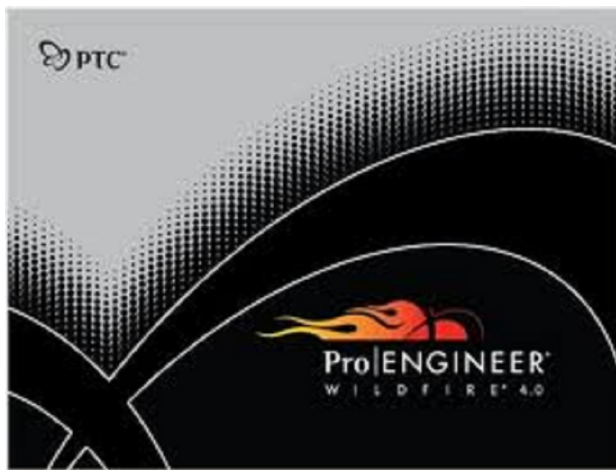
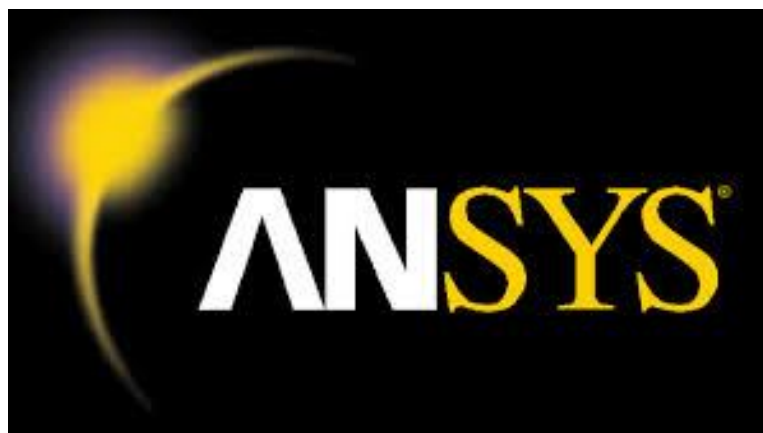


**Tribhuvan University  
Institute of Engineering  
Mechanical Department**



**System Design and Simulation: Practical book**



**Author: Dr. Sanjeev Maharjan**

**Laboratory 1: 3D modeling, meshing and modal analysis of Vortex turbine. In this work, student will create 3D design of vortex turbine provide at Center of Energy studies. The 3D design works include turbine and shaft. The 3D modeling will be meshed in simulation software (may be in ANSYS or other software). Finally modal analysis will be performed in ANSYS.**



**Laboratory 2: Review of research article and PPT presentation. In this laboratory work, students will be provided journal articles regarding gearbox vibration, gear meshing, linkage mechanism, robotics, pressure vessels, structural integrity and others. After reviewing journal articles, students should prepare PPT slides and present the learning based on the journal articles.**

**Laboratory 3: Verify power transmission of the vertical drilling machine provided at mechanical workshop. In this practical, student will measure the sheave diameter, V belt pulley, power rating of driving motor. Based on these data, student will calculate the velocity of belt, pitch length, center to center distance and angle of contact. Then design power, allowable power, number of belts for driving drilling machine will be determined. Finally belt life in number of passes and hours will be determined. Based on the calculation results student will verify the existing drilling machines**



**Laboratory 4: Select any one point from the given ten design sequence for power transmission. Describe the one you have chosen in detail.**

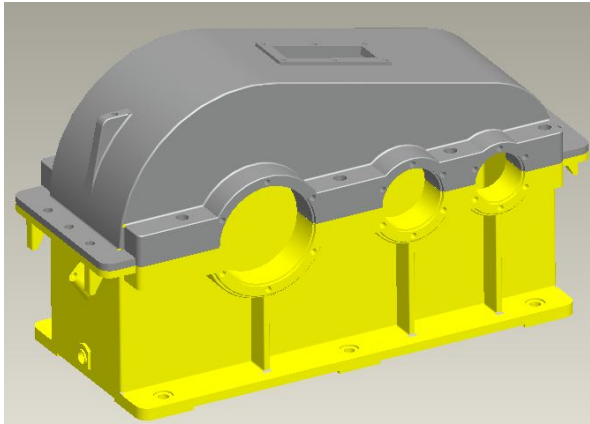
1. Power and torque requirements:
2. Gear specifications:
3. Shaft layout
4. Force analysis:
5. Shaft material selection:
6. Shaft design for stress ( fatigue and static)
7. Shaft design for deflection
8. Bearing selection
9. Key and retaining ring selection
10. Final analysis

**Laboratory 5: Describe the general design consideration for the IC engine system design. Work out for the design consideration of any one:**

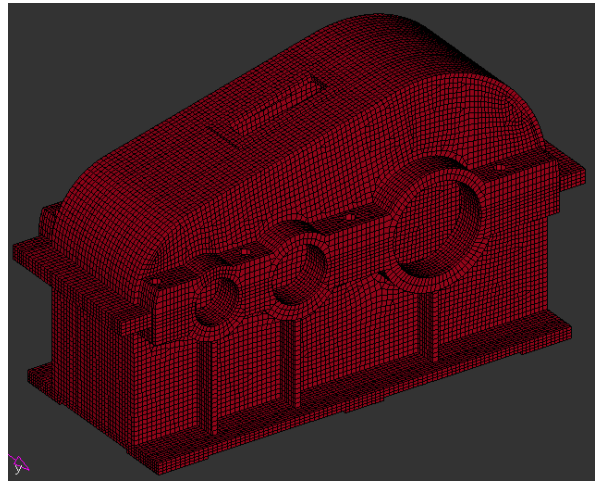
- A) design of cylinder and cylinder head
- B) design of piston , piston rings and gudgeon pin
- C) Design of connecting rod and crankshaft.

