

## 9. RESOURCE REQUIREMENTS

### 9.1 Physical Resources

#### 9.1.1 Space requirement

Norms and standards laid down by All India council for Technical Education (AICTE) may be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

#### 9.1.2 Equipment requirement

For three year diploma programme in Plastic Technology for student intake of 40, following laboratories and workshops are required corresponding to the curriculum structure suggested by the expert group:

- i) Physics Laboratory
- ii) Chemistry Laboratory
- iii) Mechanical Engineering Laboratory
- iv) Unit Operation Laboratory
- v) Electrical, Electronics Laboratory
- vi) Plastic Material and Testing Quality Control Laboratory
- vii) Plastic Die and Mould Shop and Processing Laboratories
- viii) Instrumentation Laboratory
- ix) Basic Workshops; Forging; Fitting and Assembly; Carpentry; Welding; Electrical Shop; Molding; Turning, Milling; Advanced Fitting; Grinding Advanced Machine Shop
- x) Computer Laboratory

The equipment required for laboratories/workshops for (i), (ii), (iii), (v), (ix) and (x) will be as per the standard list approved by All India Council for Technical Education (AICTE) Equipment/Machinery requirement for laboratories/workshops needed for plastic technology course is given on the following pages.

Sr. No.	Particulars	Unit 1 each
<b>UNIT OPERATION AND FLUID MECHANICS LABORATORY</b>		
1.	Ball Mill	
2.	Mixer	
3.	Triple roll mill	
4.	Air Compressor	
5.	Jaw Crusher	
6.	Cyclone Separator	
7.	Plate and frame filter press	
8.	Sieve shaker	
9.	High vacuum pumps	
10.	Packed column	
11.	Agitating equipment	
12.	Ball falling in liquids apparatus	
13.	Particle setting in fluids	
14.	Sedimentation apparatus	
15.	Filter press	
16.	Friction pipe	
17.	Weirs, channels, v-notch	
18.	Centrifugal pumps	
19.	Viscometer	
20.	Rotameter, manometer	
21.	Globe valve	
22.	Gate valve	
23.	Reynolds measuring apparatus	
<b>INSTRUMENTATION AND PROCESS CONTROL LABORATORY</b>		
24.	On-off controller	
25.	Piezo meter	
26.	LVDT apparatus	
27.	Light deflection distance meter	
28.	Strain gauge	
29.	Displacement meter	
30.	Pyrometer	
31.	Optical Pyrometer	
32.	Thermopiles	
33.	Resistance thermometer	
34.	Gas filled thermometer	
35.	Vapour filled thermometer	
36.	Bimetallic thermometer	
37.	Pitot tube	

S.No	Particulars	Unit 1 each
38.	Orifice meter	
39	Pneumatic gauge	
40.	Hydraulic gauges	
41.	Proportional controller	
42.	Micro processor based distillation column controller, heat exchanger, evaporator	
43.	Check valve, butter fly valve, blind valve	
44.	PID, PD and PI controller	
<b>PLASTIC DIE AND MOULD SHOP</b>		
45.	HMT/Kirloskar Lathe, gear operated with motor 1.8 m size, 4 jaw < 3 jaw, chucks and center chuck	3
46.	Shaper MMM Loyal	2
47.	Radial drill machine micro miltent	1
48.	Radial drill machine 25 mm size	1
49.	Grinder 250 mm size	1
50.	Universal milling machine with DRO system	1
51.	Vertical milling machine with DRO system	1
52.	HMT surface grinder with magnetic chuck size 800x400 mm	1
53.	Tool craft/praga pentrograph machine	1
54.	Fitter benches	15
55.	Vice 150 mm	30
56.	Electra 6040 M EDM (with DRO system x, y and z axis)	100
57.	Jig boring	1
58.	CNC Lathe	1
<b>PLASTIC PROCESSING LABORATORY</b>		
59.	Hand operated injection molding machine 10 gms capacity with thermostat	4
60.	Hand operated injection molding machine 25 gms. Capacity	2
61.	Hand operated compression molding machine with thermostat 25 ton	1
62.	Blow molding machine with blower half litre	2
63.	Oven (1.2m x 0.6m x 0.8m) having 6 shelves	1
64.	Embossing machine	1
65.	Grinder cum polisher half HP	1
66.	Horizontal injection molding machine 120 gms capacity, hydraulic operated with pyrometric ontrol	1
67.	Compression molding machine hydraulic operated 100 t	1

