NATIONAL SKILL QUALIFICATION FRAME WORK (NSQF)
QUALIFICATION FILE

SYLLABUS & CURRICULUM

DIPLOMA IN PLASTICS TECHNOLOGY (DPT)

Implemented from Academic Year: 2018-19

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

Version -: Draft of - ___ ____

CONTACT DETAILS OF THE BODY SUBMITTING THE QUALIFICATION FILE

Name and address of submitting body:

Central Institute of Plastics Engineering and Technology (CIPET), Ministry of Chemicals and Fertilizers, Department of Chemicals and Petrochemicals, Govt. of India, Head Office, Guindy, Chennai

Name and contact details of individual dealing with the submission

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List of documents submitted in support of the Qualifications File

1. Curriculum/ Syllabus
2. Evaluation (Marking) Scheme
3. Training Delivery Plan
4. Criteria for Assessment of Trainees

1. SUMMARY

Qualification Title and Code	Diploma in Plastics Technology (DPT)
Qualification Code	
Nature and purpose of the qualification	**Nature:** Diploma Course **Purpose:** Learners who attain this qualification are competent in understanding various plastics processing techniques such as injection molding, extrusion, blow molding, rotational molding, thermoforming, compression and transfer molding Qualifying learners attain skills to supervise work on processing shop floor to convert raw material to products by different processing techniques, set processing parameters to obtain good quality products evaluate the quality, understand plastics materials, their properties and applications.
Body/bodies which will award the qualification	**Central Institute of Plastics Engineering & Technology (Dept. of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers)**
Body which will accredit providers to offer the qualification:	**Central Institute of Plastics Engineering & Technology (Dept. of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers)**
Body/bodies which will be responsible for assessment:	**Academic Cell of Central Institute of Plastics Engineering & Technology**
Occupation(s) to which the qualification gives access:	**Supervisor in plastics product manufacturing units or Quality inspector**
Proposed level of the qualification in the NSQF:	**Level 5**
Anticipated volume of training/learning required to complete the qualification:	3242 Hours in 6 Semesters with the duration of 03 years.
Entry requirements / recommendations:	**10th Standard Pass {Minimum marks percentage (all subjects together): 35%}**
Progression from the qualification:	This qualification helps the trainee to work as shop floor engineers in plastics product manufacturing (molding/extrusion/blow molding) plants. Later using the experience in this profession, they can get good opportunities to work as supervisor in above sector with better positions. They can also become entrepreneurs After completion of DPT course, the candidate can take lateral entry in 2nd Year B.E. / B. Tech. in Chemical, Production and Mechanical discipline.
Planned arrangements for the Recognition of Prior Learning (RPL):	RPL arrangements are being developed and will be informed in due course of time.
International comparability where known:	**Not Known**
Date of planned review of the qualification.	**January 2018**

SEMESTER-I

Theory							
S. No.	Subject	CH	TH	EH	Marks		
					INT	EXT	TOTAL
MP 101	Communication English-I	43	11	03	40	60	100
MP 102	Workshop Mathematics	43	11	03	40	60	100
MP 103	Engineering Chemistry	43	11	03	40	60	100
MP 104	Computer & Information Technology	43	11	03	40	60	100
MP 105	Environmental Sciences	43	11	03	40	60	100
(18 weeks- 15 hrs a week)		215	55	15	200	300	500
		270					
Practical Work							
MPL 101	Engineering Chemistry Lab (18 weeks- 3 hrs a week)	54		04	50	50	100
MPL 102	Communication Lab (18 weeks- 4 hrs a week)	72		04	50	50	100
MPL 103	Computer Engineering Lab (18 weeks- 7 hrs a week)	126		08	100	100	200
	Library – (20 weeks 4 hrs a week) (18 weeks- 1 hr a week)	18		--	-	-	-
Total Hours (18 weeks- 15 hrs a week)		270		16	200	200	400

SEMSETER –II

Theory							
S. No.	Subject	CH	TH	EH	Marks		
					INT	EXT	TOTAL
MP 201	Communication English – II	43	11	03	40	60	100
MP 202	Engineering Mathematics	43	11	03	40	60	100
MP 203	Engineering Physics	43	11	03	40	60	100
MP 204	Electrical & Electronics Engineering	43	11	03	40	60	100
MP 205	Development of Life Skills	43	11	03	40	60	100
Total Theory Hours (18 weeks- 15 hrs a week)		215	55	15	200	300	500
		270					
Practical Work							
MPL 201	Electrical & Electronics Engineering Lab (18 weeks- 3 hrs a week)	54		04	50	50	100
MPL 202	Engineering Physics Lab (18 weeks- 3 hrs a week)	54		04	50	50	100
MPL 203	Workshop Practice (18 weeks- 8 hrs a week)	144		08	100	100	200
	Library – (18 weeks- 1 hr a week)	18		-	-	-	-
Total (18 weeks- 15 hrs a week)		270		16	200	200	400

SEMESTER-III

Theory							
S. No.	Subject	CH	TH	EH	Marks		
					INT	EXT	TOTAL
MP 301	Polymer Science & Engineering	43	11	03	40	60	100
MP 302	Plastics Materials-I	43	11	03	40	60	100
MP 303	Plastics Processing Technology-I	43	11	03	40	60	100
MP 304	Engineering Drawing	43	11	03	40	60	100
MP 305	Mould Manufacturing	43	11	03	40	60	100
(18 weeks- 15 hrs a week)		**215**	**55**	**15**	**200**	**300**	**500**
		270					
Practical Work							
MPL 301	**Plastics Processing Lab-I** (18 weeks- 8 hrs a week)	144		08	100	100	200
MPL 302	**Engineering Drawing Practice** (18 weeks- 3 hrs a week)	54		04	50	50	100
MPL 303	**Utilities & Service Equipments Lab** (18 weeks- 3 hrs a week)	54		04	50	50	100
	Library – (20 weeks 4 hrs a week) (18 weeks- 1 hr a week)	18		--	-	-	-
Total Hours (18 weeks- 15 hrs a week)		**270**		**16**	**200**	**200**	**400**

SEMSETER –IV

Theory							
S. No.	Subject	CH	TH	EH	Marks		
					INT	EXT	TOTAL
MP 401	Industrial Management & Entrepreneurship	43	11	03	40	60	100
MP 402	Plastics Product & Mould Design	43	11	03	40	60	100
MP 403	Plastics Materials-II	43	11	03	40	60	100
MP 404	Plastics Testing-I	43	11	03	40	60	100
Total Theory Hours (18 weeks- **15** hrs a week)		**172**	**44**	**15**	**160**	**240**	**400**
		216					
Practical Work							
MPL - 401	**CAD Lab** (18 weeks- 8 hrs a week)	144		08	100	100	200
MPL – 402	**Plastics Testing Lab-I** (18 weeks- 9 hrs a week)	162		08	100	200	300
	Library – (18 weeks- 1 hr a week)	18		-	-	-	-
Total (18 weeks- 18 hrs a week)		**324**		**16**	**200**	**300**	**500**

SEMESTER-V

Theory							
S. No.	Subject	CH	TH	EH	Marks		
					INT	EXT	TOTAL
MP 501	Plastics Recycling & Waste Management	43	11	03	40	60	100
MP 502	Maintenance of Plastics Processing & Testing Equipments	43	11	03	40	60	100
MP 503	Plastics Processing Technology-II	43	11	03	40	60	100
MP 504	Plastics Testing-II	43	11	03	40	60	100
(18 weeks- 15 hrs a week)		172	44	15	160	240	400
		216					
Practical Work							
MPL 501	Plastics Processing Lab-II (18 weeks- 9 hrs a week)	162		08	100	200	300
MPL 502	Plastics Testing Lab-II (18 weeks- 8 hrs a week)	144		08	100	100	200
	Library – (18 weeks- 1 hr a week)	18		--	-	-	-
Total Hours (18 weeks- 18 hrs a week)		324		16	200	300	500

SEMSETER –VI

S. No.	Subject	CH	TH	EH	Marks		
					INT	EXT	TOTAL
MPP	Project Work/ In plant training in industry **	540	-	-		-	-
Total Hours (18 weeks 30 hours per week)		540	-		-	-	-
MPP 601	Project Evaluation & Viva voce	-	-	8	400	400	800
MPP 602	Industrial Training Report	-	-		100		100
	Total	540	-		1000		900