**Laboratory 6: Demonstration of simulation softwares.**

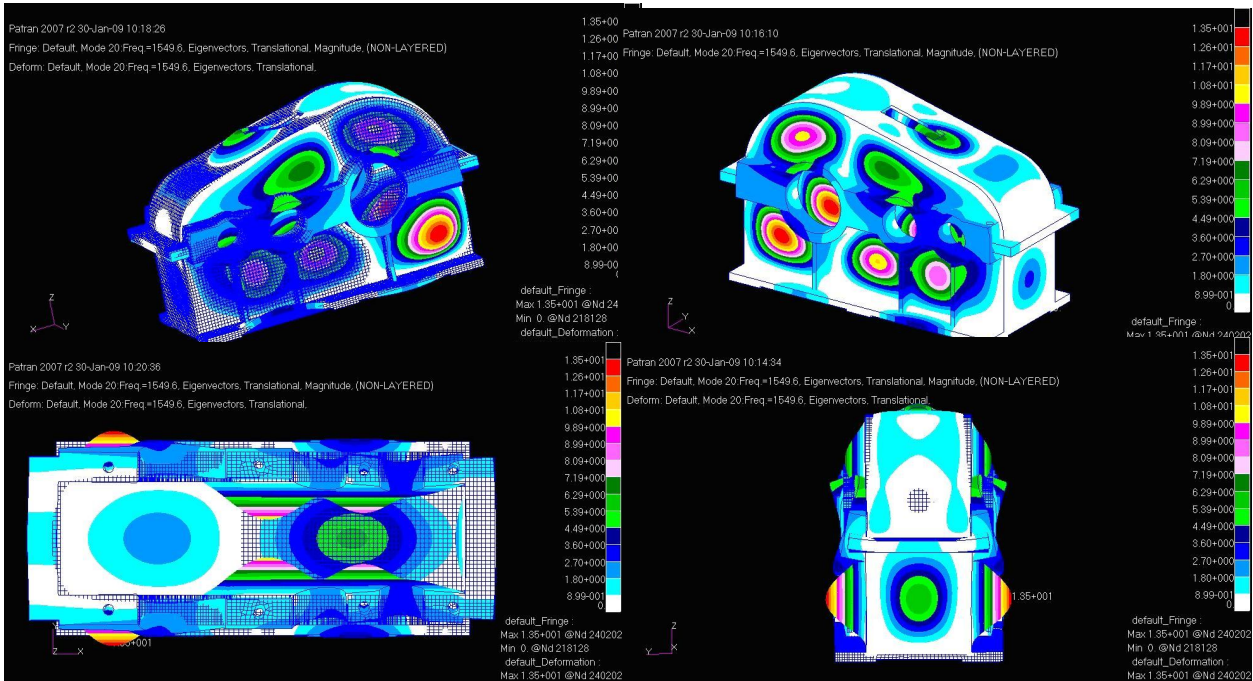
1. Pro/E – for 3d modeling of mechanical components: Gears, gearbox, two stage parallel-shaft gearbox.
2. Altair hyper mesh – for meshing 3D objects. Solid and shell modeling.
3. ANSYS/MSC NASTRAN / MSC PARTAN – for modal analysis, sensitivity analysis and other analysis.



3D modeling

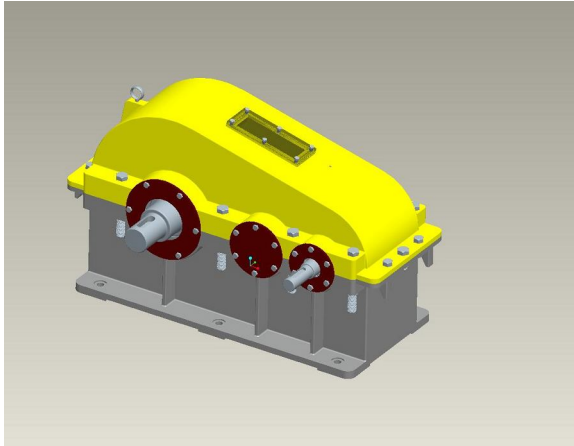


Solid element modeling

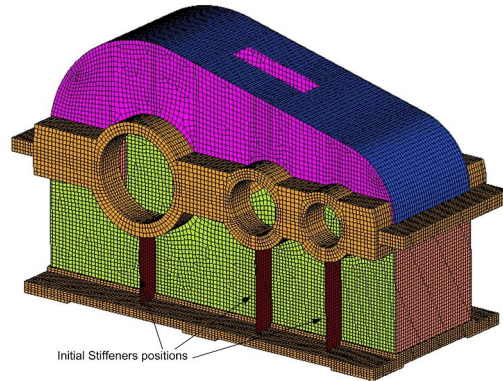


Modal analysis of gear housing





Two stage parallel shaft gear box



Solid and shell modeling of gear housing

**Laboratory 7: Guest's presentation.**

- 1) German students' (Wilhelm and Markus) presentation on composite materials applied for the AIRBUS.
- 2) Senior Engineer from Sanima Hydro for presentation on khani and mai khola hydro power.
- 3) Experts will be contacted for other presentation to interact with our students for sharing their learning's and skills.