Hello students.

I'm Caje Francis Pinto, Assistant professor from Department of Electronics at St. Xavier's College. Mapusa Goa. Today we will be covering Unit 3: Signal conditioning and the name of the module is introduction of signal conditioning and the module number is 18. The outline of this module is as follows. Signal conditioner DC signal conditioner AC signal conditioner data acquisition and conversion system. Through this module, the students will be able to explain the working principle of a DC signal conditioning system. Explain the working principle of AC signal conditioning system and explain the working principle of data acquisition and conversion system. Let us begin with our module. The physical quantity is detected by the first stage of the instrument system, which is using a transducer the quantity is converted into an electrical form. This signal has to be modified before it becomes usable and should be sufficient enough to drive the signal indicating

stage. The last stage maybe indicating device or recording device, a display unit, or it can be any data processing elements. Now a small diagram is mentioned to you over here, the input device. Is there the physical or chemical quantity can be light intensity, temperature and concentration. These physical or chemical quantity is sensed by a input device which is used to convert into an electrical signal. So if you want to convert a light intensity you require a photomultiplier tube. If you require to measure temperature you require to use thermistor bridge and if you want to measure the concentration you need to use the electrodes. So these input device converts it into an electrical signal. Now in the electrical signal modifier, it is used to change or modify the signal strength. The output signal is very low, so in order to increase the strength we need to use an electrical signal modifier. That's a first important part. The second part is if you want to display to a particular recorder, the signal has to be modified. So over here the signal can be shown on the recorder. It can be shown on the analog meter. It can be shown on the display, which is digital. Or the value can be printed on the Digital printer.

Now signal conditioning equipment is required to perform different processes, so we have linear processes.INn linear processes we have amplification,patination integration, differentiation, addition or subtraction. Also it has to do nonlinear processes such as modulation, demodulation, sampling, filtering, clipping or clamping. So these are the different nonlinear processes.

Or passive transducer requires

external excitation. It requires external excitation because it does not generate its own voltage or current example are strain gauge, Resistance Thermometer or you can also talk about thermistors. Active Transducers do not require any external excitation. Why. because it generates its own voltage or current. Example is piezo electric transducer. Or you can talk about a thermocouple. But both passive and active producer requires amplification as the signal level is very very low. Now there are different types of signal conditioning system.

The first one, what will be covering up is a DC signal

conditioning system. Over here the transducer, which can be used is a resistance transducer of the Wheatstone Bridge, and it will always be excited with the DC excitation source. The bridge is balanced. using a potentiometer and also it is calibrated to indicate the unbalanced condition. Then the signal is amplified using a DC amplifier. To produce a sufficient output voltage, so therefore the signal is passed through a low pass filter Now we'll go to the next signal conditioning that is called as AC signal conditioning. Here, the transducer which are used is a variable resistance or inductance type. The output of the transducer is often given to the bridge and is connected as one arm of the bridge. The carrier oscillator frequency varies from 50 kilohertz to 200 kilohertz. So the output of the bridge circuit will be amplitude modulated carrier signal which is given to the calibration and zeroing network. So this is used for providing a zero output for a balance condition.

Now the AC amplifier is used to amplify the amplitude

modulated signal.

Then the signal is given to a phase sensitive detector. The phase sensitive demodulater filters out the carrier frequency components of the data. Finally, the low pass filter will remove the noise and the DC output indicates the direction of the parameter change in the average output. The disadvantage of using a AC signal can be system is. That it requires a stable carrier oscillator. In the next. Topic will be covering is a data acquisition and conversion system. Over here various analog signals from signal condition system is applied to four different sample and hold circuits. So first sample and hold circuit, second,3rd and 4th. This is called as an analog multiplexer. Analog multiplexer means you have many inputs and depending on the control signal one particular input will be selected to the output. This is a A/D converter which is used to convert analog voltage to digital voltage. And this is the control unit which is used to control the various components, such as analog multiplexer and sample

and hold the circuit.

So over here, the sample and hold samples, the various inputs at specified time and holds the voltage level at their outputs. The analog multiplexer performs the time division multiplexing operation between different data inputs. Time division multiplexing channel is sequentially Multiplex for a certain specified amount of time. Example, the channel is time shared. And the control unit controls the sample and hold circuit controls the analog multiplexer and as well as it controls the A to D converter. Now. Once the analog multiplexer selects the particular input, that is the analog signal the signal is given to the A to D converter, the analog signal is converted into digital and the output is produced in the form of digitized format so this is the working principle of a data acquisition and conversion

system. With this we come to the end of our module. These are the

references of the module.

Thank you.