** Minimum of 6 weeks

CH-Contact Hours TH- Tutorial Hours EH-Examination Hours

Formal structure of the qualification:			
Title of NOS/unit or other component (include any identification code used)	Mandatory/ Optional	Estimated size (Learning hours)	Level
SEMESTER - I			
THEORY			
Communication English – I	Mandatory	54	
Workshop Mathematics	Mandatory	54	
Engineering Chemistry	Mandatory	54	
Computer & Information Technology	Mandatory	54	
Environmental Sciences	Mandatory	54	
Total		270	
PRACTICAL			
Engineering Chemistry Lab	Mandatory	54	
Communication Lab	Mandatory	72	
Computer Engineering Lab	Mandatory	126	
Library	Mandatory	18	
Total		270	
SEMESTER - II			
THEORY			
Communication English-II	Mandatory	54	
Engineering Mathematics	Mandatory	54	
Engineering Physics	Mandatory	54	
Electrical and Electronics Engineering	Mandatory	54	
Development of Life Skills	Mandatory	54	
Total		270	
PRACTICAL			
Electrical and Electronics Engineering Lab	Mandatory	54	
Engineering Physics Lab	Mandatory	54	
Workshop Practice	Mandatory	144	
Library		18	
Total		270	
SEMESTER - III			
THEORY			
Polymer Science & Engineering	Mandatory	54	
Plastics Materials – I	Mandatory	54	
Plastics Processing Technology – I	Mandatory	54	
Engineering Drawing	Mandatory	54	
Mould Manufacturing	Mandatory	54	
Total		270	
PRACTICAL			
Plastics Processing Lab – I	Mandatory	144	
Engineering Drawing Practice	Mandatory	54	
Utilities and Service Equipments Lab	Mandatory	54	
Library		18	
Total		270	

SEMESTER - IV			
THEORY			
Industrial Management and Entrepreneurship	Mandatory	54	
Plastics Product and Mould Design	Mandatory	54	
Plastics Materials-II	Mandatory	54	
Plastics Testing – I	Mandatory	54	
Total		216	
PRACTICAL			
CAD Lab	Mandatory	144	
Plastics Testing Lab-I	Mandatory	162	
Library		18	
Total		324	
SEMESTER - V			
THEORY			
Plastics Recycling & Waste Management	Mandatory	54	
Maintenance of Plastics Processing and Testing Equipments	Mandatory	54	
Plastics Processing Technology-II	Mandatory	54	
Plastics Testing-II	Mandatory	54	
Total		216	
PRACTICAL			
Plastics Processing Lab - II	Mandatory	162	
Plastics Testing Lab - II	Mandatory	144	
Library		18	
Total		324	
Semester - VI			
THEORY			
Project Work/In plant training in industry	Mandatory	540	
Total		540	

SECTION 1

ASSESSMENT

Body/Bodies which will carry out assessment:
Academic Cell, CIPET – HO, Chennai is a separate department/ body, will carry out the assessment.

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

RPL Assessment will be managed following RPL Guidelines as directed by National Skill Development Corporation, Govt. of India. RPL Assessment will be carried out by Academic Cell, CIPET – HO, Chennai.

Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, consistent and fair and show that these are in line with the requirements of the NSQF:
To maintain uniformity and consistency in the standard of training, same course curriculum is followed in all the CIPET – Centers. The Training Assessment is done on both theoretical knowledge and practical skills of the candidates:

Sl. No.	Assessment	Description	External Marks	Internal Marks	Total Marks
1	Theoretical Examination	Written examination consisting of knowledge and depth on each subject trained	60 %	40 %	100 %
2	Practical Examination	Practical assessment of the candidate by working on the machinery on each practical subject	50 %	50 %	100 %
3	Project Work and Viva Voce	Evaluation of Project Work carried out at the last semester of course curriculum	200	100	300

A. Assessment Guidelines:

1. The question papers are set by the trainers and submitted to Academic Cell, CIPET – HO.
2. Academic Cell, CIPET – HO justify the resemblance of the question paper with the course curriculum and approves it.
3. Theory and Practical Examination Schedule is notified to all the CIPET – Centres training DPT Course.
4. Practical examination takes place in all the Centres maintaining same date and time. Assessment comprises:
   a. Knowledge and skill required to work in the machinery
   b. Ability to operate the machine independently
   c. Ability to prepare report in the form of Practical Note book
   d. Answer sheet of the Practical Examination
   e. Evaluation of the “Output” produced in the Practical Examination
   f. Maintenance of cleanliness and safety, while working on the machine
   g. Attendance and punctuality
   h. Viva voce

5. Theoretical examination comprises question with Objective, short answer and long answer types
6. Immediately at the end of each examination, all the Answer Papers are collected from all centres and accumulated at Academic Cell, CIPET – HO.
7. All the received Answer Papers are Coded by Academic Cell, CIPET – HO and Evaluated by Examiners in a Centralized Evaluation System established by Academic Cell, CIPET – HO.
8. After Evaluation, Decoding is done and Result Declared.
9. In the VI Semester, the candidates carry out a Project Work to orient / motivate them in developmental work at the relevant field of interest.

B. Criteria of Assessment:

The following criteria are followed:

Sl	Examination	Pass Marks	
		External Examination	Internal Examination
1	Theory Examination	40 %	40 %
2	Practical Examination	50 %	50 %
3	Project Work and Viva Voce	50 %	

C. Assessors: The faculties engaged for the course possess competitive credentials also function as assessors. Faculties are being trained from time to time to upgrade their knowledge and skills on various aspects, thus their functional area can be updated to modern aspects of technology.

D. Eligibility to Appear in the Exam: Minimum 80% attendance is compulsory for the students to appear for the assessments.

E. Results and Certification: After Assessment following established procedure, the result is declared. Successful candidates are awarded the certificates by Central Institute of Plastics Engineering & Technology.

ASSESSMENT EVIDENCE

The following assessment evidences are followed:

1. Signature in the Attendance Register: Both at the beginning (Forenoon) and at the end (Afternoon) of classes each working day
2. Internal Assessment Record (IAR) Book for Theory Classes
3. Internal Assessment Record (IAR) Book for Practical Classes
4. Practical Note Book after completion of each Practical Assignment
5. Theory Examination – Answer Sheet
6. Practical Examination – Answer Sheet
7. Progress Report after each Semester

Title of NOS/Unit/Component:

Title of Component		Diploma in Plastics Technology (DPT)	
Sl. No.	**Outcome to be Assessed**	**Assessment Criteria for the Outcome**	**No. of Hours**
1	**Communication English-I** *(Able to read and comprehend English; and be able to communicate both orally and by writing in simple English)*	1.1 Understanding of parts of Speech, tenses. 1.2 Understanding of visual charts 1.3 Read and interpret information correctly. 1.4 Write and read essay and letters for communication purpose. 1.5 Answering verbal questions, dialogues writing and note making etc.	
2	**Workshop Mathematics** *(Describes basic elementary mathematics, trigonometric, binomial theorem, complex numbers and analytical geometry to understand simple quadratic equations, trigonometric angles pair of straight line and equation circles to solve simple problems)*	2.1 Understanding of simple fraction, addition, subtraction, multiplication, percentage and quadratic equation. 2.2 Find unknown angles in any triangles, trigonometric ratios of multiple angles (2A & 3A) and problem solving the expansions. 2.3 Remember the formula for the Binomial Theorem according to the equations. 2.4 Understand pair of line passes through origin using second degree equations – simple problems. 2.5 Illustrate and name the parts of a circle, radius, diameter & circumference and using General equations of a Circle able to find centre, radius and equation of the circle. 2.6 Can use Trigonometric ratio and its table. Sine & cosine rule, Solutions of triangle, compound angles and multiple angles –able to solve simple problems	
3	**Engineering Chemistry** *(Overview of key concepts of Chemistry. To provide the students with a fundamental understanding of structure & bonding, organic chemistry, water chemistry, organic chemistry and fuels, Electro chemistry & basic concepts of thermodynamics)*	3.1 Able to understand basic concepts of atomic structure and chemical bonding and electronic configuration. 3.2 Knowledge on acid, bases, solutions & electro chemistry. 3.3 Knowledge about water chemistry. 3.4 To provide an overview of preparation and identification of organic compounds. 3.5 Understand different types of fuels & its extractions. 3.6 Knowledge on electro chemistry & its application 3.7 Understand basic concepts and terms of thermodynamics, thermodynamic processes, Heat and work concept with expressions.	
4	**Computer & Information Technology** *(Able to use the computer, understand basics of operations and parts operating systems and*	4.1 Describe different parts of computers & its operating systems 4.2 Understanding windows operating system & its functions. Knowledge on MS office. 4.3 Application of computer & communication for	

