

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**COURSE CURRICULUM**  
**COURSE TITLE: PLASTICS EXTRUSION TECHNOLOGY**  
**(Code: 3342304)**

| <b>Diploma Programmes in which this course is offered</b> | <b>Semester in which offered</b> |
|---|----------------------------------|
| Plastic Engineering                                       | 4 <sup>th</sup> Semester         |

### 1. RATIONALE

Plastics extrusion technology is the most widely used processing technique for plastic materials. A polytechnic diploma engineer has to use this technology in the extrusion machines and production process of various extruded products. The knowledge of extrusion technology will also help to understand and develop advance extrusion processes. Hence the course has been designed to develop this competency and its associated cognitive, practical and affective domain learning outcomes.

### 2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **Operate various extrusion plants to obtain production of desired quality (by setting process parameters)**

### 3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- Sketch the extruder.
- Set up the process parameters
- Operate the extruder machine.
- Design extruder screws for different plastic materials.
- Calculate the capacity of an extruder.
- Judge the quality of an extrudate.
- Perform finishing operations.
- Operate auxiliary equipments.

### 4. TEACHING AND EXAMINATION SCHEME

| Teaching Scheme<br>(In Hours) |   |   | Total<br>Credits<br>(L+T+P) | Examination Scheme |    |                    |    | Total<br>Marks |
|-------------------------------|---|---|-----------------------------|--------------------|----|--------------------|----|----------------|
|                               |   |   |                             | Theory Marks       |    | Practical<br>Marks |    |                |
| L                             | T | P | C                           | ESE                | PA | ESE                | PA | 200            |
| 3                             | 0 | 4 | 7                           | 70                 | 30 | 40                 | 60 |                |

**Legends:** L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit ESE - End Semester Examination; PA - Progressive Assessment.

## 5. DETAILED COURSE CONTAINTS

| Unit  | Major Learning Outcomes<br>(in cognitive domain)  | Topics and Sub-topics   |
|---|---|---|
| <b>Unit – I<br/>Extruder<br/>Machine</b>      | 1a. Classify extruder machine.<br>1b. Identify various parts of an extruder machine.  | 1.1 Machine Specification and glossary of terms<br>1.2 Classification of Extruder Machines.<br>1.3 Types, Constructional Features and Function of<br>1.3.1 Screw<br>1.3.2 Barrel<br>1.3.3 Thrust bearing<br>1.3.4 Drive system<br>1.3.5 Hopper<br>1.3.6 Screen<br>1.3.7 Breaker plate<br>1.3.8 Heating system of screw and barrel<br>1.3.9 Cooling system of screw and barrel |
| <b>Unit – II<br/>Extrusion<br/>Process</b>    | 2a. Select appropriate material.<br>2b. Operate an extruder.<br>2c. Apply extrusion process for various products.<br>2d. Identify the problems during extrusion process | 2.1 Material characteristics and selection criteria<br>2.2 Types of Extrusion process: Dry and Wet<br>2.3 Melting process<br>2.4 Equation of output<br>2.5 Process variables<br>2.6 Start-up and Shut-down of extruder<br>2.7 Post extrusion techniques<br>2.8 Trouble shooting of Manufacturing Process<br>2.9 Applications – Products of Extrusions                         |
| <b>UNIT III:<br/>Extrusion<br/>Plants</b>     | 3a. Operate various extrusion plants.   | 3.1 Manufacturing Processes and Line Diagram of :<br>3.1.1 Film<br>3.1.2 Pipe<br>3.1.3 Sheet<br>3.1.4 Profile<br>3.1.5 Wire/cable<br>3.1.6 Monofilaments<br>3.1.7 Coating-lamination<br>3.1.8 Palletizing   |
| <b>UNIT IV:<br/>Auxilliary<br/>Equipments</b> | 4a. Explain working of various auxiliary equipments.  | 4.1 Automatic feeding<br>4.2 Automatic Screen<br>4.3 Rotating Die<br>4.4 Oscillating haul-off   |

## 6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

| Unit No. | Unit Title           | Teaching Hours | Distribution of Theory Marks |           |           |             |
|----------|----------------------|----------------|------------------------------|-----------|-----------|-------------|
|          |                      |                | R Level                      | U Level   | A Level   | Total Marks |
| I        | Extruder machine     | 16             | 10                           | 10        | 08        | 28          |
| II       | Extrusion process    | 12             | 10                           | 06        | 04        | 20          |
| III      | Extrusion plants     | 10             | 08                           | 04        | 03        | 15          |
| IV       | Auxiliary equipments | 04             | 04                           | 03        | 00        | 07          |
|          | <b>Total Hrs</b>     | <b>42</b>      | <b>32</b>                    | <b>23</b> | <b>15</b> | <b>70</b>   |

