

NATIONAL SKILL QUALIFICATION FRAME WORK
(NSQF)
QUALIFICATION FILE

SYLLABUS & CURRICULUM

POST GRADUATE DIPLOMA IN PLASTICS
PROCESSING AND TESTING (PGD-PPT)

(Duration: 2 years, Full Time)

Implemented from Academic Year: 2020-21



Academic Cell
Central Institute of Plastics Engineering & Technology
(Department of Chemicals & Petrochemicals,
Ministry of Chemicals & Fertilizers, Govt. of India)
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NATIONAL SKILL QUALIFICATION FRAMEWORK QUALIFICATION FILE

CONTACT DETAILS OF THE BODY SUBMITTING THE QUALIFICATION FILE

Name and address of submitting body:

**Central Institute of Plastics Engineering & Technology (CIPET)
Department of Chemicals & Petrochemicals (DCPC)
Ministry of Chemicals & Fertilizers, Govt. of India
T.V.K.Industrial Estate, Guindy, Chennai-32**

Name and contact details of individual dealing with the submission:

Name and contact details of individual dealing with the submission

Name	:	Prof. (Dr.) S. K Nayak
Position in the organization	:	Director General
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List of documents submitted in support of the Qualifications File:

- 1. Curriculum Document**
- 2. Evaluation (Marking) Scheme**

1. SUMMARY

Qualification Title	Post Graduate Diploma in Plastics Processing & Testing (PGD-PPT)
Qualification Code	CIPET/PGD-PPT/01
Nature and purpose of the qualification	<p>Nature: Post Graduate Diploma Course</p> <p>Purpose: Learners who attain this qualification are competent in Plastics processing techniques like Injection Molding, Extrusion, Blow molding, compression molding, etc. and in testing of Plastic products and raw materials. The graduates can get a job in plastics processing industries in production as well as in quality control or they can become entrepreneurs.</p>
Body/bodies which will award the qualification	Central Institute of Plastics Engineering & Technology (CIPET), Guindy, Chennai
Body which will accredit providers to offer courses leading to the	AICTE
Body/bodies which will carry out assessment of learners	Central Institute of Plastics Engineering & Technology (CIPET), Guindy, Chennai
Occupation(s) to which the qualification gives	Production Officer / Quality Control Officer / Supervisor
Licensing requirements	Not Applicable
Level of the qualification in the NSQF	Level 8
Anticipated volume of training/learning required to complete the qualification	2160
Entry requirements and /or recommendations	B. Sc. Graduates (in Science)
Progression from the qualification	<p>Job Progression: After completion of three semesters of theory and practical, students have to undergo six months industrial training cum project work with stipend and after the completion of training the graduates can work as a Production Officer or Quality Control Officer / Supervisor. After 5 years of experience they can become Production Manager/Quality Manager in the downstream Polymer/Processing industries.</p>
Planned arrangements for the Recognition of Prior learning (RPL)	Yes
International comparability where known	Not Known
Date of planned review of the qualification.	January 2021

SEMESTER-I

S. No.	Code	Subject	CH	TH	EH	Marks			Credit
						INT	EXT	TOTAL	
THEORY									
1	PPT 101	Polymer Science & Technology	43	11	03	40	60	100	03
2	PPT 102	Plastics Materials and its Applications-I	43	11	03	40	60	100	03
3	PPT 103	Plastics Processing Technology – I	43	11	03	40	60	100	03
4	PPT 104	Plastics Testing – I	43	11	03	40	60	100	03
5	PPT 105	Plastics Product and Mould Design	43	11	03	40	60	100	03
(18 weeks- 15hrs a week)			215	55	15	200	300	500	15
			270						
PRACTICAL WORK									
1	PPTL 101	Practical – I - Plastics Processing Lab –I (18 weeks- 6 hrs a week)	108		08	100	100	200	3.0
2	PPTL 102	Practical – II – Plastics Testing Lab – I (18 weeks- 4 hrs a week)	72		04	100	100	200	02
3	PPTL 103	Practical – IX – Computer Application Lab (18 weeks- 3 hrs a week)	54		04	50	50	100	1.5
4	PPTL 104	Physical Training & Yoga (18 weeks- 1hr a week)	18		--	-	-	-	00
5		Library – (18 weeks- 1hr a week)	18		--	-	-	-	00
Total Hours (18 weeks- 15hrs a week)			270		16	250	250	500	6.5

SEMESTER-II

S. No.	Code	Subject	CH	TH	EH	Marks			Credit
						INT	EXT	TOTAL	
THEORY									
1	PPT 201	Plastics Materials and its Applications- II	43	11	03	40	60	100	03
2	PPT 202	Plastics Processing Technology-II	43	11	03	40	60	100	03
3	PPT 203	Plastics Testing-II	43	11	03	40	60	100	03
4	PPT 204	Machine Maintenance	43	11	03	40	60	100	03
5	PPT 205	Environmental Science and Plastics Waste Management	43	11	03	40	60	100	03
(18 weeks- 15hrs a week)			215	55	15	200	300	500	15
			270						
PRACTICAL WORK									
1	PPTL 201	Practical –IV - Plastics Processing Lab – II (18 weeks- 7 hrs a week)	126		08	100	100	200	3.5
2	PPTL 202	Practical – V - Plastics Testing Lab –II (18 weeks- 4 hrs a week)	72		04	100	100	200	3.0
3	PPTL 203	Practical – VI – Machine Maintenance Lab (18 weeks- 3 hrs a week)	54		04	50	50	100	1.5
4		Library – (20 weeks 4 hrs a week) (18 weeks- 1hr a week)	18		-	-	-	-	00
Total Hours (18 weeks- 15hrs a week)			270		16	250	250	500	8.0

SEMESTER-III

S. No.	Code	Subject	CH	TH	EH	Marks			CREDIT
						INT	EXT	TOTAL	
THEORY									
1	PPT 301	Plastics Materials –III	43	11	03	40	60	100	03
2	PPT 302	Plastics Processing Techniques-III	43	11	03	40	60	100	03
3	PPT 303	Plastics Testing-III	43	11	03	40	60	100	03
4	PPT 304	Communication Skills in English	43	11	03	40	60	100	03
5	PPT 305	Industrial Management & Entrepreneurship	43	11	03	40	60	100	03
(18 weeks- 15hrs a week)			215	55	15	200	300	500	15
			270						
PRACTICAL WORK									
1	PPTL 301	Practical –VII - Plastics Processing Lab – III <u>(18 weeks- 6 hrs a week)</u>	108		08	100	100	200	3.0
2	PPTL 302	Practical – VIII - Plastics Testing Lab –III <u>(18 weeks- 3 hrs a week)</u>	54		04	100	100	200	02
3	PPTL 303	Practical – III - Communication Lab <u>(18 weeks- 3 hrs a week)</u>	54		04	50	50	100	1.5
4	PPTS 304	Seminar – <u>(18 weeks- 3 hrs a week)</u>	54		-	50	50	100	1.5
Total Hours (18 weeks- 15 hrs a week)			270		16	300	300	600	8.0

SEMSETER –IV

S. No.	Code	Subject	CH	TH	EH	Marks			CREDIT
						INT	EXT	TOTAL	
1	PPTP	Project Work/In plant training in industry **	540	-	-		-	-	18
Total Hours (18 weeks, 30 hours per week)			540	-	-	-	-	-	18
2	PPTP 401	Project Evaluation & Viva voce	-	-	8	400	400	800	00
3	PPTP 402	Industrial Training Report	-	-	-	100		100	00
Total			540	-	8	900		900	18

