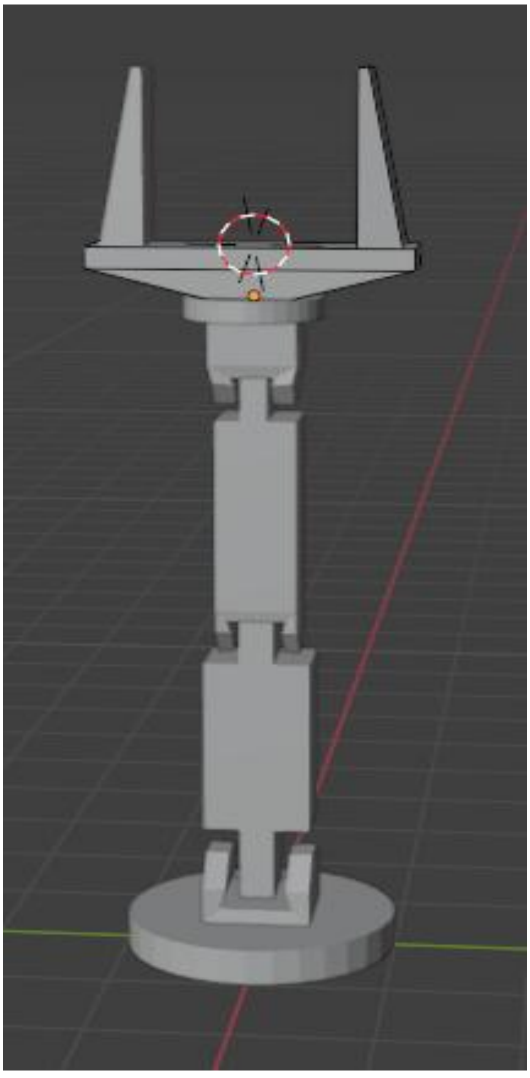

- 3D Viewport: Where modeling and sculpting happens.
- Outliner: Hierarchy of objects in the scene.
- Properties Panel: Adjust material, render settings, modifiers, etc.
- Timeline: Used for animation.
- Toolbar (left): Tools for move, scale, rotate, sculpt, etc.

**Blender Key Concepts for Modeling**

1. **Loop Cut (Ctrl+R):** Inserts a loop of vertices around a model, allowing finer control over shape and structure, especially useful in detailed modeling.
2. **Subdivision Surface:** A modifier that smooths the mesh by adding more geometry, making models look more organic or rounded without manually adding extra faces.

3. **Mirror Modifier:** Automatically mirrors one side of a model across a chosen axis, helping you work on symmetrical designs efficiently (like faces, vehicles, etc.).
4. **Boolean Modifier:** Allows you to add, subtract, or intersect one object with another, enabling the creation of holes, cuts, and combined shapes.
5. **Snap Tool:** Enables snapping to grids, vertices, faces, or edges, which helps in the precise placement of objects or parts during modeling.
6. **Modifiers Stack:** A collection of non-destructive tools that let you apply transformations like beveling edges, duplicating objects in patterns (array), mirroring, etc., while keeping the original mesh editable.

**Practice Projects in Blender:**



## Week 8: SAP & MIS

**Introduction to SAP:** Today, I started exploring SAP (Systems, Applications, and Products in Data Processing). SAP is one of the most widely used enterprise resource planning (ERP) software systems that helps businesses manage their operations efficiently. It integrates various business processes such as finance, supply chain, human resources, and customer relationship management into a single platform.

**Key Learnings:**

1. What is SAP?
   - SAP is an ERP software that helps organizations streamline their business operations.
   - It provides a centralized system for data management and improves workflow efficiency.
2. Why is SAP important?
   - Helps businesses automate and manage processes effectively.
   - Enhances data accuracy and decision-making through real-time analytics.
   - Reduces operational costs and improves overall productivity.
3. SAP Modules Overview:
   - SAP FI (Financial Accounting): Manages financial transactions.
   - **SAP HANA (High-Performance Analytic Appliance):** It enables real-time data processing and analytics for transactional and analytical workloads on a single platform.
   - SAP CO (Controlling): Helps with internal cost reporting.

- SAP MM (Material Management): Deals with procurement and inventory.
- SAP SD (Sales and Distribution): Manages customer interactions and sales.
- SAP HCM (Human Capital Management): Handles HR and payroll functions.
- SAP PP (Production Planning): Supports manufacturing processes.

4. How SAP Works?
   - SAP operates on a client-server architecture.
   - It uses databases to store business data and provides interfaces for different departments.
   - Transactions are processed in real-time, ensuring data consistency and reliability.

**MIS (Management Information System)** is a system that collects, processes, stores, and presents data to help managers make informed business decisions. It integrates people, processes, and technology to support operations, management, and strategic decision-making.

