

PLPC3001 PLASTICS PROCESSING TECHNOLOGY (3-0-0)

Course Objectives:

This course enables the students to: Outline the steps of specific process to manufacture a specific product, identify the various parts of the machine and explain the function of it. Able to predict the reasons behind specific product defect. They can explain both practical and theoretical fundamentals of injection moulding and extrusion technology, including basic knowledge of the moulding techniques.

Syllabus

Module-I: (16 hour)

Injection moulding, Compression moulding & Transfer moulding

Introduction to Injection moulding –Principles- Types of Injection moulding-Process parameters - Mould cycle – Moulding Machine–Specifications - Construction and maintenance –Mould setup- machine startup and shut down-process troubleshooting.

Introduction to Compression moulding- principles - Bulk factor and flow properties moulding materials, process variables-Curing time- Mould temperature and Pressure requirements- preforms and preheating- common moulding faults and their correction-Finishing of moulded product. Fundamental principles of transfer moulding-advantages over compression moulding Equipment used- pressures requirements -Line pressures- Injection ram pressure clamping-Heating Requirements- Moulding faults - causes and remedies.

Module-II: (16 hour)

Extrusion, Blow moulding, Thermoforming

Basic principles of extrusion – Types of extruders, extruder parts-polymer flow mechanism, die entry effects and exit instabilities-melt fracture &Bambooing. Factors affecting the output of an extruder, process variables in extrusion-downstream equipment for the production of films, blown film, cast film/slot film, BO film, coextruded film. Tube/pipe-sizing take off equipment, extrusion coating, wire & cable covering

Injection and extrusion blow moulding processes, accumulation blow moulding, processing parameters-materials requirements-blow moulding machine features and operation -faults, causes and remedies-parison programming, blow moulding of difficult articles like fuel tanks, odd shaped containers with handles, limitation in blow moulding,

Basic principles and types of thermoforming processes, Thermoforming moulds and processing parameters—faults, causes and remedies.

Module-III: (13hours)

Calendaring, Rotational molding and FRP & Laminates

Calendaring - principle and process description- types of calendar units -design of calendar roll, Heating and temp control, roll crown, roll crossing and roll bending -calendaring sheets and films, embossing, coating and lamination by calendar, comparison between calendaring and extrusion. Introduction-principle-process-machinery used-materials-moulds process parameters-merits & demerits of rotational molding. Introduction, FRP Processing methods- hand layup-spray up -vacuum bag & pressure bag moulding, filament welding – pultrusion- matched die moulding.

Course outcomes:

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

- CO1: Remembering: Choose the corresponding process to be used to manufacture a specific product from suitable polymers.
- CO2: Understanding: Compare the methods of different processing techniques for product manufacture with a given set of plastic materials for the specific use
- CO3: Apply: Apply most modern technology to modify the process variables on the existing machine to manufacture a specific plastic/ rubber/composite product
- CO3: Analyze: Inspect the defects in plastic products, examine the product quality in terms of machine parameters and list professional engineering solutions as remedies which will be sustainable and economical
- CO4: Evaluate: Explain processing difficulties and estimate numerical problems related to polymer processing
- CO5: Understand: the processing methods such as injection, compression, blow moulding, thermoforming, calendaring, rotational molding and FRP & laminates

Text Book

- 1. Injection Molding Theory & Practice , Irvin I. Rubin, Wiley-Interscience (1973)
- 2. Injection Molding Hand Book Third Ed., D.V Rosato, D.V. Rosato& M.G. Rosato, Kluwer academic publishers (2000)
- 3. Plastics: Material & Processing, A. Brent Strong, Third Ed., Prentice Hall (2005)

Reference

- 1. A Guide to Injection Molding of Plastics, P.C. Bolur, allied Publishers (2000)
- 2. Development in Injection Molding, Ed. Whelan, Elsevier (1985)
- 3. Plastics Materials & Processing – S.S.Schwartz and S.H.Goodman, Nostrand Reinhold (1982)
- 4. Injection Molding, A.S. Athalye, second Ed. (1997).
- 5. INJECTION MOULDING OF PLASTICS:A USER GUIDE Klockner Winsor India Ltd(1994)
- 6. Innovation in Polymer Processing - By Stevenson
- 7. Extrusion The definitive Processing Guide and Hand Book - By Giles, H.H &Others
- 8. Compression Molding - By Iyesew, A.I
- 9. Polymer Extrusion - By Rauwedaal, Chris
- 10. Thermoforming - By James & Throne
- 11. Basic Principle of rotational molding - By Crawford, R.J & Throne, J.L
- 12. Basic Principle of Rotational Molding - By Bruins
- 13. Basic Principle of Thermoforming - By Bryce, D.M
- 14. Plastics Injection Molding - By Bryce, D.M
- 15. Injection molding of Plastics component - By Bown John
- 16. Plastics Mold Design Vol.1 Compression & Transfer Moulds - By Bebb
- 17. Plastics forming - By Beadle
- 18. Calendaring of Plastics - By Elden & Swan