** Minimum of 10 weeks

CH-Contact Hours

TH- Tutorial Hours

EH-Examination Hours

Formal structure of the qualification				
Sl. No	Title and Identification Code of Component	Mandatory Optional	Estimated Size Learning Hours	Level
I Semester				
01	Polymer Science & Technology	Mandatory	54	
02	Plastics Materials and its Applications –I	Mandatory	54	
03	Plastics Processing Technology –I	Mandatory	54	
04	Plastics Testing –I	Mandatory	54	
05	Plastics Product and Mould Design	Mandatory	54	
06	Plastics Processing Lab –I	Mandatory	108	
07	Plastics Testing Lab –I	Mandatory	72	
08	Computer Application Lab	Mandatory	54	
II Semester				
01	Plastics Materials and its Applications – II	Mandatory	54	
02	Plastics Processing Technology – II	Mandatory	54	
03	Plastics Testing – II	Mandatory	54	
04	Machine Maintenance	Mandatory	54	
05	Environmental Science and Plastics Waste Management	Mandatory	54	
06	Plastics Processing Lab-II	Mandatory	126	
07	Plastics Testing Lab – II	Mandatory	72	
08	Machine Maintenance Lab	Mandatory	54	

III Semester				
01	Plastics Material-III	Mandatory	54	
02	Plastics Processing Technology – III	Mandatory	54	
03	Plastics Testing – III	Mandatory	54	
04	Communication Skill in English	Mandatory	54	
05	Industrial Management and Entrepreneurship	Mandatory	54	
06	Plastics Processing Lab-III	Mandatory	108	
07	Plastics Testing Lab – III	Mandatory	54	
08	Communication Lab	Mandatory	54	
09	Seminar	Mandatory	54	
IV Semester				
01	Project Work/ In plant Training in industry	Mandatory	540	

(Physical Training activity – 2 hours weekly)

SECTION 1**ASSESSMENT****Body/Bodies which will carry out assessment:**

Examination cell - Central Institute of Plastics Engineering & Technology, Head Office, Chennai - 32

How will RPL assessment be managed and who will carry it out?

Learners who have met the requirements of any Unit Standard that forms part of this qualification may apply for recognition of prior learning to the relevant Education body. The applicant must be assessed against the specific outcomes and with the assessment criteria for the relevant Unit Standards.

Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, reliable and fair and show that these are in line with the requirements of the NSQF.

1. ASSESSMENTGUIDELINE:

- Criteria for assessment based on each learning outcomes, will be assigned marks proportional to its importance.
- The assessment for the theory & practical part is based on two midterm exam and a centralized semester exam wherein the questions are set by faculties and approved by Examination cell, CIPET Head Office, Chennai.
- For each Individual batch, Examination cell creates unique question papers for theory part as well as practical for each candidate at each examination.
- To pass the Qualification, every trainee should score a minimum of 40% in each Theory and 50% Practical subject.

Assessment comprises the following components:

- Job carried out in labs/workshop
- Record book
- Answer sheet of assessment
- Viva –voce
- Mid Term Exam
- Attendance and punctuality

2. ASSESSORS:

CIPET centres faculty teaching the Post Graduate Diploma in Plastics Processing & Testing, also assesses the students as per guidelines set by Examination cell of CIPET Head office. Faculties are been trained from time to time to upgrade their skills on various aspects such as conduction of assessments, teaching methodologyetc.

3. ELIGIBILITY TO APPEAR IN THEEXAM:

Minimum 80% attendance is compulsory for the students to appear for the assessments.

4. MARKINGScheme:

Please refer Annexure - I for marking / evaluation scheme.

5. PASSING MARKS:

Passing criteria is based on marks obtain in attendance record, assignments, practical's performance, viva or oral exam, mid – semester exam , practical exam and final semester exam.

Minimum Marks to pass practical exam – 50%

Minimum Marks to pass final Exam – 40%

Minimum Marks to pass in class test – 40%

Minimum Marks to pass Project report and viva-voce exam – 50%

6. RESULTS AND CERTIFICATION:

The assessment results are backed by evidences collected by assessors. Successful trainees are awarded the Post Graduate Diploma certificate by CIPET Head Office.

ASSESSMENT EVIDENCE**ASSESSMENT EVIDENCE**

Assessment evidence comprises the following components document in the form of records:

1. *Record book*
2. *Answer sheet of periodical and midterm test assessment*
3. *Viva –voce*
4. *Attendance and punctuality*
5. *General Behavior*

TITLE OF COMPONENT		POST GRADUATE DIPLOMA IN PLASTICS PROCESSING & TESTING	
Sr. No	OUTCOMES TO BE ASSESSED	ASSESSMENT CRITERIA FOR THE OUTCOME	No. of Hours
1	POLYMER SCIENCE & TECHNOLOGY	1.1 Basic knowledge of Polymer Structure, Processing and Applications - Molecular Force and Chemical Bonding in Polymers, Geometric Isomerism, Molecular Weight and Molecular Weight Distribution and its effect on Properties and Processing of Polymers,	06 Hours
		1.2 Knowledge of Structure – Property Relationship – Molecular Weight and Poly Dispersity Index (PDI) Effect of Polymerization on PDI.	08 Hours
		1.3 Knowledge of Reaction Mechanism- Chain growth Polymerization – Addition & Condensation Polymerization	06 Hours
		1.4 Understanding of polymerization Techniques like Bulk, Solution, Suspension, Emulsion.	08 Hours
		1.5 Knowledge of General Rules for Polymer solubility, Crystallinity and orientation in polymers.	04Hours
		1.6 Knowledge about Glass Transition temperature and Melt Temperature.	04 Hours
		1.7 Knowledge of Molecular Weight Determination by Dilute Solution Viscosity, Gas Chromatography, Gel Permeation Chromatography	10 Hours
		1.8 Polymer characterization techniques concerning analysis of chemical structure and morphology and the determination of physical properties in relation to compositional and structural parameters. (DSC,TGA,FTIR,GC-MS,DMA etc to be included)	08 Hours
2	PLASTICS MATERIAL AND IT'S APPLICATION -I	2.1 Sources of Raw Materials for Natural Plastics - General Characteristics, Properties & Its applications. Introduction to Thermoplastics.	16 Hours
		2.2 Thermoplastics - Commodity Plastics- PP, PE, PVC, PS, etc. Knowledge of Commodity Plastics - Sources of Raw Materials , Manufacturing, General Characteristics, Structure & Properties-Processing Behavior and applications in key sectors.	19 Hours
		2.3 Engineering Plastics- PA, PC, PET, PBT, POM etc. Knowledge of Engineering Plastics - Sources of Raw Materials - Manufacturing, General Characteristics, Structure & Properties-Processing Behavior and applications in key sectors.	19 Hours
3	PLASTICS PROCESSING TECHNOLOGY–I	3.1 Understanding of Basic Principles of Melt Processing of Thermoplastics, Effect of Polymer Properties on Processing	04 Hours
		3.2 Understanding of Different Types of Processes and Limitations - Process Flow Charts, Selection of Process – Degradation – Molecular orientation and different grades of plastics.	04 Hours

		<p>3.3 Understanding of Injection Moulding Process - Basic Process Principles, Machine rating and Specifications - Types of Machines – Construction - Parts and its functions</p> <p>3.4 Machine Start up and Shut down procedure - Operation procedure, Projected Area calculation, Shot Capacity, Clamping System, Type of Screws and their function- Process variables - Heating System - Ejection system – Back Pressure - Suck back - Drooling - Nozzle Types - Moulding cycle - Shot weight -Purging - Material recommendation - grades</p> <p>3.5 Knowledge of Microprocessor controlled Injection Moulding- Interaction of process variables-machine operation- theoretical concepts and their relationship to processing- Shrinkage – Annealing - Dimensional Control - Moulding Records - Trouble Shooting</p> <p>3.6 Knowledge of Compression Moulding & Transfer Moulding - Principle – Process – Machine Specification, Material recommendation and flow properties - Preheating Techniques, Process Variables - Flow Characteristics, Cycle Time, Heating and Cooling system, Faults and Trouble Shooting, Process Advantages and Limitations</p> <p>3.7 Understanding of Rotational Moulding Process - Basic Process Principles, Machine Rating and Specifications - Types of Machines – Construction - Parts and its functions, Process variables - Charge size - Wall Thickness Control - Heating and Cooling system, Faults – causes and remedies, Merits and Demerits of the process</p>	<p>10 Hours</p> <p>08 Hours</p> <p>08 Hours</p> <p>04 Hours</p> <p>08 Hours</p> <p>08 Hours</p>
4	PLASTICS TESTING – I	<p>4.1 Knowledge of basics of Testing- Specification, Standards, test specimen & preparation of specimen, Pre-conditioning and test atmosphere</p> <p>4.2 Familiarity with measuring instruments - Vernier Caliper, Micrometer, Thickness Gauge, Pie Tape, Go No Go Gauges etc.</p> <p>4.3 Understanding of Identification of plastics by Simple Tests, Visual examination, Density, Melting point, Solubility test, Flame test and burning characteristics and chemical analysis test.</p> <p>4.4 Knowledge of Specific gravity-Density by density gradient column, Bulk Density - Particle size by Sieve Analysis, Moisture analysis, Ash content, Filler and Fibre content, residual content</p> <p>4.5 Knowledge of Thermal Properties - Heat Distortion Temperature (HDT), Vicat Softening Temperature (VST), Long Term Heat Resistant Tests, Thermal Conductivity, Thermal Expansion, Brittleness Temperature</p>	<p>08 Hours</p> <p>04 Hours</p> <p>10 Hours</p> <p>10 Hours</p> <p>10 Hours</p>