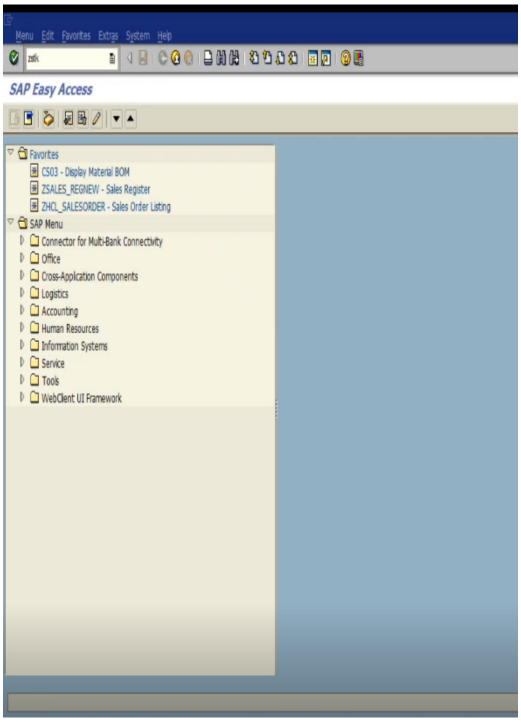
**Functions of MIS:**

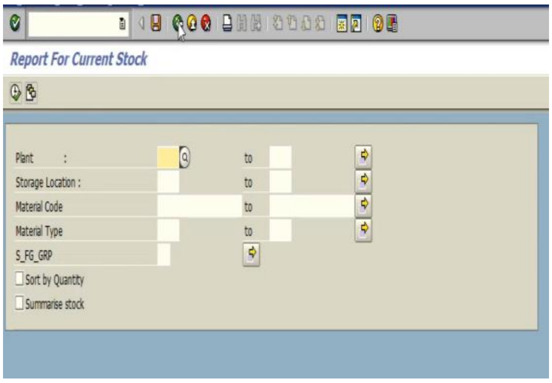
1. **Data Collection**: MIS collects data from both internal and external sources relevant to the business.
2. **Data Processing**: The collected data is organized and processed to derive meaningful insights.
3. **Information Storage**: MIS ensures data is securely stored for future use and reference.

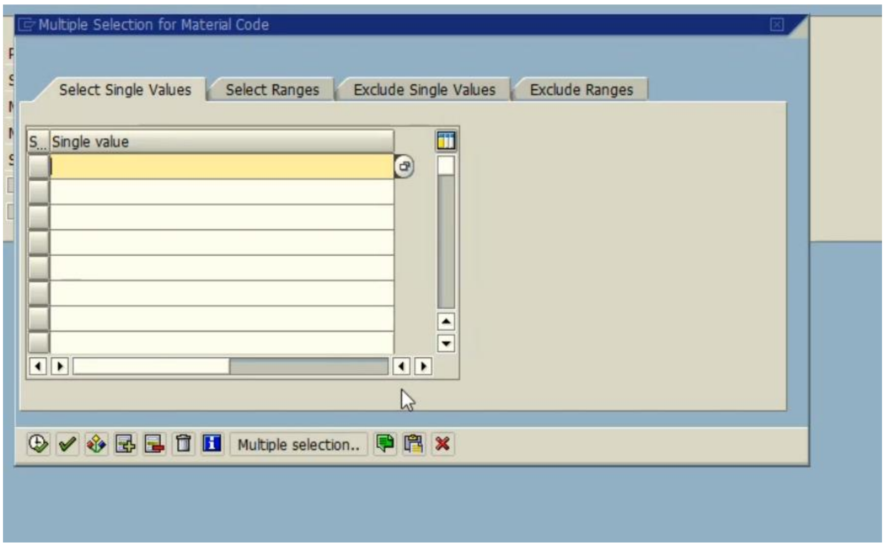
4. **Information Retrieval**: Authorized users can access and retrieve required information easily.
5. **Decision Support**: MIS helps in analyzing trends, evaluating alternatives, and making strategic decisions.

**Importance of MIS:**

1. **Improved Decision-Making:** MIS provides timely, relevant, and accurate information, leading to better decisions.
2. **Operational Efficiency:** Automates routine tasks, saving time and reducing errors.
3. **Enhanced Productivity:** Enables better planning and coordination of activities.
4. **Competitive Advantage:** Provides insights that help organizations stay ahead in the market. Data Integration: Facilitates the flow of information across different plants.

