

Design of Machines and Mechanical Systems (PC-BTM711)

Session 01

Module 1: Introduction to Course and Gears

Session Outcomes

- Outline of the course
- Discuss difference between Machine elements, Machines and Mechanical Systems
- Describe gear drives

Course Assessment Requirements

- In-semester and end-semester examinations
 - Test 1 - 20 points
 - Test 2 - 20 points
 - End semester - 100 → 60 points
- Term work (25 points) 
 - Tutorial/Assignment work - 10 points
 - Class Participation/Viva ~~- 10 points~~
 - Attendance - 5 points

Note: Class participation includes participation in both lectures and tutorials (attendance, asking and answering questions, presenting solutions to tutorial questions).

Google Classroom

- Class code: **7tgzwh**
- Classroom
 - Lecture session notes
 - Assignments
 - Quizzes
 - Discussions
 - Common Resources

Design

- Machine elements
- Machines
- Mechanical Systems

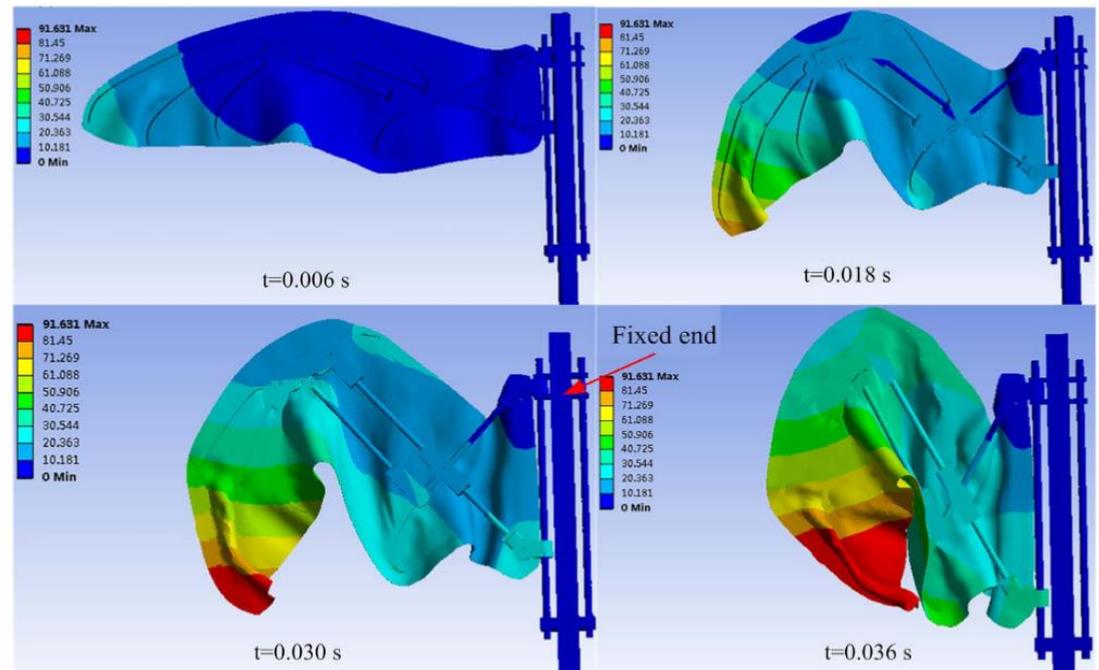
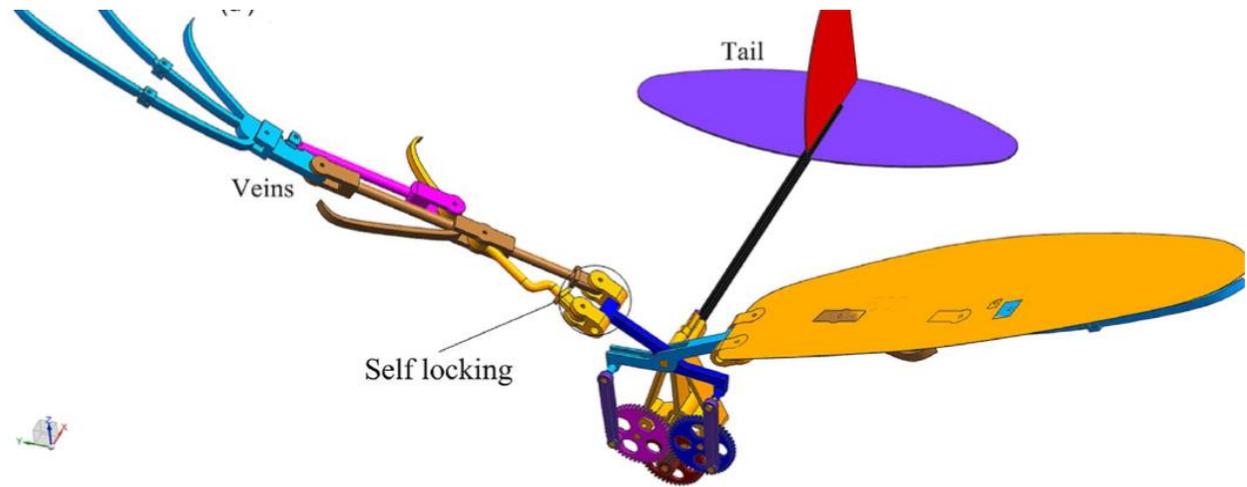
NC, CNC
ICE
Compressor
Radiator
Refrigerator/AC
Turbines
Lathe
Screw jack
Gear