		4.6 Knowledge of various material characterization properties like Melt Flow index, Viscosity, Dilute Solution Viscosity, K-Value, VCM content, Molecular weight calculation, Material Characterization, Apparent Density, Bulk Factor, Cup & Spiral flow rest, dynamic viscosity (Brookfield viscometer).	12 Hours
5	PLASTICS PRODUCT AND MOULD DESIGN	5.1 Understanding of Engineering Drawing Concepts - Orthographic views, conversion of pictorial view into orthographic view, Dimensioning techniques, Sectional views and assembly drawing. Blue print reading	06 Hours
		5.2 Knowledge of Product Design - Plastics product design - Concepts - Essential factors – process variables vs product design.	04 Hours
		5.3 Knowledge of Uniform and symmetrical wall thickness - part geometries - draft angle Ribs - internal sharp corners and notches, Bosses - Holes -Threads - undercuts - Hinges metal inserts - Tolerances	04 Hours
		5.4 Exposure to Recent trends in product development: Introduction to Prototype & Rapid prototype (RPT) - 3D Printing - applications and benefits.	04 Hours
		5.5 Knowledge of Injection Mould Design - Selection of Injection moulding machines Shot capacity, Plasticizing capacity, Clamping force and Daylight, mould elements , Bolsters - mould alignment, Feed system, Ejection types, Mould cooling, Venting, parting line and parting surface Requirement of Core & Cavities for Single & Multi impression mould, Cavity & Core finishing, Gate Types, Runners, mould material, Bill of materials	12 Hours
		5.6 Knowledge of Advanced injection mould design - Study of External undercut- split cavities, Side cores Split and side core actuation, internal undercut-form pin-collapsible core - loose cores, threaded inserts - internal and external threads.	08 Hours
		5.7 Understanding of Blow Mould design - Types of blow moulds and Requirement of pinch off, neck designs, parting line, venting, cooling	08 Hours
		5.8 Knowledge of Compression Mould Design -Types of compression moulds	08 Hours
6	PLASTIC PROCESSING LAB- I	6.1 Knowledge about Shop-floor Machinery, Lay-Out of Shop Floor, Safety aspects, Mold, Tool Handling and safety measures, use of PPE on the shop-floor.	12 Hours
		6.2 Study of Hand Injection Moulding Machine in Idle-Run Observation (IRO), Parts & functions, Operating principle, free sketch of Machine-parts eg. Nozzle, Torpedo, Hopper, Rack & Pinion Barrel etc., shot capacity definition.	12 Hours

		6.3 Operation practice to produce product on Hand Injection Moulding Machine by different moulds. Recording the observation and results in practical record books.	12 Hours
		6.4 Study of Semi-Automatic Injection Moulding Machine in Idle-Run Observation (IRO), Parts & functions, Operating principle, free sketch of Machine-parts eg. Nozzle, Torpedo, Hopper, Barrel etc.,	12 Hours
		6.5 Knowledge of Automatic Injection Molding machines-Study of M/c Parts & function, Study of clamping systems on M/cs, Technical specification of Machine, Sequence on Machine, Definitions of all Processing Parameters & study of controls in M/cs.	12 Hours
		6.6 Hands on practical – Idle -Run Observation (IRO) & study of Injection Unit, Clamping Unit, Process-Control knobs, Safety precautions, Start-up Procedure, Shut- down Procedure M/c Operation-Practice, Process parameter setting for a particular mould on the Machine, Observations of all parameters, cycle-time analysis, use of different plastics material for moulding & comparison, Moulding faults analysis for causes and remedies.	12 Hours
		6.7 Hands on practical - Operating Principle of Hand Compression Press, Mould setting-procedure & parameter setting, operation practice , M/c specification observations and recording, Cycle-time analysis, observation & Procedure of start-up & shut down of M/c, Hand on practical of Setting up, operation of M/c, safety precautions, Analysis of Cycle-time, Product defects & remedies.	12 Hours
		6.8 Practice on operation of Compression & Transfer moulds with thermoset materials. Study of Process Principle, type of moulds & material used in thermoforming.	12 Hours
		6.9 Rotomoulding - Machine-study in IRO, Process Principle & sequence of operation, Raw materials used, Mould-clamping practice on the M/c Operation practice to produce Rotomoulded components, Cycle-time analysis, Comparison of process with other processing processes.	12 Hours
7	PLASTIC TESTING LAB-I	7.1 Identification of Plastics by Simple methods Primary Tests – Elemental Analysis – Confirmation Tests	08 Hours
		7.2 Determination of Density	04 Hours
		7.3 Determination of Filler Content	06 Hours
		7.4 Determination of Moisture Content	06 Hours
		7.5 Determination of Volatile Content	04 Hours
		7.6 Determination of Ash Content	06 Hours
		7.7 Determination of VCM content	04 Hours
		7.8 Determination of K-value for PVC resin	08 Hours
			04 Hours

		<p>7.9 Determination of Melting Point</p> <p>7.10 Determination of Melt Flow Index</p> <p>7.11 Determination of Carbon Black Content and Dispersion</p> <p>7.12 Determination of Dilute Solution Viscosity</p> <p>7.13 Determination of HDT & VSP</p> <p>7.14 Specimen Preparation by Injection Moulding, Compression Moulding, Through Contour Cutting & Punching</p>	<p>04 Hours</p> <p>06 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p>
8	COMPUTER APPLICATION LAB	<p>8.1 Study of Computer Components</p> <p>8.2 Practice of Computer Booting Process in XP, Demonstration of Windows Environment</p> <p>8.3 Practice - using My Computer, Windows Explorer, using Control Panel, My Network Places, CD and DVD Writing, Paint, Demonstration of Network</p> <p>8.4 Creating e-mail Account, Sending and Receiving e-mails.</p> <p>8.5 Searching Web Page/ Site using Search Engine: (eg. google.com, yahoo.com, altavista.com etc.)</p> <p>8.6 Exercise Based on MS-Word - Document Preparation, Printing Document, Mail Merge usage, Draw Table.</p> <p>8.7 Exercise Based on Ms-Excel - Work Book Preparation, Printing Workbook, Data-base usage, Draw Charts.</p> <p>8.8 Exercise Based on Power Point - Creating Slide, Adding, Animations in Slide, Presentation</p>	<p>12 Hours</p> <p>08 Hours</p> <p>08 Hours</p> <p>04 Hours</p> <p>08 Hours</p> <p>08 Hours</p> <p>06 Hours</p>
9	PLASTICS MATERIALS AND ITS APPLICATIONS -II	<p>9.1 Knowledge of Thermosets plastics- Sources of Raw Materials, Manufacturing – General Characteristics Structure & Properties – Processing Behavior and applications in key sectors. (UF,PF, Epoxies etc.,)</p> <p>9.2 Knowledge of Specialty Plastics- LCP,PI, PEEK etc. Sources of Raw Materials, Manufacturing - General Characteristics, Structure & Properties- Processing Behavior and applications in key sectors.</p> <p>9.3 Knowledge of biodegradable plastic Bio Plastic for Principle and Mechanism of Plastics degradation Natural Bio-degradable Polymers – Synthetic, Bio-degradable Polymers - Water soluble Polymers Bio plastics types, properties and applications, Test methods for the same</p> <p>9.4 Overview on Nano technology, Nano materials, Nano Technology applications active & passive nano structure, nano composites)</p>	<p>18 Hours</p> <p>16 Hours</p> <p>14 Hours</p> <p>6 Hours</p>
10	PLASTICS PROCESSING TECHNOLOGY-II	<p>10.1 Knowledge of Extrusion principles and construction, screw, compression ratio-back pressure, Types of extruder</p> <p>10.2 Knowledge of Extruder heating & cooling systems - breaker plate - screen pack & its functions - screw & hopper cooling, Hopper,</p>	<p>04 Hours</p> <p>04 Hours</p>