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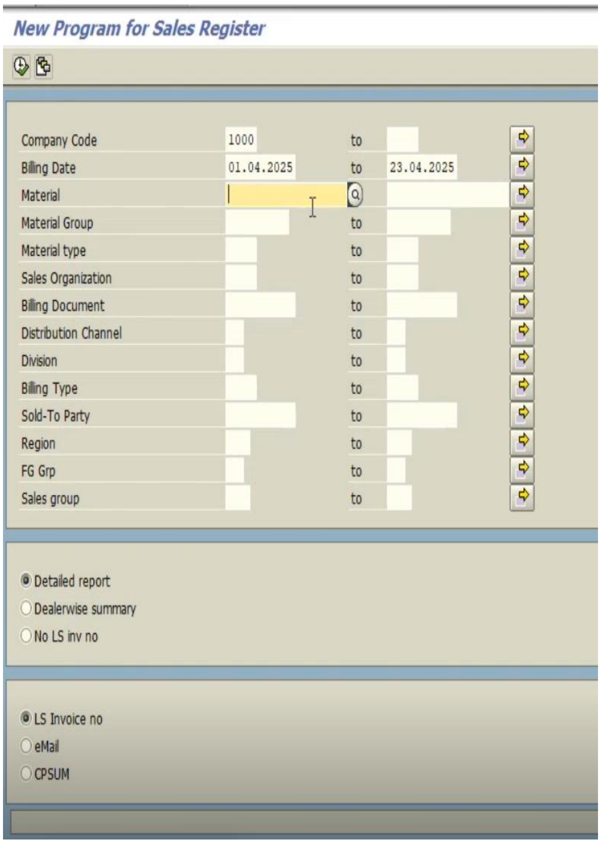
Select Single Values
Select Ranges
Exclude Single Values
Exclude Ranges
S... Single value
Multiple selection..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23.04.2025
Material
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Sales Organization
to
Billing Document
to
Distribution Channel
to
Division
to
Billing Type
to
Sold-To Party
to
Region
to
FG Grp
to
Sales group
to
Detailed report
Dealerwise summary
No LS inv no
LS Invoice no
eMail
CPSUM

## Week 9: MIS & RM STANDARDIZATION

**The task is to update MIS on daily basis.**

**RM Standardization Introduction**

I contributed to the Raw Material Standardization project for the Kids bicycle segment and currently working on MTB. The objective was to reduce the number of SKUs (Stock Keeping Units) across various components to streamline manufacturing, enhance product quality, ensure safety, and reduce costs. The entire initiative followed the FAB Framework – Functionality, Aesthetics, and Brand value.

The main objectives was to standardize critical components like Handlebars, Hubs, Chain Wheels, Tires, Tubes, Support Wheels, Spokes, Chains, Pedals, Saddles, Rims, etc. and reduce excessive SKU variation to simplify production, inventory, and procurement.

**My Role and Key Contributions**

- BOM (Bill of Materials) Analysis: Studied and extracted data from existing BOMs to identify redundant SKUs.
- Data Consolidation: Mapped “AS-IS” vs “TO-BE” configurations to support standardization.
- Vendor Alignment: Supported technical reviews and sample discussions with suppliers.
- Documentation: Helped maintain reports, BOMs, and updated specifications.

**Key Outcomes**

- Reduced 60%+ SKU complexity across kids’ components.
- Improved standardization, safety, and part interchangeability.
- Developed scalable frameworks for design and manufacturing teams.

## Week 10: MIG Welding robot and Identification of the problem statement

**MIG (Metal Inert Gas) welding**, also known as **Gas Metal Arc Welding (GMAW)**, is a widely used technique in the manufacturing industry due to its speed, operational efficiency, and ability to produce clean, strong, and consistent welds. MIG welding robots are commonly deployed for tasks such as bicycle frame and joint welding. These robots bring several advantages, including:

- Consistent weld quality with minimal defects
- Reduced human error and increased repeatability
- Enhanced safety in high-temperature work zones

During my visit to welding plant one of the most notable observations was that, despite the automation provided by MIG welding robots, the process still relied on **manual insertion of metal tubes or small fittings** into the welding jig. This manual step was not only time-consuming but also reduced the overall efficiency and potential of the robotic setup by introducing human dependency.

To address this limitation, I proposed and developed a **robotic arm prototype** that could automate the insertion process. The goal of the robotic arm was to **pick and place small metal components** into the MIG welding robot's operating area. This enhancement would allow the welding robot to work continuously without waiting for manual placement, thus increasing throughput.

This led me to the idea:
**Why not automate the loading process too?**

To support this thought, I recalled a setup I had seen at Micron Modigy, where a compact robotic arm was used for precise placement of parts before welding. That small but efficient system became the foundation of my idea.

Key Triggers That Sparked the Idea:

- Repetition of manual tube placement before every welding cycle.
- Increased time consumption and possibility of human error.
- Reference to Micron Modigy’s robotic arm, which demonstrated a smoother, automated flow.
- My own interest in robotics and automation, encouraging me to think of a prototype solution.

I began thinking about how I could create a low-cost robotic arm prototype that could replicate these loading tasks on a small scale. Although this was just the early stage of ideation, the seed was planted to later turn this concept into a practical prototype using Arduino, servos, and a 3D model.

This observation marked a key point in my learning curve, helping me understand how real-world industrial problems can be identified and solved using creative, hands-on engineering solutions.

Actual Problem


Solution to be provided

## Week 11: Teardown

**Objective:** The goal of this teardown analysis is to compare a Hero Cycles model with a similarly priced model from a competing brand, Firefox. The comparison aims to highlight the strengths and weaknesses of both products from a technical, design, and consumer point of view.