actuators
Pneu./hyd. cyl.
clampers
Sensors
impeller
pump

Gears
Bearings
pulleys
wheels
brakes/clutches
flywheels
Rotor
governor

Power screw
shafts/keys
Chain/belt drive
joints → mech. joint
springs
Couplings
fasteners
weld joints
pullup

Design of bionic foldable wing



Li, X., Guo, C., Ma, Y., & Zheng, Y. (2021). Design of bionic foldable wing mimicking the hind wings of the C. Buqueti Bamboo Weevil. *Journal of Mechanical Design, Transactions of the ASME* 143(8).

Gear root bending strength

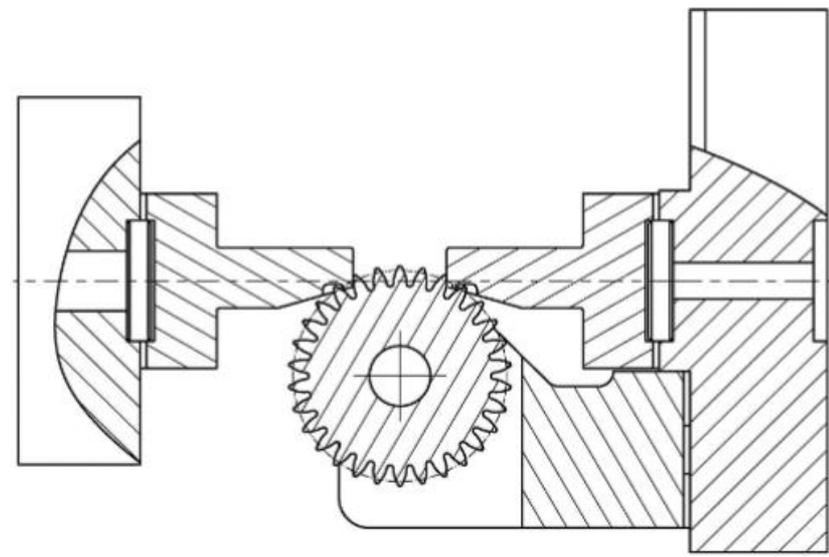
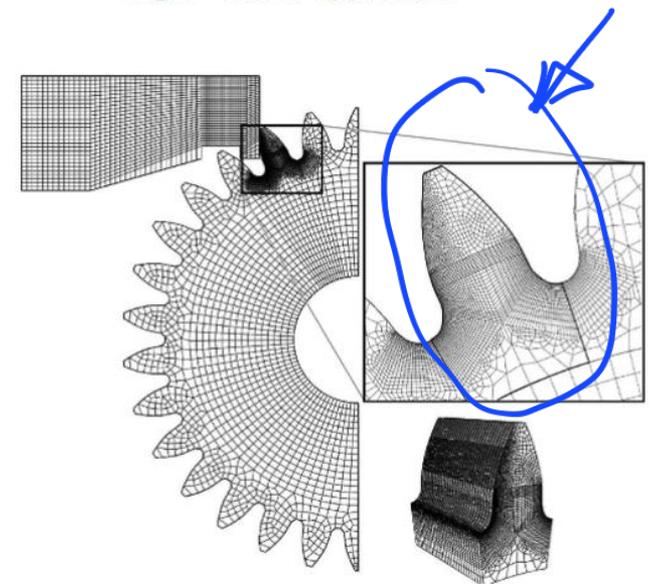
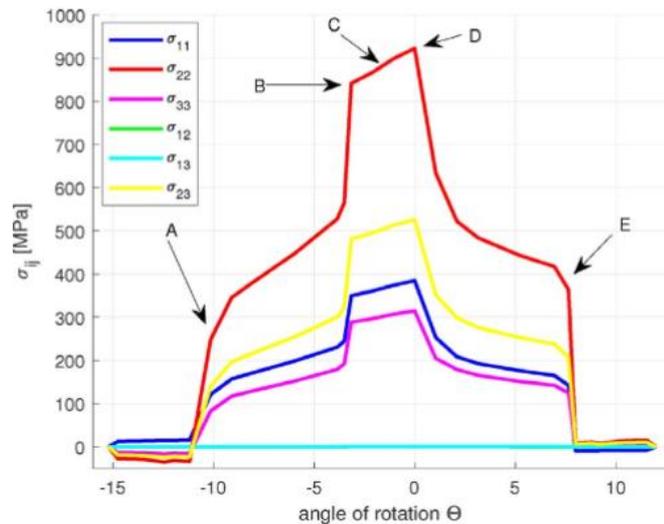


