1 Project 1 - Generate and Edit Gears

In this project, you create spur and bevel gear sets. You edit the gears to provide clearance for the shafts.

1.1 Create Spur Gears

In this section of the project, you add a spur gear set to an assembly.

1. Using the Intro to CAD & CAE.ipj

2. Open GearBox-A.iam.
3. From the Design ribbon, on the Power Transmission tab, click Spur Gear.

![Design ribbon with Spur Gear option highlighted]

4. To set the Common values for the spur gear:
   
   ![Spur Gear Component Generator dialog box]
   
   - 1. In the Spur Gear Component Generator dialog box, under Common, for Design Guide, click Number of Teeth.
   - 2. For Desired Gear Ratio, click 1 ul.
   - 3. For Module, click 2.000 mm.
   - 4. For Helix Angle, enter 0.
   - 5. Verify that Internal is not selected.
5. To define the values for Gear 1:
   • In the Spur Gear Component Generator dialog box, under Gear 1, click the red arrow next to Cylindrical Face. Click the shaft 1.
   • Click the red arrow next to Start Plane. Click the bushing face 2.
   • Drag the 3D Grip 3 to a value of 25.
6. To define the values for Gear 2:
   - Rotate the view.
   - In the Spur Gear Component Generator dialog box, under Gear 2, click the red arrow next to Cylindrical Face. Click the shaft 1.
   - Click the red arrow next to Start Plane. Click the bushing face 2.
   - Drag the 3D Grip 3 to a value of 35.

7. To check your design, in the Spur Gears Component Generator, click Calculate.
8. To add the gears to your assembly, click OK. In the File Naming dialog box, click OK.
9. Rotate the view.

10. From the Design ribbon, on the Power Transmission tab, click the Spur Gear flyout. Click Bevel Gear.
11. To set the **Common** values for the bevel gears:
   - In the **Bevel Gears Component Generator** dialog box, under **Common**, for **Facewidth**, enter **24.5**.
   - For **Module**, select **3.000 mm**.

```
<table>
<thead>
<tr>
<th>Gear Ratio</th>
<th>Facewidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6000 ul</td>
<td>24.5</td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Module</th>
<th>Shaft Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.000 mm</td>
<td>90.0000 deg</td>
</tr>
</tbody>
</table>
```

12. To define the values for **Gear 1**:
   - In the **Bevel Gear Component Generator** dialog box, under **Gear 1**, click the red arrow next to **Cylindrical Face**. Click the shaft 1.
   - Click the red arrow next to **Plane**. Click the bushing face 2.
13. To define the values for Gear 2:
   - Rotate the view.
   - In the Bevel Gear Component Generator dialog box, under Gear 2, click the red arrow next to Cylindrical Face. Click the shaft.
   - Click the red arrow next to Plane. Click the bushing face.
   - Drag the Facewidth 3D Grip to a value of 25.
   - Drag the Number of Teeth 3D Grip to a value of 21.
14. Refine Gear 1 by dragging the Number of Teeth 3D Grip to a value of 38.

15. To review the gear calculations:
   - In the Bevel Gears Component Generator dialog box, on the Calculation tab, for Power under Gear 1, enter 100.
   - Click Calculate.
16. To review the gear calculation message:
   - In the Bevel Gears Component Generator dialog box, notice the red lines displayed after performing the calculation.
   - Click the chevrons ⊲ to display the message.

17. This gear set will be driven by a motor. To size the motor, change the loads on the bevel gears:
   - In the Bevel Gears Component Generator dialog box, on the Calculation tab, for Power under Gear 1, enter 5.
   - For Speed, enter 500.
   - Click Calculate.
   - Calculation now indicates design compliance!
18. To add the gears to your design, in the **Bevel Gears Component Generator** dialog box, click **OK**. In the **File Naming** dialog box, click **OK**.

19. To edit the bevel gear set:
   - In the browser or graphics window, select the gears.
   - Right-click. Click **Edit Using Design Accelerator**.
20. To change the number of teeth in each gear, in the Bevel Gears Component Generator dialog box:
   - Under Gear1 enter 40.
   - Under Gear2, enter 20.
   - Click Calculate. Click OK.

21. In the model browser, expand Bevel Gears:1 and Shaft 4
22. Constrain the center plane of the Gears to their perspective shafts.
   - Click the **Constrain** command
   - From the model browser, Select **XZ Plane** from **Shaft:1** under **Shaft:4**
   - Select **XZ Plane** from the **Bevel Gear2:1** under **Bevel Gears:1**
   - Select **Flush** for the solution
   - Click **Ok**.
23. Repeat the previous step for the other Bevel Gear and both Spur Gears.
   - Now dragging any of the shafts will cause the other to move in accordance to the gear ratios set in the design accelerators.
24. To edit a bevel gear:
   - In the browser, double-click Bevel Gear1:1.
   - Click the front face of the bevel gear, Click Create Sketch from the Mini-Toolbar
   - Place a circle and constrain it to the origin, and extrude cut through the gear.
   - Repeat for Bevel Gear2:1
25. On the ribbon, from the Return tab, click Return.