	MS office. Able to make PowerPoint presentation and use Computer communication and internet for daily activities)		technical Work. 4.4 Power point presentation making 4.5 Learn about Computer communication like LAN, MAN, WAN, Bluetooth 4.6 Understanding how to use Internet for day to day activities.	
5	**Environmental Science** *(Overview of basic environmental science, natural resources, environmental pollution, social issues and environmental protection)*	5.1 5.2 5.3 5.4 5.5 5.6	Scope and importance of environmental science, effect human of activities on environment Know the concept of eco system, structure and function. Awareness about natural resources, forest resources, exploitation, deforestation Awareness about water resources, food resources, mineral resources land resources and energy resources. Awareness about environmental pollution such as air, water, land, thermal, and water conservation, global warming, ozone layer depletion. Knowledge about environmental protection acts and disaster management system types and policy.	
6	**Engineering Chemistry Lab** *(Understand the basic laboratory techniques and preparation of standard solutions, titration and volumetric analysis)*	6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9	Volumetric Analysis Acidimetry – Alkalimetry Estimation of Hydrochloric acid Estimation of Sulphuric acid Estimation of Sodium hydroxide given standard sodium carbonate solution & Hydrochloric acid as a link solution) Permanganometry - Estimation of potassium permanganate and Estimation of strength of Oxalic acid EDTA Titration - Estimation of total hardness of water for the water sample pH Determination - Determination of pH using pH meter Preparation of Standard Solutions - Preparation of 1N, 0.5N & 0.1N solution of sodium carbonates and Preparation of 1N Solution of oxalic acid.	05 Hours 04 Hours 05 Hours 04 Hours 05 Hours 05 Hours 04 Hours 10 Hours 12 Hours
7	**Communication Lab** *(Learn to communicate- listen, speak, read and write in English- so as to use it as a tool to aid professional advancement)*	7.1 7.2 7.3 7.4 7.5	LISTENING practical to develop comprehension SPEAKING practical to learn voice modulation and situational conversation/role-playing Learn READING and comprehension, and develop enriched vocabulary To learn art of writing both official and Business correspondence Learn how to participate in group discussions, mock interviews.	10 Hours 15 Hours 15 Hours 20 Hours 12 Hours

8	**Computer Engineering Lab** *(Demonstration & practice on computers and operating system to train the students on preparation of documents, statements, presentation and creating mail and web search which helps the trainees to work in the organization)*	8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9 8.10 8.11 8.12 8.13 8.14 8.15	Study of Computer Components Practice of Computer Booting Process in XP Demonstration of Windows Environment Practice - using My Computer, Windows Explorer Practice - using Control Panel Practice - My Network Places Practice - CD and DVD Writing Practice - Paint Installation of Windows XP by using NTFS File System. Demonstration of Network Creating e-mail Account, Sending and Receiving e-mails. Searching Web Page/ Site using Search Engine: (eg. google.com, yahoo.com, altavista.com etc.) Exercise Based on MS-Word - Document Preparation, Printing Document, Mail Merge usage, Draw Table. Exercise Based on Ms-Excel - Work Book Preparation, Printing Workbook, Data-base usage, Draw Charts. Exercise Based on Power Point - Creating Slide, Adding, Animations in Slide, Presentation.	13 Hours 11 Hours 10 Hours 08 Hours 05 Hours 04 Hours 04 Hours 02 Hours 10 Hours 10 Hours 06 Hours 06 Hours 15 Hours 15 Hours 07 Hours
9	**Communication English-II** *(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.)*	9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9	Understand homophones, homonyms, articles and compound words, dialogue writing, question tags, vocabulary learning Learn to write simple and complex sentences. Understand Active and Passive voices Usage of Idioms and phrases. Knowledge of Synonyms and Antonyms. Write and read process chart and Technical letters. Ensure communicate with people in respectful form and manner in line with organizational protocol. Finding out common errors in a sentence & corrections. Knowledge on filling up of forms and writing technical report.	
10	**Engineering Mathematics** *(Describes basic types of analytical and trigonometric function as well as calculus and integration and its application. Helps them to understand Probability and statistics to solve simple problems)*	10.1 10.2 10.3 10.4 10.5	Recognize all the types of matrices. Using matrix algebra and determinants able to solve up to third order of Simultaneous equations using Cramer's rule. Remember the formula for the Binomial Theorem according to the equations. Investigate what it is happening geometrically when z is multiplied by i to get iz Understand the properties of the Cartesian representation of a complex number, how to draw an Argand diagram, De Moivre's theorems - Simple	

		problems 10.6 Competence in calculating derivatives, integrals, using vectors and other tools fundamental to multivariable calculus. 10.7 Understand the behavior of multivariable functions graphically. And analytically, by examining level surfaces, partial derivatives, etc. 10.8 Apply probability concepts, using relational thinking, in solving problems involves: selecting and carrying out a logical sequence of steps, connecting different concepts or representations demonstrating understanding the concepts of and also relating findings to a context or communicating thinking using appropriate statements. 10.9 Ability to apply techniques of calculus to set up and solve problems involving product rule, successive differentiation & formation of differential equation up to second order. 10.10 Describe 2D, 3D shapes using given dimensions & angle.	
11	**Engineering Physics** *(Overview of key concepts of units, dynamics, force, motion, elasticity, surface tension temperature measurement and light)*	11.1 Understand different systems of units & dimensions, dimensional formula and derivation of expression of period of simple pendulum. 11.2 Knowledge on scalar & vector quantities. 11.3 Ability to understand different types of Forces and motion including linear angular circular and parabolic motions. 11.4 Knowledge on elasticity & related modulus. 11.5 Understanding the properties of surface tension & viscosity. 11.6 Modes of heat transfer & their examples. 11.7 To understand applications of optics using basic fundamentals of Physics. 11.8 To understand working principle of a LASER, components and working of different laser system and their engineering applications.	
12	**Electrical and Electronics Engineering** *(Overview of concept of AC & DC Current, DC generator & Motor, transformer, single phase capacitor, servo motor, and basic electronics and logical gates)*	12.1 Describe the characteristics of AC & DC circuits. 12.2 Describe how generators use magnetic induction. 12.3 Describe the DC generator, DC Motor & its construction, principle of operation, types & its Applications 12.4 Distinguish between single and three-phase power. 12.5 Describe voltage transformers. 12.6 Describe the basic types of transformer cores. 12.7 Describe transformer connections. 12.8 Describe common power distribution systems. 12.9 Describe the process of converting AC to DC. 12.10 Describe ways to reduce electrical safety risks. 12.11 Describe semiconductor materials	

		12.12 Describe the basic electronic & logic gates and their basic applications	
13	**Development of Life Skills** *(Understands importance of ethics, morals and professional values, motivation and teamwork for improving personality)*	13.1 Study of personality development, ethics, moral & professional values and critical thinking. 13.2 Study of time management, stress & conflict management, problem solving and decision making. 13.3 Understanding of Theory of motivation, attitude and aptitude 13.4 Knowing the importance of health and understanding body languages. 13.5 Discussion of interview techniques and group discussion. 13.6 Importance and necessity of working in a team.	
14	**Electrical and Electronics Engineering Lab** *(Understands handling of electrical equipment, electronic measurements which helps the trainees for basic maintenance on shop floor)*	**A - Electrical Engineering Lab:** 14.1A Study of measuring instruments – Ammeter – Volt meter – Watt meter etc. 14.2A Determination of resistance by Ohm's law. 14.3A Energy measurement in a single phase circuit using lamp Load. 14.4A Power measurement in a single phase circuit. 14.5A Load test on a single phase transformer. 14.6A Load test on a single phase induction motor. 14.7A Verification of series and parallel circuit. 14.8A Study of DC & AC machine starters. **B - Electronics Engineering Lab :** 14.1B Characteristics of PN junction diode. 14.2B Characteristics of transistor. 14.3B Construction of bridge rectifier. 14.4B Verification of Logic gates. 14.5B Characteristics of Photo Diode, LED and thermistor & Zener diode. 14.6B Measurement using CRO and Megger. 14.7B Study of microprocessor, microcontroller & drives.	**[27 Hours]** 04 Hours 03 Hours 03 Hours 02 Hours 03 Hours 03 Hours 03 Hours 06 Hours **[27 Hours]** 04 Hours 03 Hours 03 Hours 02 Hours 03 Hours 06 Hours 06 Hours
15	**Engineering Physics Lab** *(The experiments start with an initial discussion with a demonstrator about the physics involved, the aim of the experiment, and the experimental method. For this reason it is essential that students prepare for the experiment in advance. The student is not allowed to start the experiment until a satisfactory discussion has taken place.)*	15.1 Determination of thickness of a metal wire using screw gauge 15.2 Determination of diameter of a cylindrical bar using vernier Caliper 15.3 Determination of time period of simple pendulum. 15.4 Experiment to verify Hooke's law 15.5 Experiment to verify Lami's law 15.6 Determination of focal length of convex lens 15.7 Determination of focal length of concave lens 15.8 Determination of Young's modulus using non-uniform bending method 15.9 Determination of moment of inertia and rigidity modulus using torsional pendulum 15.10 Determination of Thermal conductivity of bad conductor by Lee's disc method 15.11 Determination of Viscosity of given liquid by Stroke's method.	04 Hours 04 Hours 06 Hours 04 Hours 04 Hours 05 Hours 05 Hours 06 Hours 07 Hours 06 Hours 03 Hours