Fig. 1 STBF apparatus



Bonaiti, L., Bayoumi, A. B. M., Concli, F., Rosa, F., & Gorla, C. (2021). Gear root bending strength: A comparison between single tooth bending fatigue tests and meshing gears. *Journal of Mechanical Design, Transactions of the ASME*, 143(10).

QUIZ

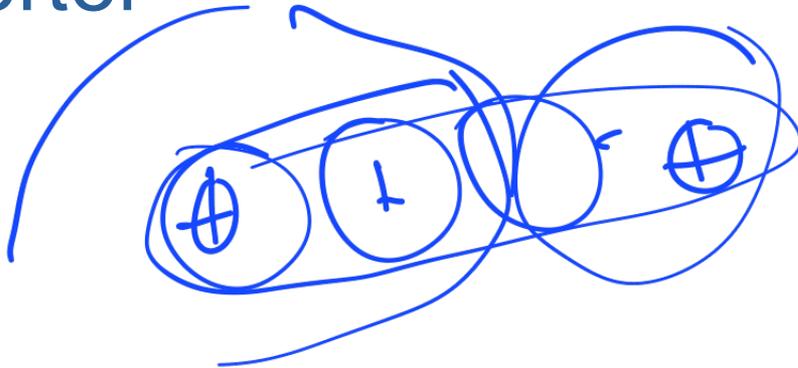
Gears and other Mechanical Drives

Q1: Gear drive transmits power over _____ distance than belt and chain drives

1. Longer

2. Shorter

*Gear
belt & chain
couplings & shafts
Screw
Cam*



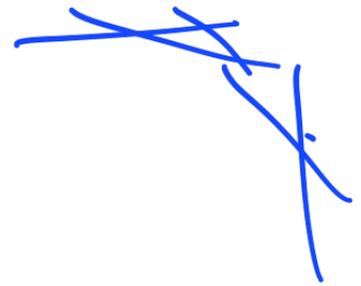
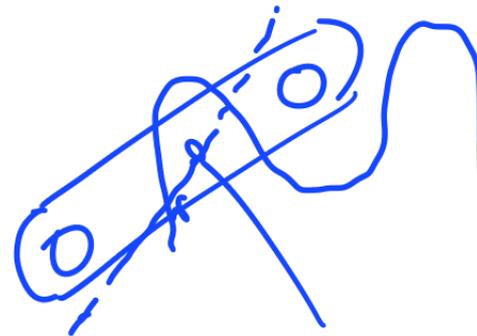
QUIZ

Gears and other Mechanical Drives

Q2: Gear drive provide _____ speed ratio compared to belt and chain drives

1. Variable

2. Constant ✓



QUIZ

Gears and other Mechanical Drives

Q3: Gear drive have _____ power transmission capacity than belt and chain drives

1. Lower

2. Higher ✓

QUIZ

Gears and other Mechanical Drives

Q4: Extremely low velocities are possible for which type of drive?

1. Gear ✓
2. Belt
3. Chain

QUIZ

Gears and other Mechanical Drives

Q5: Which type of drive has highest efficiency?

1. Gear ✓
2. Belt
3. Chain

QUIZ

Gears and other Mechanical Drives

Q6: Which type of drive need precise shaft alignment?