		loading devices - Drying equipments - Process	
		10.3 Awareness of downstream equipments and extrusion plants for Pipe/ Corrugated Pipe/Tube, Wire & Cable covering, Blown Film-single layer, multilayer, laminates plant, Sheeting/Tape plant and Mono filament / Box Strapping plant.	04 Hours
		10.4 Knowledge of Mixing machinery and devices - Mixing and mixing equipments. Principles - Operating characteristics - Machine construction - Specifications	06 Hours
		10.5 Knowledge of Process control systems and working details of Batch mixers and continuous mixers - High speed mixer	04 Hours
		10.6 Idea about Two roll mill and different types of mixers and kneaders - Single Screw extruder - Twin Screw extruder	04 Hours
		10.7 Knowledge of Calendaring principles, Process variables, Types of Calendar Rolls - Heating & Cooling System - Roll Bending - Complete Description of Calendaring line with their function – Winding Types and Method - Finishing – Trouble Shooting and applications	06 Hours
		10.8 Knowledge of Blow moulding - Advantages - Material Selection, machines and their types, mold material, types of processes, die construction, process variables, programming, defects- causes and troubleshooting	08 Hours
		10.9 Understanding of Thermoforming principles – Advantages - Material Selection, machines and their types, mold material, types of thermoforming processes, process variables, defects- causes and troubleshooting	08 Hours
		10.10 Understanding of Secondary Processing Techniques - Powder Coating, Casting, Machining & Joining of plastics-Decoration of Plastics-Metalizing-Printing & Painting etc-Post moulding operations techniques, In-mould labeling (Awareness of Downstream equipments and extrusion plants for pipe, Applications of extrusion process for manufacture of pipes and films, Dry mixers, banbury mixers, Ribbon blenders etc.,)	06 Hours
11	PLASTICS TESTING– II	11.1 Understanding of electrical properties of plastics like Dielectric strength, Dielectric constant and Dissipation factor, Insulation resistance, Volume and Surface resistivity, Arc resistance, Antistatic and ability to perform tests to determine the same.	10 Hours
		11.2 Understanding of tests for determining Short-term Mechanical Properties - Tensile, Flexural, Compressive, Shear, Impact, Tear resistance, Hardness tests, Abrasion resistance, Friction	12 Hours

		<p>properties along with long-term mechanical properties like creep and stress relaxation.</p> <p>11.3 Understanding of optical properties of plastics such as Refractive index, luminous transmittance, Clarity and Haze, Photo-elastic properties, Colour measurements and Gloss, transparency and Opacity and ability to perform tests to determine the same.</p> <p>11.4 Understanding of Characterization tests- DSC, TGA, DMA. and its applications.</p> <p>11.5 Knowledge of testing to determine Chemical & Permanence Properties of Plastics namely- Resistance to Chemicals, Immersion test, Stain Resistance of Plastics, Environmental Stress Cracking Resistance (ESCR), Water absorption, gas permeability-water vapor permeability</p>	<p>10 Hours</p> <p>10 Hours</p> <p>12 Hours</p>
12	MACHINE MAINTENANCE	<p>12.1 Understanding of Maintenance and its objectives, types of maintenance-Preventive Maintenance, Breakdown Maintenance, Predictive Maintenance, Schedule Maintenance and Maintenance Planning.</p> <p>12.2 Knowledge of Factors to be considered for Installation, Erection and Commissioning of Plastics Processing & Testing Machinery – methods of Alignments and Leveling.</p> <p>12.3 Knowledge of Mechanical Parts like Screw, Barrel, Parts of Screw , clearance between screw and barrel, Non return valve, Thrust Bearing Unit, Gear Boxes, Calendar roll, Mill roll – platens flatness measurements, Platen parallelism measurement,</p> <p>12.4 Understanding of maintenance and lubrication of moving parts– Transmission system i.e. Gears, V-belts, Chains.</p> <p>12.5 Knowledge of Hydraulics Equipments like Valves, Valve sequences, Pressure control valves, metering and flow control valves, directional control valves</p> <p>12.6 Knowledge of Gear motors- Hydraulic actuators-servo motors</p> <p>12.7 Knowledge of Hydraulic symbols, industrial hydraulic circuits-Hydraulic Circuits for injection moulding machine</p> <p>12.8 Knowledge of strainers-heat exchanger-hydraulic air venting valve-Heat exchangers,</p> <p>12.9 Knowledge of filters, Compressors, Oil seals, O - Rings - Central Lubrication System , Oil quality monitoring, filtration</p> <p>12.10 Knowledge of Principles of displacement pumps- Positive and variable displacement pumps</p> <p>12.11 Knowledge of Fundamentals of pneumatic pumps, Characteristics of air, Air generation and</p>	<p>02 Hours</p> <p>02 Hours</p> <p>02 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>03 Hours</p>

		<p>distribution, Pneumatic Valves, Actuators and output devices, pneumatic elements, power components & Pneumatic Systems,</p> <p>12.12 Knowledge of Symbols and descriptions of components, Safety requirements for pneumatic systems, Trouble shooting of pneumatic systems malfunctions and Maintenance</p> <p>12.13 Knowledge of repair and maintenance of the electrical equipments – Electrical induction motors, Variable Speed Motors, their characteristics and speed control, motor starters-DOL and star delta, Drives-safety rules.</p> <p>12.14 Knowledge of PLC based systems, Knowledge of Circuit Breakers (Air Circuit Breakers and Miniature Circuit Breakers), and circuits, PLC system used in plastics processing & Testing Machineries</p> <p>12.15 Knowledge of Limit Switches & Timers, Relays, Heaters-types,</p> <p>12.16 Knowledge of Measurement of temperature, Temperature Controllers, on-off, PID type and Thermocouples, Heaters (mica and ceramic type)</p> <p>12.17 Knowledge of study of safety rules and regulations hot runner systems, hot sprue, Manifold etc.</p> <p>12.18 Knowledge of Electrical controls devices - Protective devices-Relays (EMR and SSR), merits and demerit and switches, single and three phase supply, AC & DC supply</p>	<p>03 Hours</p> <p>03 Hours</p> <p>02 Hours</p> <p>02 Hours</p> <p>02 Hours</p> <p>02 Hours</p> <p>03 Hours</p>
13	ENVIRONMENT SCIENCE AND PLASTICS WASTE MANAGEMENT	<p>13.1 Scope and importance of environmental science, effect human of activities on environment</p> <p>13.2 Know the concept of eco system, structure and function.</p> <p>13.3 Awareness about natural resources, forest resources, exploitation, deforestation etc</p> <p>13.4 Awareness about water resources, food resources, mineral resources land resources and energy resources.</p> <p>13.5 Awareness about environmental pollution such as air, water, land, thermal, and water conservation, global warming, ozone layer depletion.</p> <p>13.6 Knowledge about environmental protection acts and disaster management system types and policy.</p> <p>13.7 Understanding of Plastics Waste - sources, collection, segregation, identification by simple methods and techniques employed for its separation</p> <p>13.8 Knowledge of Plastics Waste Management Techniques – recycling and its types, and use of plastics waste for energy recovery, road construction</p> <p>13.9 Knowledge of Machinery and Value addition, Process , Basic Mechanical recycling Plant, Additives for improving quality of recycled products</p>	<p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>08 Hours</p> <p>08 Hours</p> <p>06 Hours</p>

