Lecture 1

0. Define Mechatronics. Draw and describe the basic elements of Mechatronics Engineering system.

1. What do you mean by microprocessor, microcontroller and embedded systems?
2. What do you mean by transient response and steady-state response? Describe with proper examples.
3. Draw and describe the components of measurement system.
4. Mention the steps how a digital thermometer works.
5. Mention the key differences between open-loop and closed-loop control system.
6. Draw and describe the basic elements of closed-loop system.

Lecture 2 and 3

1. Differentiate between sensor and transducer.
2. Differentiate between analog and digital sensor.
3. State the key features of a smart sensor.
4. Define the following terms:
5. Span
6. Hysteresis error
7. Non-linearity Error
8. Repeatability/Reproducibility
9. Stability
10. Dead Band/Time
11. Resolution
12. Accuracy
13. Precision
14. What do you mean by the following specifications?
15. A temperature sensor might have a range of -10°C to 100°C
16. A thermometer reads 25°C when the actual temperature is 24°C
17. A temperature-measuring instrument is specified as having an accuracy of ±2°C
18. A strain gauge having a sensitivity of 2 mV/V
19. Consider the significance of the terms in the following specification of a strain gauge pressure transducer:

Ranges: 70 to 1000 kPa, 2000 to 70 000 kPa

Supply voltage: 10 V d.c. or a.c. r.m.s.

Full range output: 40 mV

Non-linearity and hysteresis: ±0.5% of full range output

Temperature range: -54°C to +120°C when operating

Thermal zero shift: 0.030% of full range output/°C

Interpret the following specifications.

1. List and define the static characteristics of a sensor.
2. List and define the dynamic characteristics of a sensor.

Lecture 4 and 5

1. Write the differences between the followings
2. Si vs Ge
3. Metal, Semiconductor, Insulator
4. Intrinsic and extrinsic semiconductor
5. P-type and N-type semiconductor
6. Diffusion and drift current
7. Inductor and Capacitor
8. Analog and Digital electronic circuit
9. Short circuit and Open circuit
10. KVL and KCL
11. Current divider rule and voltage divider rule
12. Define the following terms:
13. Doping
14. Charge
15. Resistance
16. Potential Different
17. EMF
18. Voltage
19. Current