1. Gear ✓
2. Belt
3. Chain

Types of gears

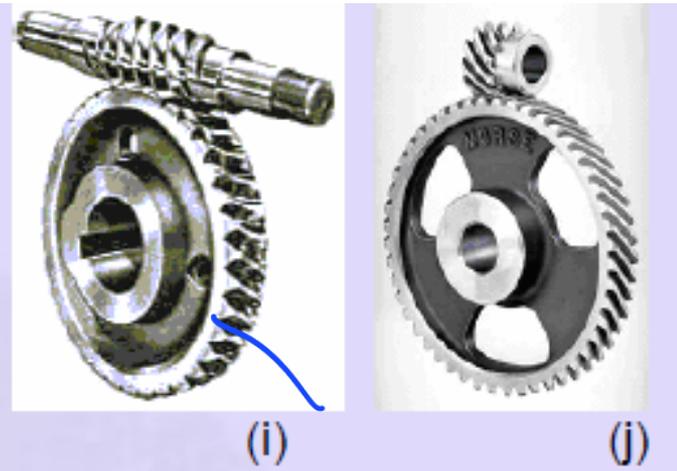
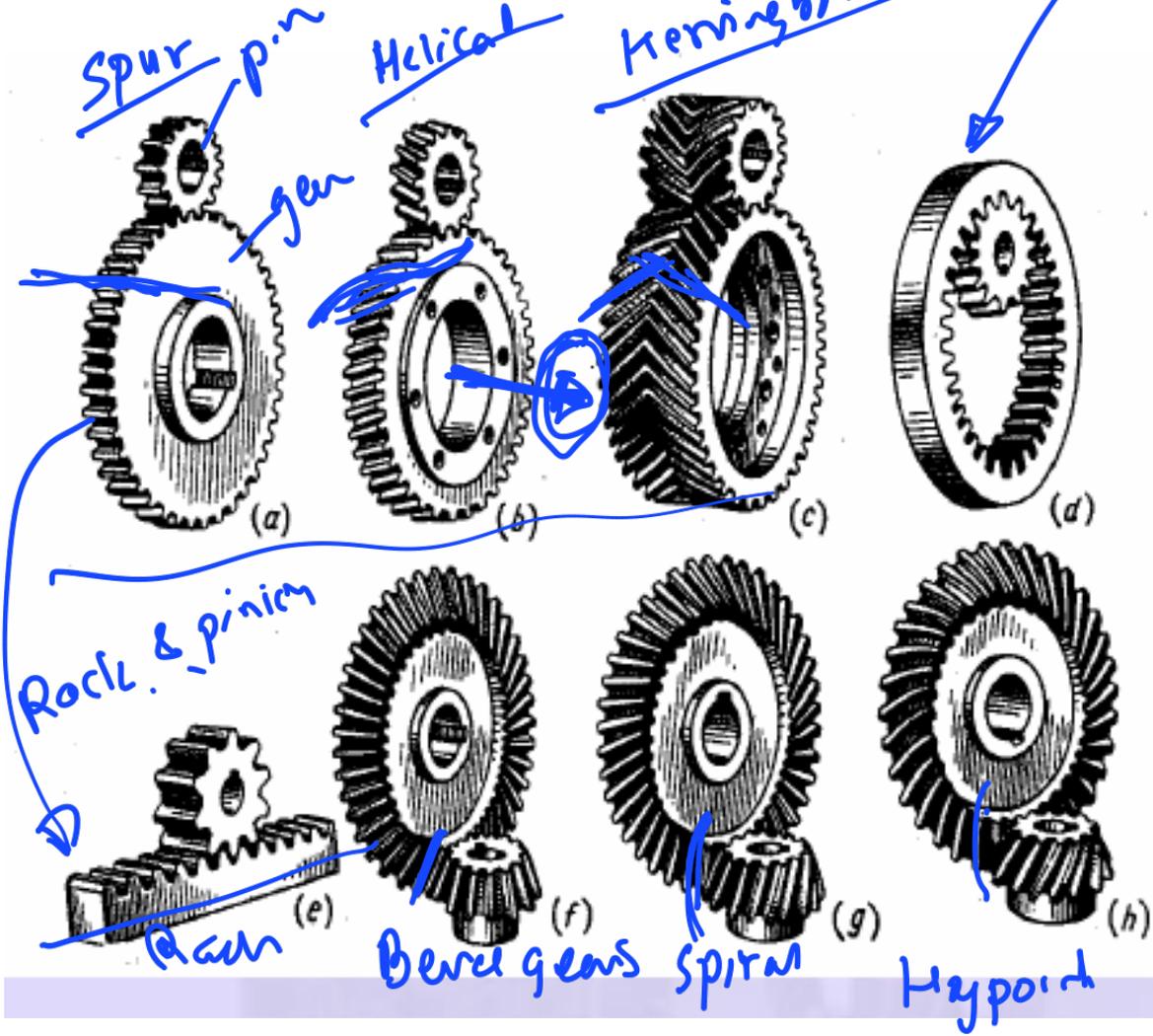


Fig. 1.6 (a) Spur gear, (b) helical gear, (c) Double helical gear or herringbone gear, (d) Internal gear, (e) Rack and pinion, (f) Straight bevel gear, (g) Spiral bevel gear, (h) Hypoid bevel gear, (i) worm gear and (j) Spiral gear