		13.10 Exposure to Environmental issues associated with Plastics Waste and Guidelines and Legislation in India for Plastics waste and its recycling	08 Hours
14.	PLASTIC PROCESSING LAB- II	14.1 Study of Extruders in IRO, Free sketch of machines, their parts and parts-function, List of products manufactured by Extrusion-Process. Study of different types of extrusion process. Operation-Practice on setting up of Process-parameter to produce Blown-Film on Film-plant, observations on extruder output, size of film produced and technical specifications of machines to be recorded.	18 Hours
		14.2 Observe and practice the extrusion process Procedure for setting up of Process-Parameters eg. Temperature on different zones, Screw-Speed, Nip- roller speed, Winder Speed, Blow-ratio, control of cooling-Air on bubble, Methodology & practice by trainees to fix the Blown Film die on M/C familiarization of Die-parts & Their function, Technical specification Of M/cs, defects, causes & remedies, Practice of operating M/c to produce different sizes of Blown Film.	18 Hours
		14.3 Study of Hand Blow Moulding M/cs, Free-sketch of M/c with parts & study of part-function, Specification of M/c, Study of Parison-die with sketch. Die-centering practice and operation of Hand Blow Machines, to produce components observations,cycle-time analysis Procedure of operation and observations. To know Technical specification of M/c, Mould clamping on M/c, operation Practice with different mould.	18 Hours
		14.4 Study of Basic concepts of Microprocessor control, Comparison of Micro Processor-Controlled M/c with Conventional M/Cs, Machine Setting Procedure. Operation of M/c with Mould fixing & setting on the M/c with different plastics materials, cycle-time analysis, Analysis of Product defects, causes & remedies during M/c operation, listing of important operating procedure points, safety precautions through M/C Instruction/Manual operating.	18 Hours
		14.5 Observe and practice the automatic blow moulding machine-setting Procedure, Parameter-setting Procedure, Method of Mould fixing & parison- die setting on the M/c, Practice by trainees to remove & fix the parison die to produce on appropriate Parison for blowing, type of blowing systems, operation-practice on different moulds, cycle-time analysis, process-faults & remedies	18 Hours
		14.6 Observe and practice the Semi-automatic thermoforming machine-setting Procedure, Parameter-setting Procedure, Method of Mould	18 Hours

		fixing on the M/c, Practice by trainees to produce on appropriate product, type of thermoforming process, operation-practice on different moulds, cycle-time analysis, process-faults & remedies. 14.7 Study of ancillary Equipment -Hopper Dryer, Chiller, Mould Temperature Controller, Cooling Tower, Mixer, dehumidifier, pulveriser, Grinder, Air-compressor	18 Hours
15.	PLASTIC TESTING LAB-II	15.1 Determination of Tensile, Flexural & Compressive Properties 15.2 Determination of Izod & Charpy Impact Test 15.3 Determination of Burst Strength, Dart Impact Resistance for Plastics Films 15.4 Determination of Hardness (Shore -A & D, Rockwell Hardness, Barcol Hardness) 15.5 Determination of Abrasion Resistance 15.6 Study of Compounding, Blending using Two Roll Mill 15.7 Determination of Dielectric Strength & Dielectric constant 15.8 Determination of Volume and surface resistivity, 15.9 To conduct Glow Wire Test, 15.10 Determination of Arc Resistance and CTI 15.11 Determination of Gloss & Opacity 15.12 Determination of Luminous Transmittance, Haze & Clarity, 15.13 Determination of Tg and Tm by DSC 15.14 Determination of Uncertainty of Measurements	08 Hours 04 Hours 04 Hours 04 Hours 04 Hours 04 Hours 04 Hours 08 Hours 04 Hours 04 Hours 04 Hours 08 Hours 08 Hours 04 Hours

16	MACHINE MAINTENANCE LAB	<p>16.1 Study of Air Compressor Elements, Safety Features, Drive Mechanism, Lubrication. 04 Hours</p> <p>16.2 Study of Hydraulic Pumps, Motors, Accumulators, Valves, Hydraulic Pressure Control, Flow Control, Hydraulic Piping and Coupling - Safety and Trouble Shooting. 04 Hours</p> <p>16.3 Understand working of 4/2, 2/2 & 4/3 directional control valve in Single & Double Acting Cylinders. 04 Hours</p> <p>16.4 Study of FRL unit and Air Dryer in Pneumatic System & Hopper Drier, Heat exchangers in Moulding Machine, Chilling Plant/Cooling Tower. 04 Hours</p> <p>16.5 Study of Mould Heating - Hot Oil Circulators. 04 Hours</p> <p>16.6 Study of Electrical safety Measures & Demonstration about use of protective devices. Study and Usage of Various basic Electrical Tools & Instruments 04 Hours</p> <p>16.7 Study of Single Phase and Three Phase power supply. Identification of phase, Neutral and Earth pits. Understand importance of three phase wiring and its effectiveness and its laying 06 Hours</p> <p>16.8 Identify common Electrical materials such as Wires, Cables, Switches, Fuses, Plugs, Connectors, Sockets etc. Various types of protective devices –fuses, circuit breakers and Different types of switches, MCCB 06 Hours</p> <p>16.9 Calculation of power and energy consumption. 04 Hours</p> <p>16.10 Study of Fluorescent lamp and CFL, Servo Voltage Stabilizer, Half wave / Full wave rectifier. 04 Hours</p> <p>16.11 Study of different types of heater used in plastics processing Machinery using Voltmeter & Ammeter find out unknown wattage of heater. 04 Hours</p> <p>16.12 Study of Auxiliary equipment, Introduction to Maintenance basic knowledge of Hydraulic & Pneumatic systems, Electrical system and Introduction to Moulds, Tool Room Machines & Drawing Practice 06 Hours</p>	
17	PLASTICS MATERIALS-III	<p>17.1 Knowledge of composites- Definition, advantage, matrix & reinforcement Sources of Raw Materials Method of Manufacture – General Characteristics Structure & Properties – Processing Behavior and applications. 16 Hours</p> <p>17.2 Knowledge of polymer blends & alloys- Definitions and nomenclature - advantages of blends and alloys, miscible and immiscible blends, morphology of blends, compatibility of polymers. 10 Hours</p> <p>17.3 Knowledge of Thermoplastic Elastomers, Sources of Raw Materials Method of Manufacture – General Characteristics Structure & Properties – Processing Behavior and applications in key sectors. 10 Hours</p> <p>17.4 Understanding of Polymer Additives and</p>	

		Reinforcements like Antioxidants, Stabilizers (Heat & UV), Processing aids, Blowing agents, Flame Retardants, Nucleating agents, Colourants, Fillers, and Additives for Recycling, Coupling Agents, Curing Agents	14 Hours
		17.5 Knowledge of properties and application of Fibres, Natural Fibres and Synthetic Fibres	04 Hours
18	PLASTICS PROCESSING TECHNIQUES-III	18.1 Knowledge of Thermoset Injection Moulding – Processing behaviour of thermosets, process principles, variables, Automation - Troubleshooting	04 Hours
		18.2 Knowledge of Advance Injection Moulding- structural foam moulding, gas assisted injection moulding, thin wall product moulding, multi material and multi-colour moulding, All Electric Injection Moulding	12 Hours
		18.3 Understanding of FRP processing methods - contact moulding - hand layup, spray up method - vacuum bag and pressure bag moulding, filament winding, centrifugal casting, pultrusion, matched die moulding and advanced techniques.	12 Hours
		18.4 Understanding of Statistical quality control and process control	06 Hours
		18.5 Application of Robotics in part handling, Robotics used in high production moulding process, Automated Conveyor system, and Automatic material handling systems.	10 Hours
		18.6 Knowledge of Plastics waste management Basic principles-mechanical recycling -chemical recycling- incineration, Pyrolysis -mixed waste recycling-value addition, application and development for recycled materials.	10 Hours
19	PLASTIC TESTING-III	19.1 Product Testing- Plastics Pipes, laterals, Films, Woven sacks, Water Tanks, Containers & Plastic Foams and other products.	18 Hours
		19.2 Understanding Failure Analysis and different Types of failures and their analysis using Non Destructive Testing (NDT), Ultrasonic methods & its application in plastics, Gamma & Beta Transmission, Laser, X-ray Fluorescence.	18 Hours
		19.3 Acquire knowledge in Flammability, Flammability (UL -94), Test Ignition Properties, Limited Oxygen Index Test, Smoke Density Test, Flammability of Cellular Plastics, salt spray test.	18 Hours
20	COMMUNICATION SKILLS IN ENGLISH <i>(Able to read and comprehend English; and be able to</i>	4.1 Understanding of parts of Speech, tenses. 4.2 Understanding of visual charts 4.3 Read and interpret information correctly. 4.4 Write and read letters for communication purpose. 4.5 Answering verbal questions, dialogues writing and note making etc., Understand homophones,	06 Hours 04 Hours 04 Hours 04 Hours 04 Hours

