PLPC2005 ADDITIVES & COMPOUNDING (3-0-0)

Course Objectives: Explain the importance of compounding ingredients in plastics and get detailed knowledge about the ingredients. Also to create plastic products through various compounding equipment.

Module- I (09 Hrs.)

Introduction – limitations of polymeric materials – Technological Requirements of additives for plastics and its properties – classification – types – chemistry and mechanisms Limitations, selection criteria, general effect on properties.

Module- II (09 Hrs.)

Additives for plastics- Fillers – Antioxidants–Thermal Stabilizers, Impact Modifiers, Lubricants-Plasticizers, Toughening-agents-Colourants- master batch – color matching-Fire retardants- Coupling agents-blowing-agents-Ultraviolet Stabilizer-Antistatic Agents-Anti blocking agents-Slip and antislip agents-processing aids-mould releasing agents– miscellaneous additives- Commercially available fillers and additives.

Module- III (09 Hrs.)

Mixing and mixing equipments- General consideration formulation methods of incorporation of additives and mixing and compounding basic concepts, mechanism of mixing and dispersion Principles of mixing– Operating characteristics – Machine construction – Specifications – Process control systems and working details of Batch mixers and continuous mixers – High speed mixer – Two roll mill – Banbury Mixer – Ribbon blender – Planetary mixers –Twin screw extruders (co rotating / counter rotating).

Mixing methodologies: Types of Mixing, Dispersive/Distributive, Agglomerates, mixing of solid additives, mixing of liquid additives, Difference between mixing and compounding, etc.

Module- IV (09 Hrs.)

Selection of Polymers and Compounding ingredients – Introduction, types and characteristics of compounds – polymer blends and alloys, polymer formulations, compounding practice – selection of polymer – selection of compounding ingredients – methods of incorporation of additives into polymeric materials, General objectives – possibilities and limitations of mixing and compounding –Methods of incorporation of additives into polymer materials, Mixing- continuous compounding machinery, safety precaution.

Module- V (09 Hrs.)

End Use Market for Blended Plastics - Principles of Material selection including consideration of conventional materials competitive with plastics. Survey and uses of plastics additives with reasons for their importance in major industries like, Agriculture, Packaging, Building, Transport, Electrical, Electronics and Telecommunications, Medical and Furniture.

Books:

George Mathews, “Polymer mixing technology”, Applied science, London,1984

•Gatcher and Muller, “Handbook of Plastics Additives”, Hanser Publishers, New York.

•Al – Malaika; S. Golovoy; A and Wilkie (Eds), Chemistry and Technology of Polymer Additives, Black well Science Ltd, Oxford (1999)

•Matthews; F.L.and Rawlings; R.D, Composite Materials, Engineering and Science Chairman and Hall, London (1994)

Course outcomes: After the completion of this course, students will be able to:

CO1 Remember: Recall the different types of processing equipment used for manufacturing plastic product of specific design.

CO2 Analyze and create: To find possibilities and limitation of additives into polymer matrices.

CO3 Understand: The markets and applications of compounded plastics.

CO4 Evaluating: Justify suitable additives composition for particular applications and recommend the cost-effective formulation.

CO5 Analyze: Categorize the methods of the preparation, properties and application of Polymer composites and plastic products