Engineering Program

Specialty	**Instrumentation and Process Control**
Course Number	**20306111**
Course Title	**Pressure and Level Measurements**
Credit Hours	**3**
Theoretical Hours	**3**
Practical Hours	**0**

Brief Course Description:

- The course shall cover the different methods to measure the pressure of gasses, liquids and solid materials. Different level measurement methods shall be also treated. Calibration and installation of pressure and level instruments is also to be covered.

Course Objectives:

Upon the completion of the course, the student will be able to:

1. Calibrate pressure gauge using dead weight tester or standard pressure gauge.
2. Carry out the necessary repair and parts replacement of the different manometers and barometers.
3. Troubleshoot pressure-measuring instruments that incorporate resistive transducers, piezoelectric transducers and capacitive transducers.
4. Troubleshoot level measuring devices that incorporate potentiomeric transducers, and capacitive transducers.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Principles of pressure in liquids and gas pressure**	▪ Units of pressure, factors affecting liquid pressure, gauge pressure and absolute pressure, Gas pressure and Volume gas pressure and temperature. Atmospheric pressure, manometers and barometers	
2.	**Low pressure measurements**	▪ Vacuum, units of low pressure, pirani gauge, thermal conductivity gauge, mcleod gauge, ionization gauge and stack diaphragm gauge	
3.		▪ Force, stress and strain measurements, force Units, static force strain gauges measurements system for strain strain gauge, ½ and ¼ and complete bridge used for strain measurement. Weight and mass beam type and ring type load cells	
4.	**Principle of level measurements**	▪ Measuring liquid level ▪ Storage tank gauges ▪ Sight glasses ▪ Magnetic gauges ▪ Buoyancy and displacer gauges ▪ Level switches in high level tanks ▪ Photo electric level detectors ▪ Magnetic reed switches	
5.	**Measurement of level using pressure head**	▪ Hydrostatic pressure, pressure head	

	instruments	▪ Pressure head instrument ▪ Air purge measurement ▪ Liquid purge systems for level measurement ▪ Force balance diaphragm systems for level measurements	
6.	**Electrical methods for level measurement**	▪ Conductivity and liquid level ▪ Level measurement using capacitive transducers. Capacitance probes ▪ Capacitance probe electronics. ▪ Sonic level measurement ▪ Radiation level detection and measurement ▪ Potentiometric method for level measurement	
7.	**Solid level measurement**	▪ Sonic and microwave solid level measurement ▪ Using capacitance probes to measure solid level ▪ Using weight to determine level ▪ Using strain gauge to detect level	

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Final Exam	50%	--/--/----
Homework and Projects		10%	
Discussions and lecture Presentations			

Teaching Methodology:

- Lectures

Text Books & References:

1. Instrumentation, Franklyn W. Kirk; Nicholas R. Rimboi; American Technical publishers; Inc Third edition, lllinois, USA.
2. Instrumentation and process measurements W. Balton, Longman scientific and technical, 1991 U. K.
3. Measurements and Instrumentation in heat engineering. V. Preobrazhensky, Volume No (2): Mir publishers, 1978, Moscow, USSR.
4. Instrument technology. E. B. Jones, Newnes-Buttererworths; Volume 1, 1974. U. K.
5. Basic instrumentation, Industrial measurement. Patrick J. O'higgins; McGraw-Hill Book Corporation.
6. Mechanical and industrial measurement. R. K Jain; Khanna publishers; Delhi.

Program Engineering

Specialty	**Instrumentation and Process Control**
Course Number	**20306112**
Course Title	**Pressure and Level Measurement Lab**
Credit Hours	**1**
Theoretical Hours	**0**
Practical Hours	**3**

Brief Course Description:

- The student shall carry out the required experiments demonstrating different methods of level and pressure measurement by using capacitive and resistive transducers. LVDT is used also for level and a pressure measurement, calibration of pressure gauges by using dead weight tester is practiced.

Course Objectives:

Upon the completion of the course, the student will be able to:

1. Practical calibrate the pressure gauges.
2. Practical investigate the different methods for pressure and level measurements.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.		▪ Using of U-type shaped manometers with open and closed limbs for pressure and differential pressure measurements	
2.		▪ Measurement of low pressures and their amplification, by using inclined manometers with a storage bulb	
3.		▪ Calibration of pressure gauges by using dead-weight tester	
4.		▪ Measurement of liquid level in closed tanks by using pressure gauges	
5.		▪ Measurement of pressure by using capacitive sensors	
6.		▪ Measurement of pressure by using variable resistance	
7.		▪ Measurement of pressure by using LVDT	
8.		▪ Measurement of level by using capacitive transducer	
9.		▪ Measurement of liquid level by using variable resistance	
10.		▪ Measurement of liquid level by using LVDT	

Evaluation Strategies:

Exams		Percentage	Date
Exams	Reports	30%	--/--/----
	Midterm Exam	20%	--/--/----
	Final Exam	50%	--/--/----

Teaching Methodology:

- Laboratory

Text Books & References:

1. Systems laboratory manuals, TQ instruments, SL10, SL30, SL60. England.
2. Teknikit technology tutor, Feed back instruments limited Kit3 tranceducers. England.