**Need for Teardown:** In a competitive marketplace like bicycle manufacturing, understanding the strengths and weaknesses of your product compared to others is essential. With this,I realized the importance of benchmarking existing models against competitors. A teardown was needed to analyze component quality, design choices, pricing strategies, and customer value.

**Benefits of Teardown:** The teardown exercise provided several key benefits. Firstly, it highlighted the cost-performance ratio of Hero products—demonstrating that Hero offers additional features (like front suspension and included accessories) at a lower price point. Secondly, it exposed areas where competitors might be ahead, such as in aesthetic design or weight optimization. This insight is valuable for the product development and marketing teams at Hero Cycles, enabling them to improve future models. The exercise also improved my technical observation skills by pushing me to look beyond specs into usability and practicality.

**Use Case of Teardown:** This teardown is useful in product development, quality control, and marketing strategy. For example, if Hero decides to develop a new model for urban riders, this kind of comparison shows what users in that segment value most—lighter weight, stylish design, and smooth ride experience. From a marketing perspective, the teardown offers talking points that can be used in promotions to highlight where Hero leads—like value for money or better off-road adaptability. It also aids in customer support by pre-empting common concerns.

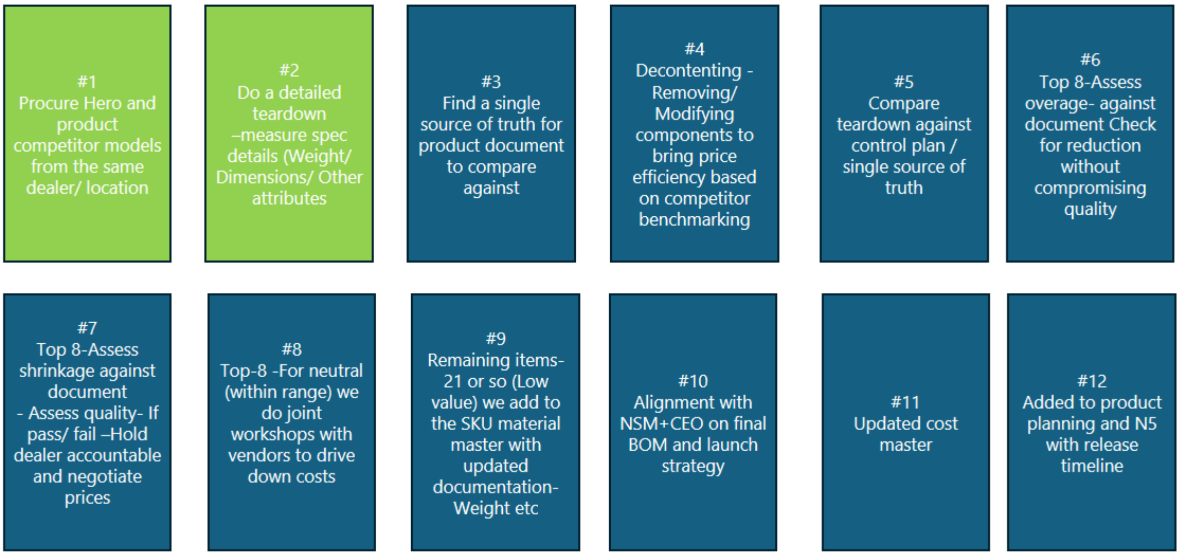
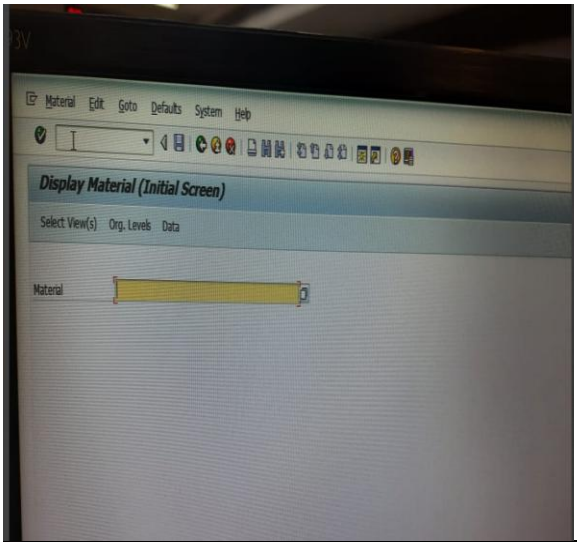