Sr. No.	Particulars	Unit I each
68.	PVC extruder 40 mm size, with motor cutter with haul up system for pipe and cable coating	
69.	Rotrograve two colour kolsite/konark/windsor	
70.	Film blowing machine 19 mm size with blower and motor LD/LLDE/HD/HM	
71.	Extruder for blown film and die for granulation	
72.	Two roll mixing mill electrically heated 300 degree C maximum 300 mm with speed controller with gear (including watt meter)	
73.	Blender –Neoplast	
74.	Scrap Granulator	
75.	Horizontal injection molding machine 80 – 120 gms with micro processor attachment	
76.	Horizontal injection moulding semiautomatic – 28 gm capacity	
77.	Thermoforming/vacuum forming models	
<b>PLASTIC RAW MATERIALS NEEDED PER YEAR</b>		<b>Quantity</b>
78.	High impact – polystyrene	100 kg
79.	General purpose low impact polystyrene (transparent)	100 kg
80.	High density polyethylene	200 kg
81.	Low density polyethylene (LDP) and Linear low density polyethylene (LLDP)	200 kg
82.	Low density polyethylene (Blow molding grade)	100 kg
83.	PVC	100 kg
84.	Nylon 6, nylon 66	25 kg
85.	ABS	100 kg
86.	Acrylic	50 kg
87.	Polypropylene	150 kg
88.	Cellulose acetate	25 kg
89.	Melamine formaldehyde	200 kg
90.	Phenol formaldehyde	200 kg
91.	Urea formaldehyde	100 kg
92.	Plastic sheet 3 mm thickness	100 Nos
93.	Polyster resin	100 kg
94.	SAN(Syrene Acrylonitrite Copolymer)	25 kg
95.	Polyester (PETP)	25 kg
96.	PVC Sheets	1 roll

Sr. No.	Particulars	Unit
<b>PLASTIC MATERIAL/POLYMER LABORATORY</b>		
97.	Softening point and HDT tester	1
98.	Hardness testing machines	1
99.	Impact testing machine	1
100.	Ring and ball apparatus for softening point	1
101.	Refracto meter	1
102.	Dean and Start apparatus for water content determination	1
103.	Photo colorimeter	1
104.	PH meter	1
105.	Centrifuge (Lab Model)	1
106.	Vacuum drying oven with vacuum pump	1
107.	Industrial oven (hot air)	1
108.	Stirrers (magnetic and electrical)	6 Nos.
109.	Analytical balances	10 Nos.
110.	Heating mantles 500 w and 250 w	10 each
111.	Water bath	10 Nos.
112.	Water distillation unit Indian	1 No.
113.	Temperature regulators	5Nos.
114.	Vacuum pump	1
115.	Falling dart	1
116.	Tensiometer	1
117.	Film bursting test	1
118.	Tear tester (imported)	1
119.	Heat resistor (imported)	1
120.	Constant temperature bath	1
<b>TESTING AND QUALITY CONTROL LABORATORY</b>		
121.	Specimen cutting press	1
122.	Strip cutter	1
123.	Hydraulic Press	1
124.	Two roll Mill	1
125.	Climatic/conditioning chamber	1
126.	Hot air oven	1
127.	Impactometer	1
128.	Bend Tester	1
129.	Rockwell Hardness tester	1
130.	Shore Hardness Tester	1
131.	Burst Strength Tester	1
132.	Dart Impact tester	1

<b>Sr. No.</b>	<b>Particulars</b>	<b>Unit 1 each</b>
133.	Water vapour permeability apparatus	
134.	Melt flow indexer	
135.	Heat Distortion vicat softening point apparatus	
136.	Martin heat stability tester	
137.	Gloss meter	
138.	Abbe refractometer	
139.	Megaohm-meter	
140.	Viscosity/molecular weight determination set up	
141.	Spiral flow mould	
142.	Cupflow mould	
143.	Environmental stress cracking resistance tester (ESCR)	
144.	Carbon black content tester	
145.	Abrader	
146.	Brook field viscometer	

### 9.1.3 Furniture requirement

Norms and standards laid down by AICTE may be followed for working out furniture requirement for this course

## 9.2 Human Resources

Weekly work schedule, annual work schedule, student teacher ratio for various group and class-size, staffing pattern, workload norms, qualifications, experience and job description of teaching staff, workshop staff and other administrative and supporting staff may be worked out as per norms and standards laid down by the AICTE

## 10. RECOMMENDATIONS FOR EFFECTIVE IMPLEMENTATION OF CURRICULUM

The following recommendations are made for effective implementation of this curriculum.

- a) While imparting instructions, stress should be laid on the development of practical skills in the students.
- b) Field visits be organized as and when required to clarify the concepts, principles and practices involved. For this purpose, time has already been provided in student centred activities
- c) Extension lectures from professionals should be organised to impart instructions in specialised areas
- d) There is no need of purchasing very costly equipment. Efforts may be made to establish linkages with local industries/field organizations
- e) Considerable stress should be laid on personality development of the student, which is very essential for any diploma holder
- f) Teachers should generate competitiveness among the students for the development of professional skills.
- g) Teachers should take interest in establishing linkages with industries and field organizations for imparting field experiences to their students
- h) Hobby clubs and other co-curricular activities be promoted to develop creativity in the students
- i) Teachers should be sent for training in the new areas relevant to their field of specialization
- j) Students should be given relevant and well thought out project assignments. This will help students in developing creativity and confidence in them for gainful employment (wage and self)
- k) A **project bank** should be developed by the Plastic Technology department of the polytechnic in consultation with Plastic Industry, Plastic Research Institutes and other important plastic institutions in the state.

## 11. LIST OF PARTICIPANTS

The following experts participated/contributed in the revision of curriculum for diploma programme in Plastic Technology during the workshop for revision of subjects of first year for Haryana state held on 14<sup>th</sup> May , 2003 at National Institute of Technical Teachers' Training and Research, Chandigarh.

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The following experts participated/contributed in the revision of curriculum for diploma programme in Plastic Technology during the workshop for revision of complete Curriculum for Haryana state held from 21-23 October, 2003 at National Institute of Technical Teachers' Training and Research, Chandigarh.

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