16	**Workshop Practice** *(Practice on basic workshop tools and their usage, exposure to safety aspects on shop floor)*	16.1 Familiarization of Workshop Tools & safety aspects 16.2 State the purpose / use of Hand tools, marking tools 16.3 Explain the purpose of Holding tools, cutting and striking tools 16.4 Study and Practice on Measuring Instruments / Equipment 16.5 Filing and Fitting Practice 16.6 Pedestal grinding - Safety precautions – Sharpening of cutting tools - single point, knife tools, form tools.	16 Hours 14 Hours 10 Hours 24 Hours 54 Hours 26 Hours
17	**Polymer Science & Engineering** *(Introduction-what are monomers, polymers, classification of polymers, bonding in polymers, Polymerization- mechanisms and techniques, structure and properties of polymers, molecular weight and thermal transitions – Tg and crystallinity, Rheology and characterization)*	17.1 Understanding of Basics of Polymer Science Monomers & its requirement- Broad Classifications of Polymers - Bonding in Polymers – Polymer structure –Isomerism, Molecular Weight and its Distribution Thermal Transitions – Tg & Tm 17.2 Understanding of basics of Polymerization -Chain growth– Reaction Mechanism - Condensation Polymerization – 17.3 Knowledge of different Polymerization techniques 17.3 Knowledge of Polymer Structure Relationship – Molecular Weight, Polymer solutions and solubility-State of Polymer – Crystalline, Amorphous, Deformations in Polymer – Mechanical, thermal and electrical properties. 17.4 Understanding of basics of Polymer Rheology, concept of Viscoelasticity 17.5 Identify and characterize Polymers, determine Molecular Weight & Melt Flow Characteristics 17.6 Study of Thermal Analysis -DSC, TGA and Dynamic Mechanical Analysis of polymers.	
18	**PLASTICS MATERIALS – I** *(To understand the different types of plastics - their method of preparation, characteristics, properties and applications)*	18.1 Introduction to natural polymers-their sources, methods of manufacture, properties and applications 18.2 Knowledge of Commodity Plastics –Olefinic, Styrenic and Vinyl polymers-Method of Manufacture – General Characteristics & Properties – Processing Behaviour and applications 18.3 Knowledge of Engineering Plastics –Method of Manufacture – General Characteristics & Properties – Processing Behaviour and applications 18.4 Thermoset Plastics- Source of Raw Materials – Methods of Manufacture – General Characteristics & Properties – Processing Behaviour and Applications	

19	**Plastics Processing Technology – I** *(Study of different processing methods, understand related operations, monitor process parameters and troubleshoot the process/product)*	19.1 Understand Basic Principles of Melt Processing of Thermoplastics – thermal behavior, Rheology, orientation, degradation, advantages and limitations 19.2 Injection Moulding Process: Basic Process Principle - Types of Machines – Parts and its functions - Operation procedure - Clamping system - Types of Screw and their function - Heating System - Ejection system, Back Pressure, Nozzle Type 19.3 Understanding of Process variables - Moulding cycle, Purging - Material recommendation - Microprocessor controlled Injection Moulding Machine- Shrinkage – Annealing - Dimensional Control - Moulding Record, Trouble Shooting aspects 19.4 Study Injection Moulding of Thermosets 19.5 Understand basics of Automation and its application 19.6 Identify Types of Injection Moulds - finish, Gate Types, Runner 19.7 Understand Extrusion-principles - classification of extruders - types of screws - L/D ratio, compression ratio-back pressure, heating & cooling systems - breaker plate - screen pack & its functions - process variables and troubleshooting 19.8 Twin screw extruder - principle - types - Vented barrel extruder - hopper loading devices - Drying equipments - Process, machinery - downstream equipments - dies for producing products 19.9 Study of Blow Moulding process- principles – Process - Specification - Types - Processing parameters - Parison Programming - machine features - Cycle time –Clamping - Heating & cooling system - Mould venting -Faults - Causes & Remedies. 19.10 Understand use of Automation- Use of Robots in part handling, Robotics used in high production moulding process, Automated Conveyor system, Automatic material handling systems	
20	**Engineering drawing** *(Practicing on the drawing concepts which help them to read different view/sections/projection of solids. Knowledge on assembly and detail drawings of Part.)*	20.1 Explanation of the scope and objective of Engineering Drawing 20.2 Study of drawing standard, size of drawing sheet, layout of drawing sheet. 20.3 Do the drawing with the help of drawing tools like, drawing Board, mini drafter, pencil etc. 20.3 Use scale and put dimension with the help of drawing tools. On different mechanical objects using dimensioning methods. 20.4 Different geometric construction methods 20.5 Practice on Orthographic and isometric views 20.6 Projection of Points, Lines and Planes and solids.	

		20.7 Different sectional views, development of surfaces 20.8 Understanding perspective projection 20.9 Interpretation of fastening devices while drawing 20.10 Exposure the need of assembly and detailing of machine parts. 20.11 Different types of couplings used for assembly and its uses.	
21	**Mould Manufacturing** *(Knowledge on mold steel and different techniques used for cavity machining, Inspection and assembly of molds and polishing / Texturing the mold surfaces)*	21.1 Material selection for different molds – mold steels and non-ferrous materials 21.2 Knowledge of Conventional Techniques -Procedure for manufacturing of moulds –Cutting Tools - Study of various machining operations, Manufacturing of various mould elements. 21.3 Knowledge of Mould Making Techniques - Special Machine & Tools- Electrical Discharge Machining (EDM), CNC machines for mould making, maintenance of molds. 21.4 Knowledge of Mould Maintenance –purpose - Specification sheets - History sheets - Instruction Manual- Factors for Physical Mould Life - Maintenance Frequency - Break Down Maintenance - Suggested Tools Preventive maintenance - Mould Removing, Cleaning and Storage.	
22	**Plastics Processing Lab – I** *(Demonstration and practice on various plastic processing machine operation and its maintenance)*	22.1 Familiarization with basic concepts, job requirements & Basic related process 22.2 Safety precautions to be taken in Shop floor 22.3 Hand injection molding machine –parts and their function, Operating Principles, IRO 22.4 Produce molded products using different hand injection moulds. 22.5 Familiarization with and Operation practice on Scrap Grinding - 22.6 Knowledge of semi-automatic injection molding machine parts and their functions 22.7 Operate semi-automatic injection molding machine both pneumatic and hydraulic types 22.8 Demonstrate ability to determine cycle time and adjust process parameters 22.9 Knowledge of automatic injection molding machine parts and their functions 22.10 Operate Pneumatic& Hydraulic type of Semi automatic Injection moulding machines, determine cycle-time 22.11 Blown film extrusion-Set up process and machine parameters and operate machine to produce different sizes of blown film. 22.12 Pipe extrusion - Set up process and machine parameters and operate machine to produce pipe/tube and also do troubleshooting.	10 Hours 04 Hours 08 Hours 07 Hours 10 Hours 08 Hours 16 Hours 08 Hours 08 Hours 14 Hours 17 Hours 18 Hours