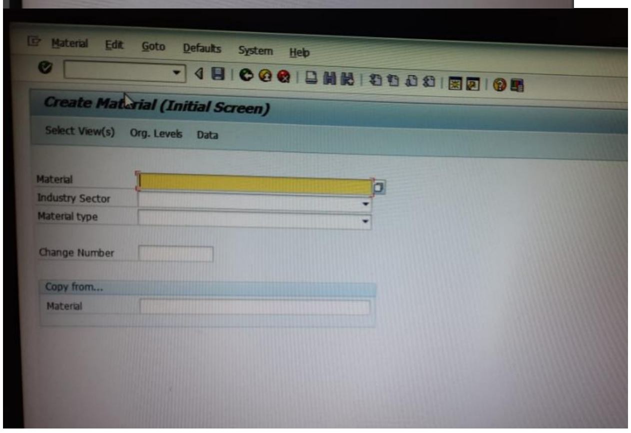

*Fig. Teardown process*

From this teardown activity, I learned how detailed technical comparisons can influence strategic decisions in the bicycle manufacturing industry. I gained hands-on experience in observing mechanical design, analyzing features, and understanding the consumer value proposition. It also taught me how to present product insights clearly and objectively using tabular and paragraph-based formats. Most importantly, I understood how benchmarking not only helps improve existing products but also plays a critical role in future product development and innovation.

## Week 12: BOM Updation

During Week 12, I focused on learning the process of BOM (Bill of Materials) updation using SAP. I was introduced to two crucial T-codes: CS01 for creating a new BOM and CS02 for making changes to an existing one. Through hands-on tasks, I understood how each component relates to the final product and how to accurately enter material codes, quantities, and units. I also learned the significance of BOMs in production planning, inventory control, and material requirement planning (MRP). I gained practical exposure in updating BOMs by interpreting technical drawings and revising data accordingly. This experience enhanced my understanding of product structures and improved my skills in SAP data management.



## Week 13: TASK 1

### Need for the AI Recruiter Website

During my internship, the company identified a pressing need to streamline its hiring process, especially for entry-level and mass recruitment roles. The traditional model, where human interviewers manually screen every candidate, was time-consuming, resource-intensive, and inconsistent. It also limited the company's ability to quickly assess a large volume of applicants.

To address this issue, the company proposed the development of an AI-powered recruiter website. The goal was to build a system that could interview candidates autonomously, evaluate their responses, and provide real-time feedback or selection status. This solution would free HR personnel from repetitive tasks and improve the overall efficiency of recruitment.

As part of my role, I was assigned the task of developing this system. The company wanted to:

- Automate initial interviews
- Reduce dependency on human resources
- Ensure unbiased, real-time assessments
- Speed up the hiring process

This AI recruiter platform would act as a first-level filter, capable of interviewing dozens of candidates simultaneously.

### Progress so far

### 1. AI-Powered Interview Interface

The web interface allows users to begin an automated interview where questions are asked by the system using Text-to-Speech (TTS) functionality.

**2. Question Speed Control**

Candidates can select their preferred question delivery speed: Normal, Slow, or Fast, catering to users with different processing speeds or language comfort.

**3. Speech-to-Text (STT) Conversion**

User responses are recorded and converted into text using STT. These answers are then sent to the backend system for analysis.

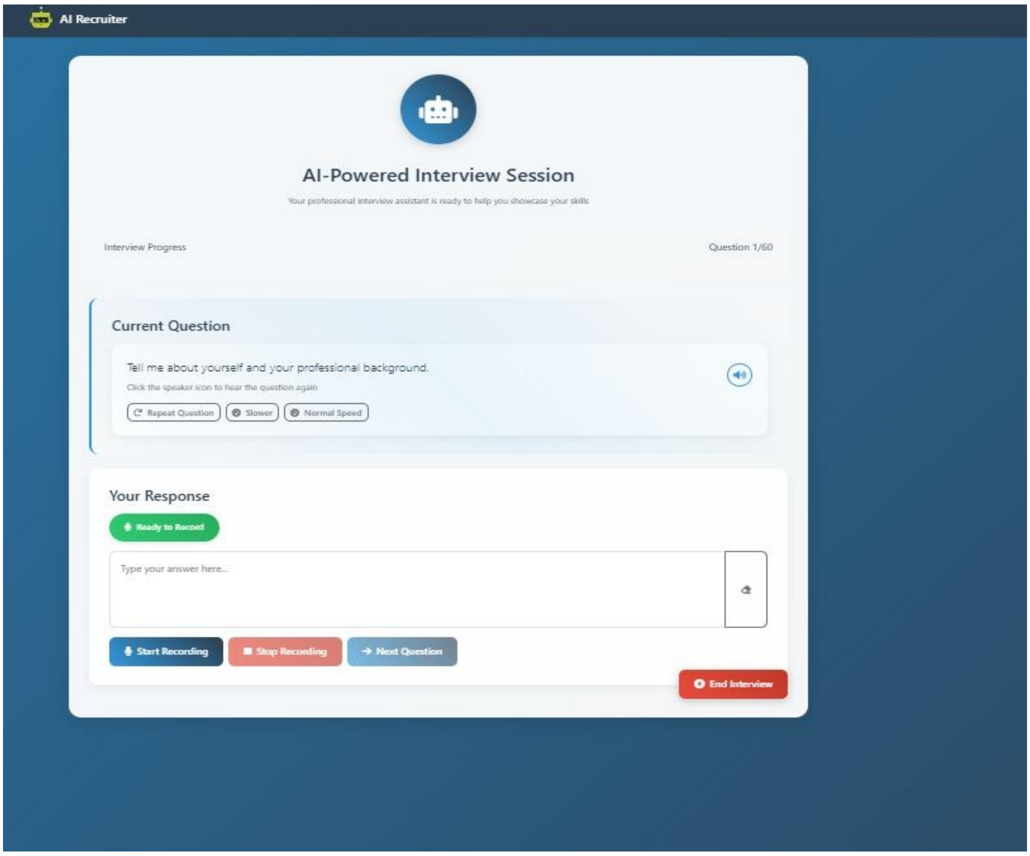
**4. Automated Evaluation(In Progress)**

