The book *Fundamentals of Plastics Mould Design*, has been written explicitly to meet the requirements of B.E./B.Tech./M.E./M.Tech. courses of Plastics/Polymer Technology branches with the perspective of enlightening students about the plastics mould design. It also meets the requirements of Diploma in Plastics Mould Technology and Diploma in Plastics Technology students. Post-diploma in Plastics Mould Design and Postgraduate diploma in Plastics Processing and Testing course trainees also will be benefited.

Being a book on mould design, it covers the design aspects of Injection Mould, Compression Mould, Transfer Mould, Blow Mould and Extrusion. In addition to the fundamental design concepts this book also covers the recent technologies like CAD/CAM/CAE applications in the field of product and mould design.
## Contents

### Preface

1. Product Design
   1.1 General Product Design Concept
   1.2 Designing for Plastics
   1.3 Wall Thickness
   1.4 Parting Line
   1.5 Ribs, Bosses or Gussets
   1.6 Radii and Fillets
   1.7 Taper or Draft
   1.8 Holes
   1.9 Coring
   1.10 Undercut
   1.11 Threads
   1.12 Inserts
   1.13 Gate Size and Location
   1.14 Location of Ejector Pins
   1.15 Tolerance
   1.16 Fastening
   1.17 Shrinkage
   1.18 Surface Finish
   1.19 Designing with Plastics for Load Bearing Applications
   1.20 Tooling Aspects on Product Design
   1.21 Processing Variables Vs Product Design
   1.22 Mechanical Properties
   1.23 Product Design for Composites
   1.24 Modern Approaches to Product Design

2. Injection Mould Design
   2.1 Introduction
   2.2 Selection of Machines
   2.3 Parting Line and Parting Surface
   2.4 Mould Venting
   2.5 Feed System
   2.6 Ejection System
   2.7 Temperature Control System
   2.8 Methodical Approach to Mould Design
   2.9 Split Mould

3. Compression Mould Design
   3.1 Introduction
   3.2 Compression Moulding Processes
   3.3 Thermo-set Plastics Materials and Product application
4. Transfer Mould Design

4.1 Introduction
4.2 Types of Transfer Moulds
4.3 Pot Transfer Moulds
4.4 Plunger Transfer Mould
4.5 Transfer - Pot Calculations
4.6 Mould Heating
4.7 Selection of Moulding Method-Compression or Transfer
4.8 Economic Determination of the number of Cavities
4.9 Design of Sprue, Runner and Gate
4.10 Venting
4.11 Number of cavities
4.12 Advantages and Disadvantages of Transfer Moulding
4.13 Comparison of Compression and Transfer moulding
4.14 General Mould Design Check List
4.15 Introduction to Thermo-set Plastic Materials
4.16 Trouble Shooting and Quality Assurance
4.17 Mould Material and its Selection

5. Advanced Injection Mould Design

5.1 Moulds for Threaded Components
5.2 Hot Runner Mould
5.3 Outsert and Insert Moulding
5.4 Multicolour Injection Moulding
5.5 Gas-Assisted Injection Moulding
5.6 Stack Mould
5.7 Reaction Injection Moulding (RIM)
5.8 Casting
5.9 Resin Transfer Moulding (RTM)
5.10 Structural Foam Moulding
5.11 Lamination

6. Blow Mould Design

6.1 Introduction - Blow Moulding Process
6.2 Blow Mould Terminology 6-3
6.3 Applications of Blow Moulded Parts 6-3
6.4 Blow Mould Part Design Parameters 6-4
6.5 Blow Moulded Part Design Considerations 6-5
6.6 Container Design Features 6-7
6.7 Design Details 6-8
6.8 Special Considerations for Bottle Design 6-9
6.9 Plastics materials for Blow Moulding 6-10
6.10 Types of Blow Moulding 6-12
6.11 Extrusion Blow Moulding Process 6-12
6.12 Injection Blow Moulding 6-30
6.13 Injection Stretch Blow Moulding Process 6-36

7. Extrusion Dies 7-1
7.1 Introduction 7-1
7.2 Characteristics and Property of Plastic Materials 7-1
7.3 Flow Properties of Solid Polymers 7-2
7.4 Flow Properties of Polymer Melts 7-2
7.5 Effect of Temperature and Pressure on Viscosity 7-4
7.6 Thermal Properties 7-4
7.7 Principles of Extrusion 7-5
7.8 Classification of Dies and Die Geometry 7-10
7.9 Types of Dies 7-17
7.10 Blown Film Dies 7-32
7.11 Flat Film and Sheet Dies 7-37
7.12 Wire and Cable Coating Dies 7-40
7.13 Die Making 7-42
7.14 Heating System Temperature Control 7-43
7.15 Maintenance and Cleaning of Die 7-45
7.16 Die Fabrication 7-45

8. CAD/CAM Applications in Mould Design 8-1
8.1 Introduction to Computers 8-1
8.2 Computer Fundamentals 8-8
8.3 Memory 8-13
8.4 Communication Devices 8-19
8.5 Principles of Programming 8-31
8.6 Interactive Computer Graphics 8-38
8.7 Database Management 8-44
8.8 Computer Networking 8-47
8.9 Basic Concepts of CAD 8-48
8.10 Two-Dimensional Drafting 8-53
8.11 Three-Dimensional Modelling 8-57
8.12 Concepts of Engineering Database 8-65
8.13 Advanced CAD/CAM Technologies 8-67
8.14 Computer Aided Engineering 8-82
8.15 Introduction to CAM 8-90
8.16 Numerical Control
8.17 Part Programming
8.18 Computer Numerical Control
8.19 Direct Numerical Control
8.20 Adaptive Control
8.21 Computer Integrated Manufacturing
8.22 Advanced CAM Techniques