**Scope:** This project is based on a Case Study project from “Shigley's Mechanical Engineering Design,” and will require you to design a gear box for power transmission. You will be given a set of input and output parameters, geometric constraints, and overall assumptions. For this you will need to design the gearing system (reverted gear train), shafts, bearings, and fasteners for the specified life. All steps must be well documented, all additional assumptions must be stated clearly, and all references must be cited.

**Deliverables:**

1. Presentation during the “Final Exam” time (grading will be based on this)
2. Documentation Packet (Required to justify all aspects of your presentation)
   1. Formatted similar to an appendix
   2. All calculations, assumptions, and citations

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| **Project Presentation Grading Rubric** | | | |
| **Key Aspect** | **Requirements** | **Guidance (What to say/not say)** | **Points** |
| Slide 1  Slide 2-3 | **Title Page:** Student Names, Project name, Date, Course Name, Slide # (on every slide)  **Background:** What is the problem? What were the main steps? Why? Where is this used in real-life? At least one picture on each slide. | Introduce yourselves  Tell the project title  Tell a story about the background  GOOD Animation/video are encouraged | \_\_/2 |
| Slide 4 | **Full Drawing:** Show the details of dimensions and the big picture of the design (CAD drawing) | Final dimensions and layout for gears, shafts, bearings, and fasteners | \_\_/5 |
| Slide 5-10 | **Detailed Design:** Include the following   * Power and torque requirements * Force analysis (explain the forces on the gears, shafts, bearings, and fasteners; give key equations and assumptions; you can split this up and present with each component below; grading will be included with the component type) (5 points) * (10) Gear specifications (ratios, # teeth, pressure angle, diametral pitch, width, SF, etc.) * (10) Shaft specifications (material, stresses, deflection, critical speed, SF, etc.) * (10) Bearing specifications (Loads, speeds, size, class, etc. selection | | \_\_/35 |
| Slide 11  Slide 12 | **Recommendations:** Present improvements that could be made to the design  **Conclusions:** What you learned | Give specific things that could be addressed to improve the overall design What did you personally learn? What skills did you improve (both technical and non-technical)? | \_\_/3 |
| Slide 13 | **References:** Cite all sources | Anything that is not your own work, you must cite | \_\_/1 |
| Slide 14 | **Questions:** Invite the audience to ask questions |  | \_\_/1 |
| Style | **Slide Format:** Clean slide format. Use concise and precise phrases, use bullet points, NO PARAGRAPHS, proper spelling and grammar  **Verbal Presentation:** Avoid um, uh, etc. Use good body language, eye-contact, tone, etc. |  | \_\_/3 |
| **Total** |  |  | 50 |

**Project Approach:** The following steps will give you a basic approach to the project. This will be an iterative process as you determine certain aspects and need to meet the set constraints.

1. You will be given the following parameters:
   1. Universal parameters for all groups:
      1. Internal gear box max dimensions 14 in x 14 in base, 22 in height; (clearances +wall height) = 1.5 in
      2. Input and output shafts must be in-line
   2. Universal allowed assumptions

* + 2. 99% Reliability for the gears
    3. Kv corresponding to E curve
  1. Individual group parameters (See excel sheet)

1. Design process steps:
   1. Gears (Safety factor - 2 to 3)
      1. Determine gear ratios and approximate sizes
      2. Determine diametral pitch requirements needed to satisfy size constraints
      3. Determine force loads on the gears, and how that impacts the stress/life
      4. Select appropriate gears
   2. Shaft (2< SF <5)
      1. Determine shaft speeds and select an initial diameter and material
      2. Determine shaft life and confirm material and size selection
      3. Determine shaft deflection and critical speed
      4. Temporary shaft design
   3. Bearings
      1. Determine loading of bearings
      2. Apply bearing life requirements and select bearings
      3. May need to revisit shaft calculations to fit bearing bore. If a stepped shaft is needed revisit shaft design for stress concentration.
      4. Finalize Bearing and Shaft design
2. Build
   1. Build a scale version of your design (3D print) (e.g. 1:4)