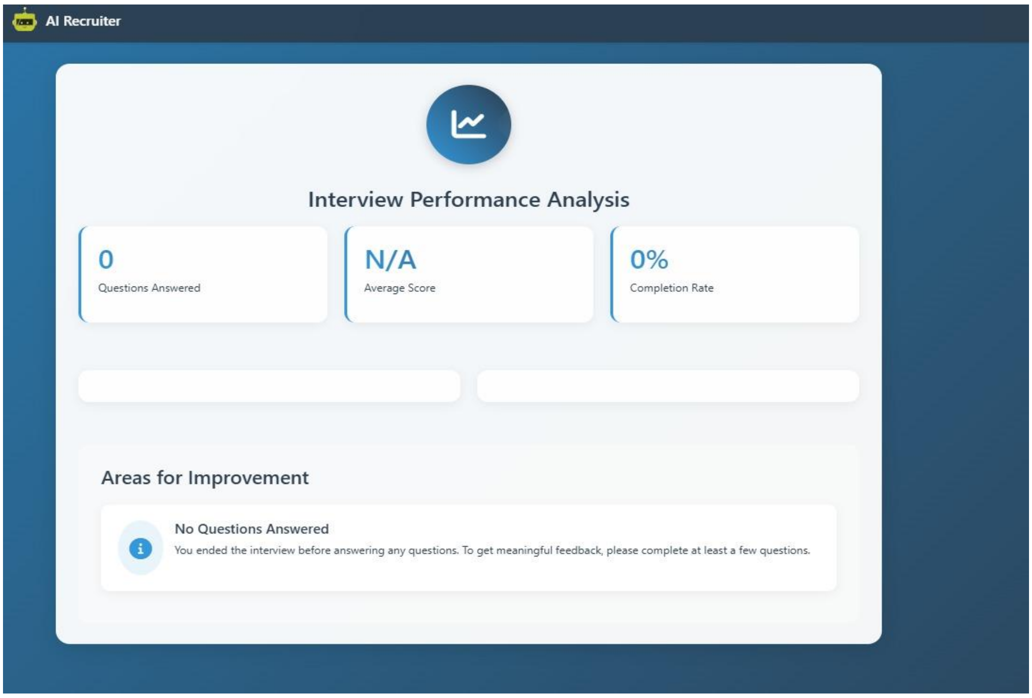
Based on keywords, response relevance, and confidence score, the AI decides whether the candidate should be shortlisted or rejected.

**5. Feedback System (In Progress)**

An optional feedback module is under development, which will provide suggestions for improvement. To ensure fairness, a no-cheating mechanism (like voice consistency, face tracking, or suspicious pause detection) is also planned for future versions.

Through this task, I learned how real-world problems such as recruitment bottlenecks can be solved through AI integration. I worked with web technologies, TTS/STT APIs, and basic AI logic for decision-making. More importantly, I understood how technical skills can directly serve a business need, adding value beyond just code.


AI Recruiter
AI-Powered Interview Session
Your professional interview assistant is ready to help you showcase your skills
Interview Progress
Question 1/60
Current Question
Tell me about yourself and your professional background.
Click the speaker icon to hear the question again
Repeat Question
Slower
Normal Speed
Your Response
Ready to Record
Type your answer here...
Start Recording
Stop Recording
Next Question
End Interview


AI Recruiter
Interview Performance Analysis
0
Questions Answered
N/A
Average Score
0%
Completion Rate
Areas for Improvement
No Questions Answered
You ended the interview before answering any questions. To get meaningful feedback, please complete at least a few questions.

## Week 14: MARKETING STRATEGIES

During my internship, learning about product, pricing, positioning, and grand strategies used by a major company like Hero Cycles provided me with valuable insights into real-world business operations and decision-making processes. Understanding how a leading brand structures its marketing and strategic plans helped me see beyond theoretical classroom knowledge and grasp how these strategies directly impact the company's market presence and profitability.

By analyzing Hero Cycles' product strategy, I learned how companies develop and diversify their product lines to cater to various customer segments. This knowledge is useful to me because it helps me understand market segmentation, consumer behavior, and product development—essential concepts for anyone aspiring to work in product management, marketing, or entrepreneurship.

