

Mechatronics:

## Mechanical Elements, especially, “motion Conversion Elements”

1. Gears (Transmission between parallel axes)
2. Gears (Transmission between non-parallel axes)
3. Planetary gears
4. Continuously variable (CV) Drives
5. Harmonic Drive
6. Couplings
7. Hydraulic couplings
8. Flexible shafts
9. Clutches (Transmission)
10. Unidirectional or free-wheeling clutches
11. Toothed belts
12. Chains and sprockets
13. Ball screws
14. Linear motion guides
15. Bearings with sliding contact (Hydrostatic and hydrodynamic lubrication)
16. Bearings with rolling contacts
17. Planar 4-bar mechanisms
18. Spatial 4-bar mechanisms
19. Springs
20. Dampers

21.Fastening Screws

22.Non-threaded fasteners (keys, dowels, split pins, circlips.....)

23.Machining processes and Machine tools.

24.Fits and Tolerances

## Electronic Elements :

1.Diodes (Types, characteristics, Application examples)

2.BJTs (Types, characteristics PNP, Application: Linear Amplifiers & Switching

3.FETs (Types, characteristics, Application: Linear Amplifiers and switching)

4.High current switching devices: Thyristors, Triacs, GTOs, IGBTs

5.Operational Amplifiers: Basics, need for feed-back, Inverting and Non-inverting configurations

6.Operational Amplifiers: Applications as Comparator, summing amplifier, integrator, differentiator, function generator, buffer

7. Precision Instrumentation amplifiers: construction, types of errors, CMRR etc..

8.Logic gates: TTL, AND, OR, NAND, NOR, NOT, Exclusive OR, Combinational circuits

9. Sequential digital circuits: Flip-flops (different types and applications)

10. Schmitt trigger, 555 Timer IC (Construction and applications)

11.Signal processing: Analog to digital converters (Types and principles)

12. Digital to analog converters (types and principles)

13.Microprocessors (General Architecture and use)

14.Microcontrollers (General Architecture and use)

15. Digital Signal processors (General Architecture and applications)

16.Network topologies (Industrial Bus structures )

17. Communication protocols (for various types of communications)

18. Programmable logic controllers (Architecture, ladder diagrams)

19. Batteries as power sources (Types, characteristics, applications)