# Refinery and Petrochemical engg

6th Sem **Instrumentation and Refinery process control**

CO-I To understand the basic principles involved in measurements

LO-I To acquire the basic knowledge of an instrument

Content - Importance of instrumentation and control in processing industries, Measurements and measuring instruments, methods of measurement, elements of an instruments, function of an instruments, classification of an instruments.

~~LO-2 To analy~~

Method of assessment - External theory exam hrs - 8 Marks-10

LO-2 To analyze the characteristic of an instrument

Content - Static characteristics - Accuracy and static error, span, range, error calibration and error curve, reproducibility and drift, sensitivity, dead zone, hysteresis, Dynamic characteristics - speed of response, lag, Fidelity, dynamic error, order of an instrument.

Method of assessment - External theory exam hrs - 5 Marks-5

LO-3. To estimate error calibration for instruments

Content - Error calibration of flow meters, Error calibration of temperature measuring devices.

Method of assessment - External Practical hrs - 8 Marks - 10

CO-2. Use temperature measuring instruments for appropriate industrial application.

LO-4. To operate liquid in glass thermometer for given application in refinery plant

Content - Thermodynamic temperature scales, principle

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construction and working of liquid in glass thermo-meter, characteristic of liquid used in glass thermo-meter, immersion and deflection effect, limitations of liquid in glass thermometer

Method of assessment - External theory exam hrs - 5 Marks - 5

LO-5. Acquire the basic knowledge and understanding of pressure spring thermometer.

Content - Principle, construction and working of pressure spring thermometer, Ambient temperature effect and their compensation, Head and barometric effect. Bimetallic thermometer, Resistance temperature detector, Industrial resistance thermometer, resistance thermometer circuits, thermistors

Method of assessment - External theory exam hrs - 7 Marks 10

CO-3. Choose the relevant instrument to measure the temperature of given system.

LO-6. Identify the importance of thermocouples in petrochemical plants.

contents - Thermocouples, Laws governing the applicati-ons of thermocouples, thermocouples material and classification, measurement of thermocouple output, millivoltmeter and null potentiometer, Lead wire, thermal well

Method of assessment - Internal Mid Sem Test hrs - 7 Marks - 10

LO-7. select appropriate pyrometer for temperature

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measurement

Content - Laws of radiation, Black body devices and heated body in a black body cavity, Radiation receiving elements; thermopile, vacuum thermocouple, bolometer, Radiation, Photoelectric and optical pyrometer.

Method of assessment: External theory exam hrs-7 marks-10

LO.8 To measure high temperature in refinery industries.

Content - Measurement of temperature by radiation pyrometer

Method of assessment: Internal Practical (Labwork) hrs-6 Marks-10

CO.4 - Choose the relevant instrument to measure differential ~~and~~ ~~hi~~ pressure, high pressure and level.

LO-9. Acquire the fundamental concept of different differential pressure measurement devices.

Content - Principle, Construction, working and applications of simple, inclined leg, enlarged leg and well type manometer, Uses of manometer, Manometric fluid, Simple problems.

Method of assessment - Internal Mid Sem Test hrs-5 Marks-10

LO-10. Operate appropriate pressure measuring device in the given situation.

Content - Mechanical pressure transducer: Bourdon and its different types, Diaphragms and Bellows, Measurement of absolute pressure by simple and double bell

pressure measurement in corrosive fluids, vacuum measurement, Mchead gauge, pirani gauge

Method of assessment: External theory exam. hrs - 8 marks - 10

LO-11. Induce analytical and empirical approach to ~~the~~ level measurement problems in industry.

content - Direct level measurement : Float and tape measurement, Float and shaft measurement, slight glass measurement. Indirect level measurement : Bubbler system, Diaphragm box, Air ~~tape~~ trap system, , level measurement in pressure vessel, measurement of interfacial level

Method of assessment: External theory exam hrs - 5 marks - 5

LO-12 - To measure fluid level in petrochemical plants.

content - Measure level by float type level meter, Determine the level of the liquid in the tank using air-purge method.

Method of assessment: External Practical hrs - 8 Marks - 10

CO 5. ~~Apply~~ Identify appropriate method for density and composition analysis and modes of controller required for process system.

LO-13. Understand the primary features and importance of density measurement systems.

content - Density measurement : Liquid level method, ~~Liquid~~ Displaced method, hydrometer method.

Method of assessment - Internal sessional (Term work) hrs - 5 Marks - 10

LO-14. Select correct analysis method for sample ana-

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lysis in refinery industries.

content - Composition analysis : brief treatment of absorption Emmisi Emission and Mass spectroscopy, Gas Chromatography, thermal conductivity method, Ph meter, Humidity measurement : Hygrometer and psychrometer.

Method of assessment : External theory exam. hrs - 5 Marks - 5

L.O-15. Evaluate the performance of control system with appropriate controllers

content - control system and elements, Block diagram, on-off control, feed back and feed forward control, open and close loop, proportional, proportional integral, proportional derivative controller, proportional integral derivative controller Reset, Rate control, automatic control, pneumatic, electric and hydraulic controllers.

Method of assessment : External theory exam hrs - 8 Marks - 10

LO-16. To measure density and moisture in process industries.

content - Measure density by density bottle method, determine moisture by Karl-Fisher apparatus

Method of assessment - External Practical hrs - 7 Marks - 10

LO-17 - Understand the concept of the control loop system.

content - study of level control loop system and temperature ~~loop~~ control loop system.

Method of assessment - Internal Practical (lab work) hrs - 6 Marks - 10