		22.13	Blow moulding - semi auto & automatic machine- set up and operate to produce good quality products.	16 Hours
23	**Engineering Drawing Lab** *(Practical Exposure on Engineering drawing, study of assembly drawings)*	23.1	Projection of points in different quadrants	03 Hours
		23.2	Projection of straight lines parallel to one or both planes, parallel to one plane, perpendicular to other, inclined to one plane and parallel to other line inclined to both planes (in first quadrant) and finding the true length	03 Hours
		23.3	Projection of planes and polygonal surface – parallel to one plane and perpendicular to other plane (in first quadrant).	04 Hours
		23.4	Projection of simple solids for prism, pyramid, cylinder and cone when the axis is parallel to one plane and perpendicular to other plane in first quadrant	05 Hours
		23.5	Sectioning of solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, obtaining true shape of section	10 Hours
		23.6	Development of lateral surfaces of simple and truncated solids- prisms, pyramids, cylinders and cones	10 Hours
		23.7	Development of lateral surfaces of solids with cylindrical cut-outs, perpendicular to the axis.	10 Hours
		23.8	Isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones	05 Hours
		23.9	Study of Assembly Drawing	04 Hours
24	**UTILITIES & SERVICE EQUIPMENTS LAB** *(Understand the working, functions, operation and maintenance of service and auxiliary equipment in the lab/shop floor)*	24.1	Study of Air Compressor Elements, Safety Features, Drive Mechanism, Lubrication.	06 Hours
		24.2	Study of Hydraulic Pumps, Motors, Accumulators, Valves, Hydraulic Pressure Control, Flow Control, Hydraulic Piping and Coupling - Safety and Trouble Shooting.	06 Hours
		24.3	Understand working of 4/2, 2/2 & 4/3 directional control valve in Single & Double Acting Cylinders.	04 Hours
		24.4	Study of FRL unit and Air Dryer in Pneumatic System & Hopper Drier.	03 Hours
		24.5	Study of heat exchangers in Moulding Machine.	02 Hours
		24.6	Study of Mould Heating - Hot Oil Circulators.	02 Hours
		24.7	Study of Chilling Plant/Cooling Tower.	02 Hours
		24.8	Study of Electrical safety Measures & Demonstration about use of protective devices.	03 Hours
		24.9	Study and Usage of Various basic Electrical Tools & Instruments	02 Hours
		24.10	Study of Single Phase and Three Phase power supply. Identification of phase, Neutral and Earth pits.	02 Hours

		24.11 Understand importance of three phase wiring and its effectiveness and its laying 24.12 Identify common Electrical materials such as Wires, Cables, Switches, Fuses, Plugs, Connectors, Sockets etc. 24.13 Calculation of power and energy consumption. 24.14 Various types of protective devices –fuses, circuit breakers and Different types of switches, MCCB. 24.15 Study of Fluorescent lamp and CFL. 24.16 Study of Servo Voltage Stabilizer. 24.17 Study of Half wave / Full wave rectifier. 24.18 Study of different types of heater used in plastics processing Machinery using Voltmeter & Ammeter find out unknown wattage of heater.	03 Hours 04 Hours 01 Hours 02 Hours 02 Hours 02 Hours 02 Hours 06 Hours
25	**Industrial Management And Entrepreneurship** *(Awareness about management and its functions, human resources, develop awareness about quality and techniques to achieve quality through planning and adopting quality control measures, TQM. To have an idea about entrepreneurship and setting up of a small scale industry, costing and taxes)*	25.1 Principles of Management 25.2 Understanding of the Functions of Management: Planning, Organizing, Staffing, Directing, Controlling, Decision making. 25.3 Awareness about Organizational Structure, Line & Staff Organization, Leadership, Motivation and Communication. 25.4 Awareness about Human Resource Management, Job description, Manpower Planning, Job Evaluation, Performance Appraisal, Training 25.5 Understanding of concept and features of Quality Planning and Quality Control, Total Quality Control. 25.6 Awareness about Quality Assurance and ISO 9000. 25.7 Understanding of concept of TQM and Organizational Excellence and Techniques of TQM. 25.8 Understanding of the concept of entrepreneur, & entrepreneurship 25.9 Knowledge about steps required to start small scale industry, procedure for registration, identifying sources of financial assistance, preparation of project report and basics about Tax 25.10 Understanding of basics of Costing and costing methods, Break-even point and its control functions, Value Analysis. 25.11 Develop Proforma for Cost Estimation, Break Even Point.	
26	**Plastics Product and Mould Design** *(Understand the basics of plastics product and mold design involving the different processing techniques)*	26.1 Understanding of basic concepts of Product Design and Prototype & Rapid prototype (RPT) - 3D Printing 26.2 Knowledge on Injection Mould Design elements, parting line, Runner, gate, ejection, mould cooling, mould alignment 26.3 Knowledge on different Types of Injection Moulds 26.4 Understanding of basic concepts of Compression Mould Design and types of compression molds and ancillaries 26.5 Understanding of basic concepts of Transfer Mould	

		Design and types of transfer molds and ancillaries 26.6 Understanding of basic concepts of Transfer Mould Design and types of transfer molds and other ancillaries and related terminology 26.7 Understanding of basic concepts of Extrusion Die design and dies for different extrusion processes 26.8 Introduction to Design of Thermoforming, vacuum forming, rotational and RIM moulds.	
27	**Plastics Materials – II** *(Understand specialty plastics – their manufacturing, properties, processing behaviour and applications, Concept of polymer blends and alloys – their preparation and utility, additives- their role and use)*	27.1 Knowledge of Speciality Plastics - Sources of raw material, Method of Manufacture, General Characteristics & Properties, Processing Behaviour and Applications of Speciality Plastics 27.2 Understanding of concept of Polymer Blends & Alloys, reasons for making polymer blends and alloy and their applications 27.3 Understanding of concept of Polymer Composite – matrix materials, reinforcements, fillers etc. and applications of composites in different fields. 27.4 Knowledge of Additives and their properties for modifying the properties of plastics & Compounding processes used for incorporating the additives 27.5 Selection of Polymers and Compounding ingredients - General objectives - possibilities and limitations of mixing and compounding. Compounding Equipments.	
28	**Plastics Testing – I** *(Understand the concept of testing and identification of plastics materials, and know testing methods for evaluation of their mechanical and thermal properties)*	28.1 Understanding of Concepts of Testing & Identification of Plastics- Specification and Standards, Test specimen preparation - Pre-conditioning and test atmosphere. 28.2 Knowledge of simple tests for Identification of plastics 28.3 Knowledge of simple techniques used for Material Characterization – flow behaviour, density 28.4 Understanding of testing methods for determining short and long term Mechanical Properties 28.5 Knowledge of test for determining Thermal Properties of plastics	
29	**CAD Lab** *(Practice designing different types of molds and mold elements)*	29.1 Hand Injection Mould Design 29.2 Design of Mould Elements / Standard Mould Base 29.3 Single Impression Two Plate Mould 29.4 Multi-impression Two Plate Mould 29.5 Three Plate Mould (Multi-impression) 29.6 Split Mould Design 29.7 Mould Design for Internal Undercuts	14 Hours 20 Hours 21 Hours 21 Hours 29 Hours 29 Hours 10 Hours

30	**Plastics Testing Lab – I** *(Perform the tests to identify and characterize plastics materials/ products and determine the mechanical, thermal, electrical and optical properties using various testing equipments)*	30.1 Identification of Plastics by Simple methods Primary Tests – Elemental Analysis – Confirmation Tests 30.2 Determination of Density by Displacement Method 30.3 Determination of Melting Point 30.4 Determination of Filler Content 30.5 Determination of Moisture Content 30.6 Determination of Volatile Content 30.7 Determination of Ash Content and Loss on Ignition 30.8 Specimen Preparation by Injection Moulding, Compression Moulding through Cutting & Punching 30.9 Determination of Tensile, Flexural & Compressive Properties 30.10 Determination of Izod & Charpy Impact Test 30.11 Determination of Dart Impact Resistance of Plastics Films & Sheets 30.12 Determination of Hardness (Shore -A & D, Rockwell Hardness, Barcol Hardness) 30.13 Determination of Melt Flow Index 30.14 Determination of Linear Shrinkage and Shrinkage on Transverse Direction 30.15 Determination of Carbon Black Content and Dispersion 30.16 Determination of Dilute Solution Viscosity 30.17 Determination of K-value for PVC resin 30.18 Determination of HDT & VSP 30.19 Determination of Dielectric Strength 30.20 Determination of Haze & Clarity	60 Hours 7 Hours 6 Hours 7 Hours 3 Hours 3 Hours 6 Hours 7 Hours 7 Hours 4 Hours 4 Hours 4 Hours 5 Hours 6 Hours 7 Hours 6 Hours 7 Hours 5 Hours 4 Hours 4 Hours
31	**Plastics Recycling and Waste Management** *(Develop understanding of plastics waste collection, segregation and recycling techniques, value addition and associated environmental issues and legislation)*	31.1 Understanding of Plastics Waste - sources, collection, segregation, identification by simple methods and techniques employed for its separation 31.2 Knowledge of Plastics Waste Management Techniques – recycling and its types, and use of plastics waste for energy recovery, road construction 31.3 Knowledge of Machinery and Value addition Process , Basic Mechanical recycling Plant, Additives for improving quality of recycled products 31.4 Exposure to Environmental issues associated with Plastics Waste and Guidelines and Legislation in India for Plastics waste and its recycling	
32	**Maintenance of Plastics Processing & Testing Equipments** *(Awareness of importance of maintenance and its types. Basic knowledge of maintenance of*	32.1 Understanding of the Importance and Objectives of Maintenance, different types of Maintenance, Maintenance Planning, 32.2 Awareness of safety rules and regulations 32.3 Knowledge of basic electrical parameters -Repair	