	<p><i>communicate both orally and by writing in simple English, Describes key types of communication and common roadblocks to communication, as well as how to use effective communication as a tool to help build teamwork and manage conflict.)</i></p>	<p>homonyms, articles and compound words, dialogue writing, question tags, vocabulary learning 4.6 Learn to write simple and complex sentences. 4.7 Understand Active and Passive voices 4.8 Usage of Idioms and phrases. 4.9 Knowledge of Synonyms and Antonyms. 4.10 Write and read process chart and Technical letters. 4.11 Ensure communication with people in respectful form and manner in line with organizational protocol. 4.12 Finding out common errors in a sentence & corrections. 4.13 Knowledge on filling up of forms and writing technical report. Workplace communication, Business Communication.</p>	<p>04 Hours 04 Hours 04 Hours 04Hours 04 Hours 04 Hours 04Hours</p>
<p>21</p>	<p>INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP</p>	<p>21.1 Knowledge of Principles of Management - Development of management theory: - Taylor’s Scientific Management. 21.2 Knowledge of Functions of Management - Planning, Organizing, Staffing, Directing, Controlling, Decision making. 21.3 Knowledge of Organizational Structure - Knowledge of Line & Staff Organization, Leadership, Motivation and Communication. 21.4 Knowledge of Operation Management - Plant - location. 21.5 Knowledge of Quality Management, types of quality – quality of design, conformance and performance, phases of quality management, Juran’s and Deming’s view of quality 21.6 Understanding of Quality Management Assistance Tools - Ishikawa diagram – Pareto Analysis – Pokka Yoke (Mistake Proofing). 21.7 Knowledge of basics of quality circles, DMAIC, 8D,PDCA cycle, TQM, Kaizen, Lean Manufacturing, Five S (5S), Six sigma Quality Management Standards Knowledge of the ISO 9001Quality Management System Standard etc 21.8 Knowledge of the ISO 14001, ISO 27001 21.9 Knowledge of Entrepreneurship and entrepreneurial qualities, Steps required for starting a small scale industry, procedure for registration, Knowledge of sources of financial assistance, govt., assistance for development of SSI,MSME. 21.10 Knowledge of preparation of project report, Taxes &: GST, license requirements, Case study for setup of Plastics Industry.</p>	<p>02 Hours 02 Hours 04 Hours 02 Hours 04 Hours 04 Hours 08 Hours 04 Hours 04 Hours 04 Hours</p>

		<p>21.11 Knowledge of Introduction to Behavioral Science & Personality development, Attitudes, organization commitments, values & business ethics.</p> <p>21.12 Knowledge of meaning of Motivation, Group behavior, group dynamics, Communication, Leadership</p> <p>21.13 Knowledge of Basic Principle of Costing and Costing Methods, Break – Even Point Control Functions – Cost Reduction – Value Analysis – Cost Audit – Costing as related to mould and mouldings.</p> <p>21.14 Knowledge of Profoma for Cost Estimation – Product Cost – Mould Cost – Processing Cost – Project Costing – Direct Cost – Indirect Cost – Break Even Point.</p>	<p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p>
22	PLASTIC PROCESSING LAB-III	<p>22.1 Knowledge of Principles and Operation of Advance Injection Moulding- structural foam moulding, Thin wall product moulding, multi material and multi-colour moulding, All Electric Injection Moulding etc.</p> <p>22.2 FRP - Study of types of Resin, fibres used in the process, sequence of Process operation in Hand-layup process. Operation Practice for Hand-layup Process for producing FRP- products, Precautions during the process, Process-defects & analysis for the remedies.</p> <p>22.3 Knowledge of Principles of coating equipment, Process-method, type of material used, sequence of Operation in Coating.</p> <p>22.4 Knowledge of Principles and Operation of Heat-Sealing equipment, High frequency Welding & Hot stamping operation. Familiarization of screen printing process, methodology for screen preparation, type of inks used.</p> <p>22.5 Observe and practice the Mechanical recycling machine-washer & Drier, Grinder, Agglomerator, Extruder, Pelletizer etc - Parameter-setting Procedure, Practice by trainees to produce on appropriate product, output analysis, process-faults & remedies</p>	<p>24 Hours</p> <p>24 Hours</p> <p>18 Hours</p> <p>18 Hours</p> <p>24 Hours</p>
23	PLASTIC TESTING LAB-III	<p>23.1 Determination of Linear Shrinkage and Shrinkage on Transverse Direction</p> <p>23.2 Determination of Flammability Properties</p> <p>23.3 Determination of LOI</p> <p>23.4 Study the Introduction of product testing Plastics Product Testing as per BIS;</p> <p>23.5 Testing of PVC Pipes and Fittings</p> <p>23.6 Testing of HDPE Pipes and Fittings</p> <p>23.7 Testing of LDPE Films</p> <p>23.8 Testing of PET Containers for Drinking Water</p>	<p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p> <p>04 Hours</p>

		23.9 Testing of PC Electric Meter box 23.10 Testing of Water Storage Tank 23.11 Testing of Foam 23.12 Testing of FRP Products 23.13 Testing of Irrigation Laterals & Drippers 23.14 Testing of Woven Sacks 23.15 Measurement of Uncertainty (Learning of data interpretation and data transfer)	04 Hours 04 Hours 04 Hours 04 Hours 04 Hours 04 Hours 02Hours
24	COMMUNICATION LAB	24.1 LISTENING practical to develop comprehension 24.2 SPEAKING practical to learn voice modulation and situational conversation/role-playing 24.3 Learn READING and comprehension, and develop enriched vocabulary 24.4 To learn art of writing both official and Business correspondence 24.5 Learn how to participate in group discussions, mock interviews.	16 Hours 10 Hours 10 hours 08 Hours 10 Hours
25	SEMINAR	25.1 Individual or group of students as a team should select a seminar topic in recent developments and advancements relevant to their subject 25.2 The seminar contents should be presented in power point presentation and the same topic has to be submitted as hardcopy for assessment and allotment of marks.	27 Hours 27 Hours
26	PROJECT WORK / IN-PLANT TRAINING AND VIVA VOCE	26.1 Undertake a project. Project work shall be identified in collaboration with industry preferably. 26.2 Project Topic should cover any of the following: Projects related to : increasing productivity/ quality assurance/ estimation and economics of production/ repair and maintenance of plant and equipment/ identification of raw material thereby reducing the wastage/ suggesting substitutes of the polymer being used/ Any other related problems of interest for host industry. - Industry project/Viva voce	540 Hours

PGD-PPT

List of text books/Reference books

- 1. Plastics Materials and its Applications - I**
 - a. Plastics Materials – J.A. Brydson.
 - b. Plastic Materials Hand Book – A.S. Athalye

- 2. Plastics Processing Technology - I**
 - a. Injection Moulding Theory & Practice – Rubin, Irvin.
 - b. Plastics Engineering Hand Book – Society of Plastic Industry Inc.
 - c. Plastics Processing Data Hand Book – D.V. Rosato.
 - d. Plastics Materials & Processing – Brent Strong.
 - e. Industrial Robot Handbook - Richard K. Miller, CMfg.E, Springer Science+Business Media, LLC
 - f. Total Quality Process Control for Injection Molding, 2nd Edition, M. Joseph Gordon, Jr.