Through the pricing strategy, I saw how pricing is not just about setting a number but involves strategic thinking around value perception, cost efficiency, and competitive positioning. This helps me in future projects or startups where understanding how to price a product can make or break success.

The positioning strategy showed me how companies build a brand image and customer loyalty. It taught me how effective branding can influence buying decisions, which is crucial in any business or marketing career path.

Finally, learning about grand strategies such as international tie-ups, R&D investments, and promotional partnerships showed me the importance of long-term planning, innovation, and adaptability.

Overall, this learning experience has improved my business acumen, made me more industry-aware, and equipped me with a strategic mindset to plan, position, and promote products effectively. This mindset is not just theoretical,it is practically useful when trying to sell or market various items. Here, I primarily learned about e-commerce product listing on various platforms, including how to analyze market trends and strategically time product placements for maximum impact.

## Week 15: MY DESIGN

This week, I focused on designing a personal smart display system tailored specifically for traditional bicycles. The primary aim was to integrate modern technology such as an OLED display while maintaining compatibility with conventional bicycle designs, thereby enhancing functionality without altering the bicycle's classic structure.

The design features a compact OLED display module, selected for its high visibility, low power consumption, and crisp display quality. The display provides essential cycling information such as current speed, distance traveled, and basic navigation cues.

Power Supply Integration: To ensure energy efficiency and sustainability, the design includes the option to be powered through renewable sources:

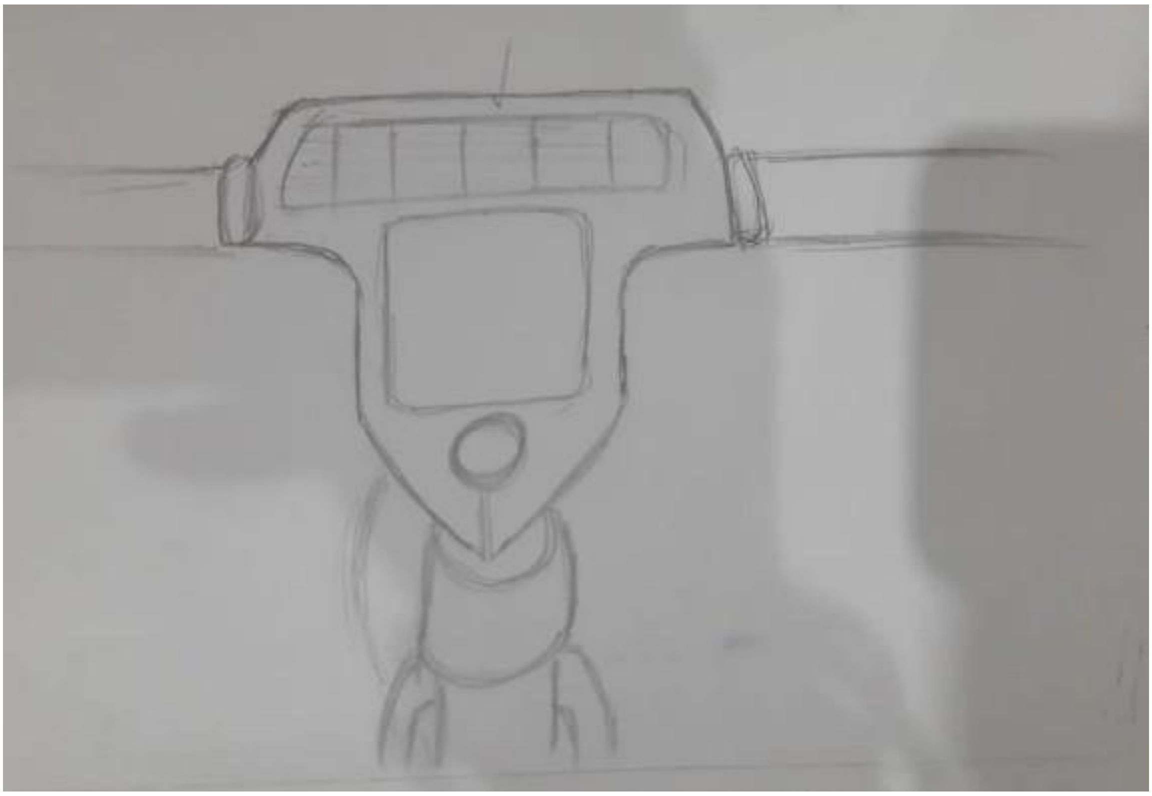
- Solar Power Capability: Small solar panels can be incorporated into the bicycle's frame or handlebars, allowing the display to recharge during daylight.
- Dynamo Hub Support: The system can also connect to a bicycle dynamo hub, which generates electricity as the rider pedals. The harvested energy is stored and used to power the OLED display, promoting a self-sustaining setup.

This hybrid energy approach minimizes the need for external battery charging and aligns with environmentally conscious design principles.