	electrical and mechanical – hydraulics and transmission - systems of equipments on lab/shop floor)	and maintenance of the electrical equipments – different types of motors, starters, Circuit Breakers, Limit Switches & Timers, Relays, Heaters, Temperature Controllers, Thermocouples, 32.5 Knowledge of basic Mechanical elements: Screw, Barrel, Non return valve, Thrust Bearing Unit, Gear Boxes, Calendar roll, Mill roll – platens flatness & parallelism measurement , Moving parts maintenance 32.6 Basic understanding of Hydraulics- different types of pumps, different types of Valves, Valve sequences, Valve counter balance, 32.7 Knowledge of Hydraulic Motors, Hydraulic Actuators, Filters, Compressors, Oil seals, O - Rings - Central Lubrication System , Oil quality monitoring, filtration 32.8 Knowledge of Transmission system i.e. Gears, V-belts, Chains - PLC system used in plastics processing & Testing Machineries.	
33	**Plastics Processing Technology – II** *(Overview of rotational molding, thermoforming, compression and transfer molding process. Basic understanding of automation and secondary processing techniques and exposure to advanced plastics processing techniques)*	33.1 Knowledge of Rotational Moulding, thermoforming, compression and transfer molding, - Basic principle - Material selection Types of machine - Heating and cooling system, advantages and limitations, Process variables, defects and troubleshooting 33.2 Understanding of basic concept of Fibre Reinforced Plastics (FRP). Handling of matrix Materials and fibre reinforcements. 33.3 Different FRP processing & fabrication methods. 33.4 Exposure to concept of Automation- Use of Robots in part handling, Robotics used in high production moulding process, Automated Conveyor system, 33.5 Knowledge of various secondary processes - Calendaring Process, Powder coating, casting, machining, joining of plastics 33.6 Understanding of Post moulding operations, Assembly techniques, In-mould labeling, printing, joining, welding, Electroplating, Printing 33.7 Introduction to Advanced Plastics Processing: structural foam moulding, gas assisted and water assisted injection moulding, Two/multi- colour moulding, Co-injection moulding, Double wall Blow moulding, Lost core Injection molding, thermoset injection moulding, All Electric Injection Moulding – merits and demerits.	
34	**PLASTICS TESTING – II** *(Develop understanding of testing of electrical, optical, chemical, weathering flammability and biodegradability characteristics of*	34.1 Knowledge of testing of Electrical Properties - Dielectric strength - Dielectric constant and Dissipation factor - Insulation resistance - Volume and Surface resistivity - Arc resistance - Antistatic 34.2 Knowledge of testing of Refractive index - Luminous	

	plastics. Understands product testing- pipes, water tanks, films, woven sacks)		transmittance - Clarity and Haze - Photo-elastic properties - Colour measurements and Gloss. 34.3 Knowledge of testing of Chemical Properties Immersion test – Stain Resistance of Plastics – Environmental Stress Cracking Resistance 34.4 Understanding of Flammability testing - Flammability Test – Ignition Properties – Oxygen Index Test – Flammability of Cellular Plastics – Smoke Density Test – UL90 Flammability Test. 34.5 Knowledge of tests conducted for Weathering of plastics, environmental factors affecting plastics – Accelerated weathering tests – outdoor weathering of plastics – Resistance of plastics to biological systems. 34.6 Understanding of Bio-degradability Testing- Test methods and standards for bio-degradable plastics - Criteria used in evaluation of bio-degradable plastics - Description of current test methods. 34.7 Exposure to Product Testing - Plastics Pipes – Water Tanks – Containers & Plastic Foams, Packaging materials-film-woven sacks.	
35	**PLASTICS PROCESSING LAB – II** *(Practice on machine-various plastics conversion techniques-automatic injection molding, compression and transfer molding, thermoforming, rotational molding and study role and operation of ancillary equipment)*	35.1 35.2 35.3 35.4 35.5 35.6 35.7 35.8 35.9	Understanding of Safety Precautions to be taken while handling Machine, Mould & Tools on shop floor Exposure to running of Automatic Injection Molding machine -Idle-Run Observation (IRO) Machines operation -Automatic Injection Molding machine -Practice, Process parameter setting Operation of Machine to produce components, observations of all parameters, cycle-time analysis, moulding faults analysis, causes and remedies. Understanding of Compression & Transfer Moulding-Semi Auto & Automatic -Parameter setting, clamping and safety factors Operation-practice on different Compression & Transfer Moulds, Analysis of product defects & remedies, Analysis of cycle-time, Study of different Thermoforming processes, type of moulds & materials used, Mounting & Clamping of plastic sheet, heating & vacuum system, cooling, trimming & finishing. Familiarization with machine controls Operation practice of Thermoforming processes Analysis of Cycle- time, processing-defects & remedies. Study of Rotational Moulding in IRO, sequence of operation, Raw materials used & loading, mould clamping practice	8 Hours 10 Hours 17 Hours 23 Hours 12 Hours 20 Hours 10 Hours 17 Hours 10 Hours

		35.10 Operation practice to produce rotomoulded components, heating & cooling method adopted, Cycle-time analysis	16 Hours
		35.11 Understanding of FRP Process-Study of types of resins, Fibres & additives used in the process, Sequence of process operation in Hand lay-up process, Operation practice for hand lay-up process for producing FRP products, defects & analysis for the remedies	10 Hours
		35.12 Study of ancillary Equipment -Hopper Dryer, Chiller, Mould Temperature Controller, Cooling Tower, Mixer	9 Hours
36	**PLASTICS TESTING LAB – II** *(Practical exposure to product testing- pipes, water tanks, films, woven sacks, flooring etc.)*	36.1 Product Testing as per BIS Standards	10 Hours
		36.2 Testing of PVC Pipes and Fittings	12 Hours
		36.3 Testing of HDPE Pipes and Fittings	12 Hours
		36.4 Testing of LDPE Films	09 Hours
		36.5 Testing of PET Containers for Drinking Water	10 Hours
		36.6 Testing of PP and PC Feeding Bottle	12 Hours
		36.7 Testing of Water Storage Tank	12 Hours
		36.8 Testing of Foam	12 Hours
		36.9 Testing of FRP Products	12 Hours
		36.10 Testing of Irrigation Laterals & Drippers	11 Hours
		36.11 Testing of Woven Sacks	10 Hours
		36.12 Migration Test to Stimulants	11 Hours
		36.13 Testing of Vinyl Flooring	11 Hours
37	**Project Work**	37.1 Undertake a project. Project work shall be identified in collaboration with industry preferably.	
		37.2 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	

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I Semester

List of text books/Reference books

1. Communication English - I

a. Viswamohan, Aysha. English for Technical Communication. Tata McGraw –Hill, New Delhi.2008.
b. Regional Institute 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.

2. Workshop Mathematics

a. ITI Workshop Calculations by B R Das
b. Applied workshop calculations by W A J Chapman
c. Workshop calculations, tables by H A Camm Formulae
d. Senior Workshop calculation by W A J Chapman
e. Mathematics of the shop by J Mcmackin & Others

3. Engineering Chemistry

a. Text book of Engineering Chemistry - Jain & Jain, Dhanpat Rai & Co. New Delhi.
b. Text book of Organic Chemistry - Bahl - Arun Bahl.
c. Text book of Inorganic Chemistry - P.L. Soni, Sultan Chand & Co., Delhi.
d. Essential topics in Physical Chemistry - Bhal, Tuli & Madan, Sultan Chand & Co., New Delhi.
e. A Text book of engineering chemistry – M.M. Uppal , Khanna publishers Delhi.