- 3. Plastics Testing - I**
 - a. Text Book on Fundamentals of Plastics Testing - Prof. (Dr.) S.K..Nayak
 - b. Plastics Testing Technology Hand Book – Vishu Shah
 - c. Simple Methods for Identification of Plastics – Brawn R. B.

- 4. Plastics Product and Mould Design**
 - a. Plastics Product Design Beck, R
 - b. Injection Mould Design – Pye R.G.W
 - c. Injection Moulds 130 Proven Design Gashtrow
 - d. Fundamentals of Plastic Mold Design – S K Nayak
 - e. Engineering Graphics – N D Bhat
 - f. Engineering Graphics – K Venugopal

- 5. Polymer Science & Technology**
 - a. Polymer Science – Gowariker V.R. & others.
 - b. Text book of Polymer Science – Billmeyer F.W.

- 6. Plastics Materials and its Applications - II**
 - a. Plastics Materials – J.A. Brydson.
 - b. Plastic Materials Hand Book – A.S. Athalye.

- 7 Plastics Processing Technology - II**
 - a. Compression Moulding – Iyesaw, A.I.
 - b. Technical Manual on Plastics Processing –
 - c. Plastics Engineering Hand Book – Society of Plastics Industry Inc.

- d. Plastics Materials & Processing – Strong A Brent.

8. Plastics Testing – II

- a. Text Book on Fundamentals of Plastics Testing - Prof. (Dr.) S.K. Nayak
- b. Plastics Testing Technology Hand Book – Shah Vishu

9. Machine Maintenance

- a. Manuals on Hydraulics & Pneumatics – Vickers.

10. Industrial Management & Entrepreneurship

- a. Industrial Engineering Management – Khanna O. P.
- b. Personal Management & Industrial Relations – Davar R. S.

11. Communication Skills in English

- a. Viswamohan, Aysha. English for Technical Communication. Tata McGraw –Hill, New Delhi.2008.
- b. Regionallnstitute of English. English for Engineers. Cambridge University Press, New Delhi.2006.
- c. A.S. Hornby, “The Advanced Learners dictionary of Current English” Oxford University Press,2004.
- d. Wren and Martin, “High school English Grammar and Composition”. S.Chand & ., Ltd.
- e. Glennis Pye, ‘Vocabulary in Practice –Part 1 to4’, Cambridge University Press,2004.
- f. Raymond Murphy, “ Essential English Grammar”, Cambridge University Press, 1990.
- g. Michael Swan “Basic English Usage”, EBS/OUP, 1989.
- h. Mishra , “Communication Skills for Engineers ” 1st Edition Pearson Longman.
- i. M.Thomas, “Common Errors in English”, Lotus Press, New Delhi,2006.
- j. Shiv K Kumar & Hemalatha Nagarajan, “ Learn Correct English”, Pearson Longman.

12. Environmental Science and Plastics Waste Management

- a. Introduction to environmental engineering and science, 2ndedition, prentice hall 2003–Gilbert M Masters
- b. Environmental Science and engineering –Benny Joseph, Tata McGraw-Hill, New Delhi 2006
- c. Environmental Science, CengageLearning India 2014 –G.Tyler Miller and Scott.
- d. Environmental studies from crisis to cure, Oxford University third edition
- e. A text book of environment studies –Shashi Chawla
- f. Technical Manual on Plastics Processing –CIPET
- g. Recycling & Plastics Waste Management –Dr. J S Anand
- h. Environmental Engineering & Management –Suresh K. Dameja

SECTION 2

EVIDENCE OF LEVEL

Awarding bodies will enter a proposed NSQF level for the qualification in the qualification File Summary. This section asks for the evidence on which that proposal is based. The evidence must refer to the level descriptors of the NSQF.

NSDA recommends an approach to working out the level of qualifications which starts with the level descriptor domains (Process, Professional knowledge, Professional skill, Core skill and Responsibility: see annex A). Two variants for providing the evidence of level are offered here: Option A and Option B in the following pages. Awarding bodies should choose the option which best suits the qualification.

TITLE/NAME OF QUALIFICATION/COMPONENT: POST GRADUATE DIPLOMA IN PLASTICS PROCESSING & TESTING			
NSQF DOMAIN	OUTCOMES OF THE QUALIFICATION/COMPONENT	HOW THE JOB ROLE RELATES TO THE NSQF LEVEL DESCRIPTORS	NSQF LEVEL
Process	<ul style="list-style-type: none"> • Selection of Plastics Processing Machines • Selecting right grade of material. • Setting machine parameters - Operating Machine as per cycle time for getting finished Product • Carrying out tests and quality evaluation of the Raw Materials and finished Products as per various National and International standards 	<ul style="list-style-type: none"> • The trainee having Post Graduate Diploma in Plastics Processing and Testing is best suited to work in downstream Petrochemical industries. Plastics Industries offer myriad opportunities for these trainees. • The trainees are assigned jobs in various departments of Plastics Industries namely Design, Plastics Processing Department and Plastics Testing. In this qualification the trainees have to work in the field of Plastics processing and testing. The trainee’s responsibility is to consider the various properties and characteristics of plastics materials and execute the order which includes receiving inquiry from customer, preparing quotation, gathering of information from valid sources e.g. Purchase Order, Product Drawing, Contract Terms of customer etc. • They have to identify plastics for a particular application with respect to its properties. The Trainees has knowledge about Natural Polymers, Commodity Plastics, Engineering Plastics and specialty 	Level 8

		<p>Plastics as well as thermosets and also about different grades of plastics that are commercially available.</p> <ul style="list-style-type: none"> • The trainees can work on either microprocessor Injection moulding unit, Extrusion Pipe plant, Monofilament plant, wire coating plants, Injection & Extrusion Blow Moulding, Blow Moulding Thermoforming, Rotational Moulding, Fiber Reinforced plastics, Gas assisted Injection Moulding machine, Compression Moulding, Printing techniques, Coating and electroplating process and calendaring. They can set the mould and die and the machine parameters as per requirement. They will supervise Production and plan shift schedule and execute the production planning. They can maintain 5S on the production Floor. Maintain the production and quality control as per ISO & BIS. Manage Inventory needed for smooth production. Prepare MIS documents related to production floor. Manage wastage of raw material on shop floor. Man management in the shift. • The Trainees can perform Testing & Quality control as per standard procedure both national and international level. The Trainees can work in Mechanical, Chemical, and Thermal, and characterization, optical, electrical and rheological labs for testing of different plastics products. 	
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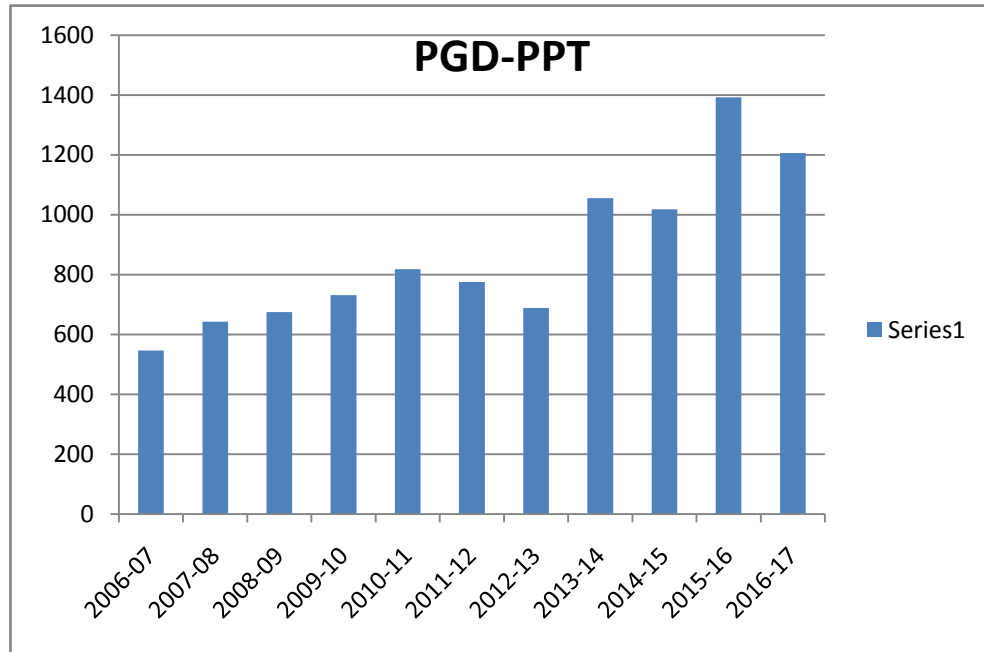
TITLE/NAME OF QUALIFICATION/COMPONENT: POST GRADUATE DIPLOMA IN PLASTICS PROCESSING & TESTING			
NSQF DOMAIN	OUTCOMES OF THE QUALIFICATION/COMPONENT	HOW THE JOB ROLE RELATES TO THE NSQF LEVEL DESCRIPTORS	NSQF LEVEL
Professional Knowledge	<ul style="list-style-type: none"> • The Trainee is well versed with the grade of material used for processing of particular plastics products. • Trainees can select the processing technique and set-up process parameters to run production • Trainees can identify defects and do troubleshooting • Trainee understands the standard and work as per standard procedure. • Trainees can devise ways to cut short the cycle time and hence increase production. • Trainee can evaluate quality of the product 	<ul style="list-style-type: none"> • The Trainee should be technically skilled in the area of design, tool room, processing & testing. He/She should be able to understand the trouble or defect and should be able to resolve the issue. • The Trainee should be able to compound the polymer along with other necessary additives and should know the proper machine in which the compounding has to be done. • They should be able to identify the specification of the machine. • Trainee should be aware of giving high output in the form of production at the given time using manpower in most economical way. • Trainee should be aware of system and procedures and accordingly work on it. • Trainee should be able to do quality analysis as per various national and international standards. They should be able to understand what the standard says. The trainee has to work into different Plastics Processing process so they have to have sound knowledge in various processing techniques. They have to be prone to new technologies or newer versions of the software. • They should be aware of maintenance of mould and machineries. • They should be capable of running the machine independently. 	Level 8
Professional Skills	<ul style="list-style-type: none"> • Identify processing requirement • Develop plan for processing • Troubleshoot the problems on the shop 	<ul style="list-style-type: none"> • Job Holder shall supervise the production process • Job Holder shall diagnose common problems in the material, machines and equipments based on visual inspection and quality checks 	Level 8