Connectivity Features: The display system is designed to interface with smartphones, enabling GPS navigation, call notifications, and fitness tracking. This wireless connection enhances the user experience by providing smart features without complicating the bicycle's traditional design.

Presentation: I presented this design to my mentor, highlighting its compatibility with existing bicycle models and the advantages of integrating an OLED display powered by renewable sources. The presentation included detailed schematics and a 3D model demonstration.

**Future Scope:** The upcoming tasks involve prototyping the display system, testing power efficiency from solar and dynamo sources, and developing the communication protocol for smartphone connectivity.



## Week 16 & 17 : Robotic Arm

During weeks 16 and 17, I concentrated on the practical development and assembly of a robotic arm prototype. The system was designed using an Arduino Uno microcontroller, controlled by a joystick interface, and actuated by four servo motors. This phase involved hardware integration and programming.

Tasks Completed

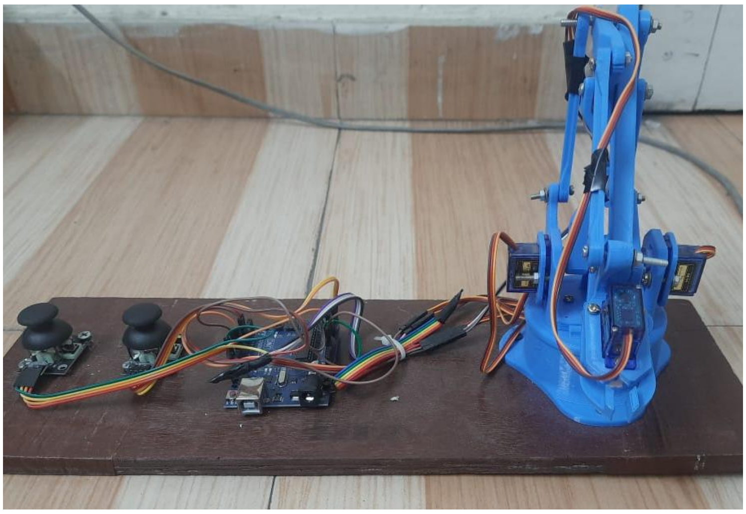
- Component Assembly: I assembled the robotic arm structure, ensuring secure mounting of the four standard servo motors responsible for arm articulation. Each servo was positioned to simulate the shoulder, elbow, wrist, and gripper movements of a human arm.
- Microcontroller Integration: The Arduino Uno was configured to serve as the central control unit. Proper connections were established between the Uno, servos, and joystick module, with attention to power supply and signal integrity.
- Joystick Control Implementation: Developed and tested the joystick interface to provide intuitive control over the robotic arm's degrees of freedom. The joystick inputs were mapped to servo positions, enabling smooth and precise movement.
- Programming: Implemented control algorithms in C++ using the Arduino IDE. Code included servo calibration routines, input reading from the joystick, and translation of analog inputs to servo angles.
- Initial Testing: Conducted functional tests to verify servo responsiveness and joystick control accuracy. Minor adjustments were made to the servo limits and response curves to improve precision.

**Challenges and Solutions**

- Power Management: Managing the power requirements of multiple servos was critical to avoid voltage drops and ensure stable operation. I incorporated a regulated 5V power supply separate from the Arduino board's onboard regulator.
- Servo Calibration: Achieving smooth and accurate servo movement required iterative calibration of pulse widths and motion limits, which was addressed through systematic testing and code refinement.

Outcome:

- Successfully created a functional prototype capable of executing controlled movements across four degrees of freedom.
- Established a reliable communication and control link between the joystick and servos via the Arduino Uno.
- Gained valuable experience in integrating hardware components and programming embedded systems for real-time control.



## Week 18: Task 2: EXCEL AUTOMATION

In Week 18, my ongoing task focuses on automating the creation of tollgate sheets for various models using Excel. The objective is to streamline and expedite the process by generating sheets automatically from brief data inputs, while also incorporating the capability to manage and account for project delays effectively.

It involves developing an Excel-based automation tool that:

- Extracts model-specific data from a master dataset or brief.
- Automatically generates tollgate sheets tailored for each model.
- Includes fields to monitor scheduled milestones and actual progress.
- Handles and flags delays by comparing expected and actual timelines.
- Provides alerts or summaries for overdue tasks to aid project tracking.

This automation aims to reduce manual effort, minimize errors, and improve project monitoring efficiency.

Progress and Approach

- Data Structuring: I began by analyzing the data format and designing a standardized template for the tollgate sheet that can dynamically populate based on input data.
- Excel Automation Techniques: I am implementing automation using Excel formulas, macros (VBA), and potentially integrating Python scripts for more complex data handling and delay management.
- Delay Management Logic: A system to track deadlines and identify delays is being built, enabling proactive notification of any deviations from the planned schedule.

- Testing and Validation: Initial tests with sample data are underway to verify correct sheet generation and accurate delay detection.

Challenges

- Ensuring seamless integration of delay calculations within the automated sheets without compromising usability.
- Handling variable data formats from different models efficiently.