4. Computer & Information Technology

a. Fundamentals of computers – 4th edition – V Rajaraman
b. Computer Fundament – 6th edition – Pradeep K Sinha, Priti sinha
c. Fundamentals of Computer Engineering – V Sivaraman

5. Environmental Sciences

a. Introduction to environmental engineering and science, 2nd edition, prentice hall 2003 – Gilbert M Masters
b. Environmental Science and engineering – Benny Joseph, Tata McGraw-Hill, New Delhi 2006
c. Environmental Science, Cengage Learning 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

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II Semester

List of text books/Reference books

1. Communication English - II

a. Viswamohan, Aysha. English for Technical Communication. Tata McGraw –Hill, New Delhi.2008.
b. Regional Institute 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 ” 1 st 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.

2. Engineering Mathematics

a. Mathematics for Polytechnic Colleges (First Semester) - P.Krishnamurthy, N.Thangasamy.
b. Higher Secondary Mathematics - First Year - Tamil Nadu Text Book Cooperative Society.
c. Engineering Mathematics - Dr.M.K.Venkatraman, National Publishing Co, Chennai.
d. Engineering Mathematics - Dr.P. Kandasamy& Others, schand& co Ltd., New Delhi.

3. Engineering Physics

a. R.K.Gaur and S.L.Gupta “Engineering Physics’, Dhanpat Rai Publications (All Units)
b. “Engineering Physics”,, P.Mani, Dhanam Publications
c. “Physics Part I & II”, Halliday and Resnick
d. “Engineering Physics- I”, R.Elangovan, M.Vijay Amirthraj and N.Karikalan, Mercury sun publications

4 Electrical & Electronics Engineering

a. Muthusubramanian R, Salivahanan S and Muraleedharan K A, BasicElectrical, Electronics and Computer Engineering",Tata McGraw Hill, Second Edition, (2006).
b. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press (2005).
c. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, (1994).
d. B.L. Theraja, Fundamentals of Electrical and Electronics Engineering, S.Chand & Co.
e. T. Thiyagarajan, Fundamentals of Electrical and Electronics Engineering, Scitech a. Publicatiuons (India) Pvt.ltd.
f. Mikell P. Groover, Automation, Production System and Computer Integrated Manufacturing, Edn. 2 Published by Pearson Education (Singapore) Pte. Ltd., Indian Branch, 2842 F.I.E., Patparganj, Delhi 110 002, India.
g. KB Raina & S.K.Battachariya, Electrical Design Estimating and Costing, Edn. 6, Tata McGraw Hill Publishing Co., 7, West Patel Nagar, New Delhi 110 008.
h. Gary Dummy, Introduction to Programmable logic controls, Thomson Debnar learning second edition second reprint 2003.
i. B.L.Theraja & A.K. Theraja, Electrical Technology Vol. I & II, Edn. 23, published by S.Chand & Co. Ltd., Ram Nagar,New Delhi 110 055.

5. Development of Life skills

a. Soft skills for every one, Cengage learning, New Delhi 2015 – Butterfield Jeff
b. Introduction of engineering ethics, second edition - Mike W Martin and a Roland Schinzinger

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III Semester

List of text books/Reference books

1. Polymer Science & Engineering

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

2. Plastics Materials - I

a. Plastic Materials – J.A. Brydson.
b. Plastic Materials Hand Book – A.S. Athalye.

3. Plastics Processing Technology - I

a. Injection Moulding Theory & Practice – Rubin, Irvin.
b. Plastics Engineering Hand Book – Socity of Plastic Industry Inc.
c. Plastics Processing Data Hand Book – D.V. Rosato.
d. Plastics Materials & Processing – Brent Strong.

4. Engineering Drawing

a. Engineering Graphics, Julyes Jaisingh.
b. Engineering Drawing – K.V. Natarajan.
c. Engineering Graphics – K. C. John.
d. Engineering Graphics – P. I. Varghese.
e. Engineering Drawing – Venugopal.
f. Engineering Drawing – M.B. Shah & B.C.Rama.
g. Engineering Drawing – N.D. Bhatt , Charotar Publishing House.
h. Machine Drawing – Lakshminarayan & Mathur , Jain Brothers .

5. Mould Manufacturing

a. Mould Making Hand Book, Stoeckert.
b. Plastics Moulds and Dies, Sors.
c. Injection Moulds, V.D.I.
d. Injection Mould Design –Pye R.G.W.
e. Production Technology - Er.R.K. Jain.
f. Production Technology - P.C. Sharma Pub: S. Chand and Co.
g. Workshop Technology, Volume I & II – W.A.J Chapman.
h. Elements of Workshop Technology-S.K.Hajra Choudhury & A.K Hajra Choudhury.

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IV Semester

List of text books/Reference books

1. Industrial Management & Entrepreneurship

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

2. Plastics Product & Mould Design

a. Technical Manual on Plastics Mould Design –
b. Injection Mould Design for Thermoplastics – Pye, R. G. W.
c. Plastics Product Design Engineering – Dubois H.
d. Runner design / Feed systems

3. Plastics Materials - II

a. Plastics Materials – J.A. Brydson.
b. Plastic Materials Hand Book – A.S. Athalye.

4. Plastics Testing - I

a. Text Book on Fundamentals of Plastics Testing - Prof. (Dr.) S.K..Nayak
b. Plastics Testing Technology Hand Book – Shah Vishu
c. Simple Methods for Identification of Plastics – Dietrich Braun

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V Semester

List of text books/Reference books

1. Plastics Recycling & Waste Management

a. Technical Manual on Plastics Processing – CIPET
b. Recycling & Plastics Waste Management – Dr. J S Anand
c. Environmental Engineering & Management – Suresh k. Dameja

2. Maintenance of Plastics Processing & Testing Equipments

a. Manuals on Hydraulics & Pneumatics – Vickers.

3. 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.

4. Plastics Testing - II

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

Means of Assessment 1 and 2

Skill performance is assessed by conducting:

- Assignment for each module
- Written test (class test) for each module
- Final exam after completion of all module
- Practical exam for each module
- Final practical exam after completion of all module with Viva / Oral Exam
- Carrying out Project work and submission of Project Report and viva-voce

Pass/Fail

Criteria to declare a candidate "Passed" is to secure min. marks as stated below:

Sl. No.	Examination	Pass Marks	
		External Examination	Internal Examination
1	Theory Examination	40 %	40 %
2	Practical Examination	50 %	50 %
3	Project Work and Viva Voce	50 %	

SECTION 2

EVIDENCE OF LEVEL

OPTION A

Title/Name of qualification/component: Diploma in Plastics Technology (DPT)			
NSQF Domain	**Outcomes of the Qualification/ Component**	**How the job role relates to the NSQF level descriptors**	**NSQF Level**
Process	• Polymer Material selection for Plastic Products • Knowledge of various Plastic Processes • Mould Selection with respect Polymer material and Plastic Products • Design & Development Process for Moulds • Optimizing Machine Parameter during Plastic Product Trial • Controlling visual and dimensional aspects of plastic product during manufacturing	• In the occupation of Plastic Product Manufacturing Engineer each new project is considered as new challenge since the product which will be obtained from Processing is always unpredictable: whether mould cavity will fill properly or per piece cost of production will be optimized or customer will be satisfied from all aspects, etc. • In this qualification Job Holder has to carry out Plastic Process activity for Plastic products which includes parameter optimization, selection of materials, Group Technology and line balancing of Plastic Product as per Process Plan activity, Optimizing the cost of product by optimizing the process parameter of plastic processing machineries, recycling process of scrap material etc. • Job holder shall review and approve the process parameter by optimizing the per piece cost production as per customer's requirement. Job holder shall release raw material requirements for production. Job holder will request and make suggestions to the mould designer to manufacture a mould with the desired number of cavities, mould base / die set etc. Job holder shall be responsible for the product trial, machine parameter setting and product Production. Job holder shall be responsible for desired number of production as per process plan activity. • Job holder shall be responsible for alternative material selection as per market availability. Alternative material process selection and machine for product manufacturing during machine maintenance. Job holder will be responsible for housekeeping and cleaning of processing shop.	Level 5

