(4 Lect./Week)
(4 hrs. Lab/Week)
(1 Student's presentation /Week) **(Total Credits -7)**

Paper 9: Polymer Testing

1. Principles and methods of standardization, statistical method of analysis. Standards: BIS standards – BIS standards of few polymers. ASTM standards – ASTM standards of few polymers. Evaluation of errors in polymer testing.
2. Mechanical properties: Thermal and mechanical analysis of polymers
   (a) Short term strengths: Tensile, Flexural, Impact, Tear resistance, Abrasion etc.
   (b) Long term strengths: Creep and fatigue properties.
   (c) Thermal properties: Thermal conductivity, thermal diffusivity, specific heat capacity, linear thermal expansion, heat distortion temperature, vicat softening point, low temperature flexibility etc.
3. Flow properties: Melt flow index, cup flow test, solution and inherent viscosity, melt viscosity etc.
4. Flammability properties: Oxygen index, critical temperature index, smoke density, flammability tests etc.
5. Optical properties: Gloss, haze, refractive index, degree of yellowness etc.
6. Permeability: Definition, permeability to gases, standard methods of measuring, permeability of gases, other methods of measuring permeability. Environment resistance – cause of deterioration of polymer by weathering, assessment of deterioration, natural weathering, artificial weathering. Chemical resistance.

Practical - Polymer IV:

1. Determine the melt flow index of LLDPE, PP etc.
2. Evaluate limiting oxygen index (LOI) of Poly(vinyl chloride) and Nylon- 6.
3. Determination the Heat Distortion Temperature and Vicat softening temperature of polymer film.
4. Measurement of abrasion resistance of polymer sheets.
5. Determination the coefficient of friction and izod Impact strength of PVC and PP samples.
6. Determination of environment stress cracking resistance of PE/PP films.
7. Determination of Shore Hardness of plastics.

Suggested Readings:

1. Handbook of Plastic Testing & Technology by V. Shah, Wiley-Interscience (2007).
2. Rubber Technology Handbook by Martin and Smith, Smithers Rapra Technology (2009).
3. SPI Plastic Engineering Handbook by M.L. Berins. Springer-Verlag (1991).
4. An Introduction to the Mechanical Properties of Solid Polymers by I. M. Ward and J. Sweeney, Wiley (2004).