GUJARAT TECHNOLOGICAL UNIVERSITY

Plastic Technology

B. E. SEMESTER: VI

Subject Name: **Plastic Process Instrumentation and Process Control**
Subject Code: **162303**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
3	0	3	6	70	30	50

Sr. No.	Course Contents	Total Hrs
1.	**Introduction:** Process control and its importance; need for instrumentation; need for controllers; terminology **[A] Measurements:** role of instruments, range, error, accuracy, precision,sensitivity, resolution, block diagram of instrumentation system. **[B] Pressure measurement. :** Pneumatic pressure transducers; Mechanical Consideration, Specifications, Comparison of different transudes **[C] Temperature measurements. :** Methods of temp measurement. Barrel temp Measurement; Stock temp measurement. Ultra sound transmission line. **[D] Other measurements. :** Power measurement.; Rotational speed measurement.; Extrudate thickness.; Extrudate surface condition	12

2.	**Controllers:** • Temp controllers-analog & digital. • Power controllers. • Dual output controllers. **Time temp characteristics:** • Thermal characteristics of systems. • Modeling of responses. • Temp. Characteristics. **Tuning of the controller parameters:** • Performance criteria. • Effect of PID parameters. • Pre tuned temp controllers. • Self tuning temp controllers.	10
3.	**Injection molding process controls:** • Mould cycles –Machinery used-parts and functions-starts-up and shut down procedures-cylinder nozzles-press capacity projected area • On machine monitor • Temperature control of barrel and melt • PID in pre controller • Relating process control to process parameters • Adaptive ROM programmable • Simplified approach to undesirable process control • Process control techniques • Total injection molding proc. Control.	12
4.	**Extrusion molding process controls:** • Instrumentation requirements, most important parameters • General features of extruders viz. barrel, screw, types of screws, drive mechanism, specifications, heating and cooling systems, • Pressure measurements : Importance of melt process, different types of pressure transducers, mechanical consideration, specifications , comparison of different transducers • Temperature measurements: method of temp. Measurements, barrel temp. measurements, stock temp measurements • Other measurements: Power measurements, rotational speed, Extrudate thickness, Extrudate surface conditions • Temp. Control: On Off Control, Proportional control- controllers –time temp. characteristics – tuning of controller parameters • Total process control : True total extrusion process control	10

5.	**Blow molding process controls:** • Controls for blow molding • Machine controls : Temperature , Placement of sensors, Dual sensors • Control characteristics : On/off , Proportional controls, Automatic reset • Types of sensor: Thermocouple, Resistance temp. detectors (RTD) • Automatic tuning • RPM speed regulation • Timing and sequencing • **Process controls :** Melt temp process control , melt pressure, melt pump, parison programming, parison length control, product control, weight control, thickness controls, Plant wide control and management • **Screw and Plunger Systems** – Cross head die design – Blow moulding machine feauters and operation including hydraulic and electrical control systems-faults, causes and remedies, • Parison programming, blow mould construction, cooling methods, mould venting, blow moulding of difficult articles like fuel tanks, odd shaped containers with handles.	10

Text Books:

1. Injection molding Handbook : Rosato and Rosato
2. Polymer Extrusion : Rauwendaal
3. Blow molding handbook : Rosato

Reference Books:

1. Blow molding handbook : Lee
2. S.P.Singh : Industrial instrumentation & control.
3. J.d.lenk; hand book of controls & instrumentation; prentice-hall corp.
4. P.d. roberts; measurement & control.
5. C.l. smith; instruments & control systems.
6. Plastic industry safety handbook-s.p.e.