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

## 7. SUGGESTED LIST OF EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

*Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.*

| S. No. | Unit No. | Practical Exercises<br>(Outcomes' in Psychomotor Domain)                       | Hrs. Required |
|--------|----------|--|---------------|
| 1      | I        | Study of an extruder machine and prepare a report on it.                       | 04            |
| 2      |          | Prepare specifications of extruder machines available in the laboratory.       | 04            |
| 3      | II & III | Operate pipe extrusion plant with changing various process parameters.         | 08            |
| 4      |          | Identify processing problems on an extrusion pipe plant and suggest solutions. | 04            |
| 5      |          | Operate blown film extrusion plant with changing various process parameters.   | 08            |
| 6      |          | Identify processing problems on blown film plant and suggest their solutions.  | 04            |
| 7      |          | Operate pelletizing plant with changing various process parameters.            | 08            |
| 8      |          | Identify processing problems on pelletizing plant and suggest solutions.       | 04            |

|              |    |   |           |
|--------------|----|---|-----------|
| 9            |    | Set process parameters on sheet plant and operate it.                     | 08        |
| 10           |    | Identify processing problems on sheet plant and suggest solutions for it. | 04        |
| 11           | IV | Demonstrate various auxiliary equipments used in extrusion plant.         | 04        |
| 12           |    | Grind scrap materials.  | 04        |
| <b>Total</b> |    |   | <b>64</b> |

## 8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- i. Students will collect various extruded products like pipe, tube, wire/cable, film, monofilament etc. and would comment on their quality.
- ii. Students will collect information related to the extrusion process through internet.
- iii. Students will visit nearby extrusion industry.

## 9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Visit to nearby plastic industries engaged in extrusion.
- ii. Video/Animation films on working of different type of extrusion plant may be shown.
- iii. Mini project may be given to students on different defects in the various extruded products to find out reasons for these defects and possible remedies.

## 10. SUGGESTED LEARNING RESOURCES

### A. List of Books

| S. No. | Title of Book                             | Author                     | Publication                   |
|--------|---|----------------------------|-------------------------------|
| 1.     | Extrusion of plastics                     | E.G. Fisher                | The Plastics Institute        |
| 2.     | Extrusion                                 | Allen Griffith             |                               |
| 3.     | Plastics Extrusion technology handbook    | S.Levy                     | Industrial Press Inc., 1989   |
| 4.     | Handbook of Plastic Processing Technology | D.V.Rosato                 | Springer                      |
| 5.     | Plastics Extrusion Technology             | Fried helm Hence           | Hanser Publishers             |
| 6.     | Polymer Extrusion                         | Chris Rauwendaal           | Hanser Verlag                 |
| 7.     | Plastics Engineering Hand book            | J. Fradeos                 | Van Nostrand Reinhold Company |
| 8.     | Plastics Engineering Hand book            | M Berins                   | Springer                      |
| 9.     | Plastic materials and processes           | S.S.Schwartz & S.H.Goodman | Van Nostrand Reinhold Company |

**B. List of Major Equipment/ Instrument with Broad Specifications**

- i.Extrusion plants (Pipe, blown film, pelletizing/sheet plant)
- ii.Scrap grinders
- iii.Crane
- iv.Dies
- v.Chilling unit
- vi.Weighing scale
- vii.Cooling tower
- viiiAutomatic feeder

**C. List of Software/Learning Websites**

- i. <http://www.bpf.co.uk/>
- ii. <http://www.youtube.com>
- iii.<http://www.technologystudent.com/>
- iv.<http://www.notesandsketches.co.uk/Index.html>
- v. <http://www.paulsontraining.com>
- vi.<http://www.traininteractive.com>
- vii.[http://en.wikipedia.org/wiki/Plastics\\_extrusion](http://en.wikipedia.org/wiki/Plastics_extrusion)
- viii.[http://en.wikipedia.org/wiki/Plastics\\_extrusion](http://en.wikipedia.org/wiki/Plastics_extrusion)

**11. COURSE CURRICULUM DEVELOPMENT COMMITTEE****Faculty Members from Polytechnics**

- **Prof. A. S. Amin**, Lecturer in Plastic Engineering, Govt. polytechnic, Ahmedabad
- **Prof. J. R. Desai**, Lecturer in Plastic Engineering, Govt. polytechnic, Valsad
- **Prof. M. K. Thakarar**, Lecturer in Plastic Engineering, Govt. polytechnic, Valsad
- **Prof. B. I. Oza**, Lecturer in Plastic Engineering, Govt. polytechnic, Ahmedabad
- **Prof. N. C. Suvagya**, Lecturer in Plastic Engineering, G.P., Chhotaudepur

**Coordinator and Faculty Members from NITTTR Bhopal**

- **Dr. Abhilash Thakur**, Associate Professor, Department of Applied Sciences
- **Dr. Bashirullah Shaikh**, Assistant Professor, Department of Applied Sciences