NSQF Domain	Outcomes of the Qualification/ Component	How the job role relates to the NSQF level descriptors	NSQF Level
Professional knowledge	• Describe general Injection Molding Machine Parameters require for Plastics Product manufacturing • Describe mould parts with their functions • Describe maintenance of mould after production through plastic manufacturing machine • List of different plastic product manufacturing machines • Describe Manufacturing Processes and process plan of Plastic Product manufacturing • Application of reverse engineering and rapid prototyping technology in Plastic Product manufacturing Process	• As job holder is dealing with Plastic Processing for manufacturing a plastic product which is to be used for mass production of the product, it is required that job holder should possess overall (Comprehensive) theoretical knowledge in the field of Plastic Processing like Molds, Types of Polymers, Elastomers etc. • Job Holder shall apply his/her comprehensive knowledge with clear context with a broad concept in general polymer materials selection methodology and morphology like, types of Polymers, Polymerization process principle and methods in which it can be processed, fundamental knowledge of working principal of • Job Holder shall have detail knowledge of polymer and ability to select polymer material, Mould tool and machine as per application • Molding requires the technician to install molds in production machines, establish correct molding cycles, monitor the molding process, maintain production schedules, test incoming raw materials, inspect goods in production, and ensure that the final product meets specifications.	Level 5

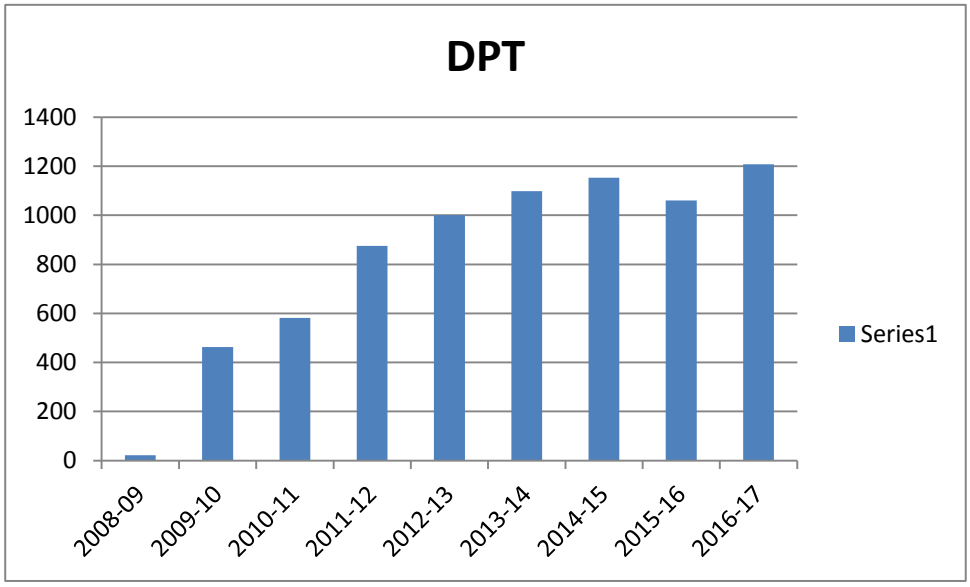
Title/Name of qualification/component: Diploma in Plastics Mold Technology			
NSQF Domain	**Outcomes of the Qualification/ Component**	**How the job role relates to the NSQF level descriptors**	**NSQF Level**
Professional Skills	• Identify processing requirement • Develop plan for processing • Set-up the process parameters and evaluate cycle time • Perform the processing operations • Troubleshoot the problems • Develop quality consciousness concept	• Job Holder shall use follow SOP for processing • Job holder shall handle test reports • Job holder shall handle record books • Job holder shall handle processing and processed components • Job holder shall handle take away equipments • Job holder shall perform computer operations • Job holder shall manage pressure and adhere to strict guidelines/procedures for completing processing operation in timely manner • Job holder shall handle the coordination among team members • Job holder shall report team members issues to HR department that is beyond his control	Level 5

NSQF Domain	Outcomes of the Qualification/ Component	How the job role relates to the NSQF level descriptors	NSQF Level
Core Skills	• Use basic health and safety practices at the work place • Can run the machine independently and can set up process parameters and do basic troubleshooting • Develop entrepreneurship skills • Communicate effectively	• 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. • They should be able to identify the specification of the processing machine. • Trainee should be aware of giving high output in the form of production at the given time • Trainee should be aware of system and procedures and accordingly work on it. • The trainee has to work on different Plastics Processing techniques so they have to have sound knowledge on various processing techniques. • They should be aware of maintenance of mould and machineries. • They should be capable of running the machine independently. He should be aware of maintenance of mould and machineries. • He should be able to read and understand ,memos ,health and safety instructions ,manuals ,diagrams ,graphs ,agesmi ,job cards ,reports .technical drawings etc • He should be capable of maintaining records • He should be able to communicate effectively with team members and with management • Resolve any difficulties in relationships with colleagues, or get help from an appropriate person, in a way that preserves goodwill and trust. • He needs to know and understand how to practice honesty with respect to company property and time.	Level 5

NSQF Domain	Outcomes of the Qualification/ Component	How the job role relates to the NSQF level descriptors	NSQF Level
Respon-sibility	Work with responsibility of output	• Job holder shall follow work standard, specific norms and procedures laid down by the organization. • Job holder shall develop moral values and follow ethical practices in business operation. • Job holder shall avoid absenteeism • Job holder shall act objectively, rather than impulsively or emotionally when faced with difficult/stressful or emotional situations. • Job holder shall work in disciplined factory environment • Job holder shall be punctual	Level 5

SECTION 3 EVIDENCE OF NEED

What evidence is there that the qualification is needed?



The qualification, **Diploma in Plastics Technology (DPT)** is in existence since 2008 and CIPET has trained more than 7000 trainees in the last 8 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 expert, academic professional experts.
- The work group under the guidance of curriculum development committee already conducted desk search as well as refers the qualification packs for as a supporting document for the mapping of curriculum.
- As per the search it is found that, the Diploma in Plastics Technology course is 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 opportunities, multiple entry and exits incorporated or RPL strategy implementations.
- The curriculum review and updates, in consultation with 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 a CIPET Diploma in Plastics Technology (DPT). Plastics engineers perform a wide variety of duties depending on the type of company they work for and the products it produces. Some of their specific job titles and duties include: application engineers, who develop new processes and materials in order to create a better finished product; process engineers, who oversee the production of reliable, high quality, standard materials; internal production problems. Duties include making sure the process is consistent to ensure creation of accurate and precise parts and making sure parts are handled and packaged efficiently, properly, and cheaply. Each part is unique in this respect.

After completion of course and after 3 years of field experience the trainee can work as a Processing supervisor and after that 5 years of experience, the person can work as a Manager (Processing Dept.). Also he/she can become an entrepreneur in this sector.

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

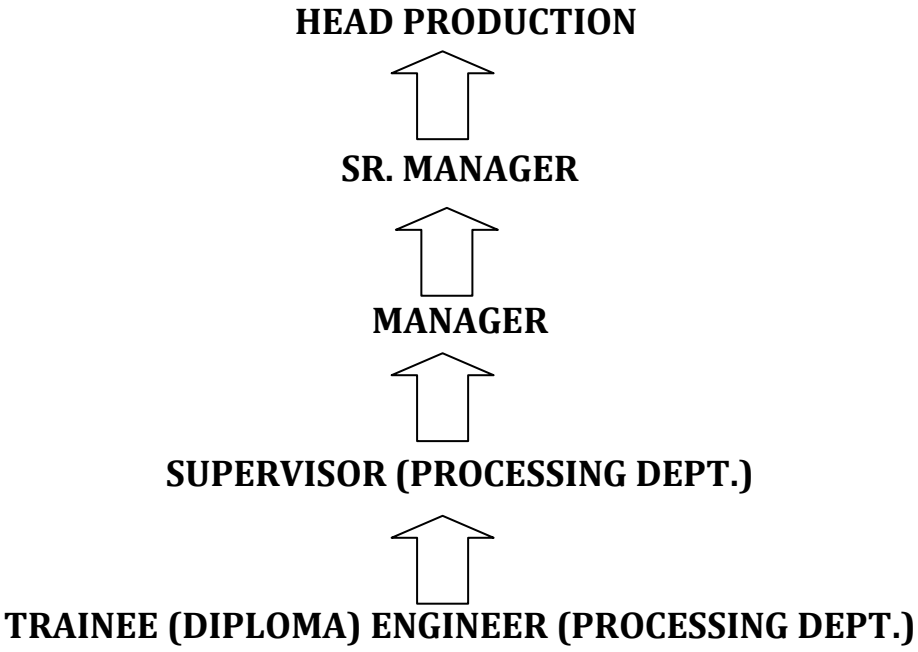


Fig. 1 ***Career Progression of Process Engineer***