

ME 822 ADVANCED DESIGN OF PARALLEL AXIS GEARS

1. TOOTHED GEARING FUNDAMENTALS

Principles of transmission and conjugate action, **Characteristics of involute curve**, involute curve and gear tooth profile, characteristics of cycloidal curves, cycloidal gears. *Principles of tooth engagement*- Contact in a plane, cylindrical pitch surfaces.

2. ANALYTICAL AND CONTACT GEOMETRY

Profile shift, rectangular coordinates, tooth-thickness modification coefficient, virtual number of teeth, standard and extended centre distance for spur and helical gears. Modes of relative surface motion, contact-velocity relationships. *Spur gears*-Addendum contact ratio, contact ratio factor, addendum ratio, trimming, radii of curvature, contact velocities. *Helical gears*-Zone of contact, calculation of transverse, normal and axial contact ratio, true length of contact line, radii of curvature, contact velocities.

3. GEAR TOOTH LOAD AND STRESS

Loads on spur and helical gear tooth, contact line loading in spur and helical gears, tooth deflection, single and double pair contact, bending and torsional deflections, dynamic loading. *Bending stress*- Choice of critical section and load point, calculation of bending stress, tip strength factor, Strength factor for other points. *Contact stress*- Hertzian compressive stress, subsurface stress and depth with cylinders in contact. Contact stress calculation in spur and helical gears.

4. DESIGNED LIFE AND EFFICIENCY

Equivalent life, multiple contact, duty cycle, general case of varying torque and speed. Rate of cooling, prediction of equilibrium temperature, estimation of efficiency from temperature rise, instantaneous efficiency, efficiency over engagement cycle, tooth loss factor in spur and helical gears, coefficient of friction and condensed formula for tooth loss.

5. GEAR FAILURES AND CAUSES

Classification of gear-tooth failure- fractures, surface failures due to internal stress, surface damage following oil break down, causes of failure.

Reference Books

- 1.H.E. Merritt-Gear Engineering
- 2.Gitin M Maitra- Handbook of gear design
- 3.Darlie W. Dudley - Handbook of Practical Gear Design