	<p>floor</p> <ul style="list-style-type: none"> • Assess process efficiency • Assess product quality using different testing methods • Develop quality consciousness concept 	<ul style="list-style-type: none"> • Job Holder shall look for improvements wherever possible • Job Holder shall motivate the team, handle the coordination among team members and report team members issues to HR department that is beyond his control 	
<p>Core Skills</p>	<ul style="list-style-type: none"> • Use basic health and safety practices at the work place • Can supervise the shop-floor and can assess process parameters and troubleshoot • Develop entrepreneurship skills • Communicate effectively 	<ul style="list-style-type: none"> • The Trainee should be technically skilled in the processing & testing. He/She should be able to understand the trouble or defect and should be able to resolve the issue. • The Trainee should be able to compound the polymer along with other necessary additives and should know the machines on which the compounding has to be done. • He should be able to identify the specification of the processing machine. • Trainee should be aware of system and procedures and accordingly work on it. • The trainee has to supervise the shop-floor so they must know Plastics Processing techniques so they have to have sound knowledge on various processing techniques. • He should be aware of maintenance of mould and machineries. • He should be able to implement safety procedures as per standards • He should be capable of analyzing production records using statistical tools • He should be able to communicate effectively with team members and with management • He should resolve any difficulties in relationships with colleagues, or get help from an appropriate 	<p>Level 8</p>

		<p>person, in a way that preserves goodwill and trust.</p> <ul style="list-style-type: none"> • He needs to know and understand how to practice honesty with respect to company property and time. 	
Responsibility	<p>Work independently and guide team members with full responsibility of output of group and development of organization.</p>	<ul style="list-style-type: none"> • Should be responsible for implementing KAIZEN. • He should be responsible for arranging raw material for production in a shift. • He should be responsible for arranging the manpower for smooth running of shift activity. • He should be responsible for executing production planning receive by PPC (Production Planning & Control) department. • He should be responsible to get optimum output of plant capacity and reduce the wastage. • He should be responsible for controlling input costs for production. • He should be responsible to control online quality control and quality assurance of the finished products. • Job holder shall follow work standard, specific norms and procedures laid down by the organization. Job holder shall develop moral, values and ethical practices in business operation. 	Level 8

SECTION 3
EVIDENCE OF NEED

What evidence is there that the qualification is needed?



The qualification, **Post graduate Diploma in Plastics Processing and Testing (PGD-PPT)** is in existence since 1979 and CIPET has trained more than 9,500 trainees in the last 10 years. All trainees are placed in Industries through campus placement.

What is the estimated uptake of this qualification and what is the basis of this estimate?

Skills Gap analysis Reports for industry demand and secondary research data, though these do not lend to accurate demand projection. The link to NSDC Human Resource & Skills Requirement in Capital Goods Sector is

http://cgsc.in/Humanresource_skill_requirement.pdf

What steps were taken to ensure that the qualification(s) does (do) not duplicate already existing or planned qualifications in the NSQF?

- The qualification is originally designed by curriculum committee comprising the training head, industrial experts, academicians and professional experts.
- The work group under the guidance of curriculum development committee already conducted desk search as well as referred to the qualification packs as a supporting document for mapping of the curriculum.
- As per the search it is found that, the Post graduate Diploma in Plastics Processing and Testing (PGD-PPT) courses not available for the skill development of the candidates in Capital Goods Sector Skill Council.

What arrangements are in place to monitor and review the qualification(s)? What data will be used and at what point will the qualification(s) be revised or updated?

- The curriculum committee meeting for review will be in the month of Jan 2018 which comprising industrial expert, university professors with subject specialization.
- The data used for revision or update will be impact analysis (student and industries) and new subject area in the field of plastics processing and testing & quality control.
- The curriculum review and updates, in consultation with polymer industries and expert of respective domain, NOS approved by NSDA will also be referred to from time to time.

SECTION 4 EVIDENCE OF PROGRESSION

What steps have been taken in the design of this or other qualifications to ensure that there is a clear path to other qualifications in this sector?

Qualifying trainee will obtain CIPET Certificate in 'Post graduate Diploma in Plastics Processing and Testing (PGD-PPT)'. After completion of course and after 3 years of field experience the trainee can work as a Senior production/quality control supervisor and after that 5 years of experience, the person can work as a Manager production or Manager Quality control. Also he/she can become an entrepreneur in the downstream polymer industries sector.

The diagram shown below represents the vertical mobility for the job holder as a job progression in capital goods Sector.

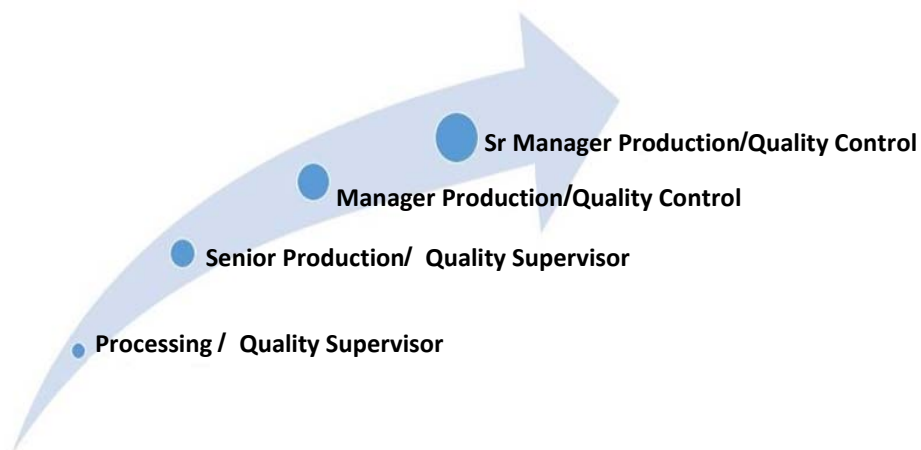


Fig. 1. Career Progression of PGD-PPT Graduates