Diploma in Plastics Technology (DPT)

SYLLABUS & CURRICULUM

REVISED: AUGUST 2014
Implemented from Academic Year 2014-15

Academic Cell
Central Institute of Plastics Engineering & Technology
(Department of Chemicals & Petrochemicals,
Ministry of Chemicals & Fertilizers, Govt. of India)
Head Office, Guindy, Chennai – 600 032.

Tel. No.: 91-44-22254780  Fax: 91-44-22254787
Email: hocipetolc@gmail.com  Web: www.cipet.gov.in
# DIPLOMA IN PLASTICS TECHNOLOGY

## SYLLABUS

### SEMESTER – I

#### THEORY

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Total (20 weeks - 26 Hours per week) 520 18 240 360 600

#### PRACTICAL

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Total (20 weeks - 14 hours per week) 280 16 200 200 400

### SEMESTER – II

#### THEORY

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Total (20 weeks - 24 hours per week) 480 18 240 360 600

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Total (20 weeks - 16 hours per week) 320 16 200 200 400

CH- Contact Hours     TH-Tutorial Hours     EH- Examination Hours
# DIPLOMA IN PLASTICS TECHNOLOGY
## SYLLABUS

### SEMESTER – III

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**Total Theory Hours (20 weeks – 15 hours a week)**

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**Total Theory Hours (20 weeks – 14 hours a week)**

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**CH- Contact Hours  TH-Tutorial Hours  EH- Examination Hours**
# DIPLOMA IN PLASTICS TECHNOLOGY SYLLABUS

## SEMESTER – V

### THEORY

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**Total Theory Hours (20 weeks – 11 hours a week)**

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**Total Hours**

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## SEMESTER – VI

### THEORY

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**Total Theory Hours (20 weeks – 6 hours a week)**

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**Total Hours**

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CH- Contact Hours  TH-Tutorial Hours  EH- Examination Hours
DPT
SEMESTER – I

GE101 COMMUNICATION ENGLISH-I (80 Hours)

Unit I (16Hours)
Grammar- Parts of Speech; Voice; Direct and Indirect speech; Tenses; Infinitives, Gerunds, Prepositions, Question tag, One-word substitute, Articles, Adverb, Punctuation,

Unit II (16Hours)
Letter writing-Personal letters (letter to your friend inviting to birthday party, letter to your father asking him to permit to join Education Tour, letter from a son/daughter to his/her father stating how he/she hopes to fare in the approaching Diploma Examinations, letter to a friend offering suggestions as to what to do after completing the Diploma course)

Unit III (16 Hours)
Composition (Simple passage related to topics such as Environment, Moral story, Science & Technology, about A Favorite Place, Hobbies, School life etc), Common Errors (Noun, pronoun, articles, adverb, prepositions etc.), Correction of sentences;

Unit IV (16 Hours)
Dialogue writing; Note-making; Essay writing (Related to Environment and Science & Technology); Writing Instructions (Imperatives/ ‘Should’ form), Sending communication through E-mail (All Personal letters)

Unit V (16 Hours)
Hints Development, Filling forms (Bank challan, application for bank loan Railway ticket booking)

Phrases: At all; Instead of; In spite of, As well as; Set up; Upset; Look up; Call off; Call out; Come across; Set right. Sending communication through E-mail.

Idioms: Work up(excite); Break down; Stand up for; Turn down; Pass away; Pass on; Back up; back out Carry out; done for(ruined);Bring about; Go through; Ran over ;Look up(improve); pick out (selected)

Text /Reference Books


Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – I

GE 102 – ENGINEERING MATHEMATICS (80 Hours)

Unit -I: Algebra (16 Hours)
Determinants - Expansion of determinants up to third order - properties of determinants - Solution of simultaneous equations using cramer's rule.

Matrices -Introduction - Definition - Types of matrices - Operations on matrices.

Binomial Theorem: Introduction to permutation and combination - Definitions - Values of $n^r$ and $n^c_r$. Binomial theorem for a positive integral index

Unit- II: Complex Numbers (16 Hours)
Introduction - Definition, real and imaginary parts, conjugates, modulus and amplitude form, multiplication and division of complex numbers .Argand diagrams - Collinear points, four points forming square, rectangle, rhombus and parallelogram. Simple problems. Demoivre's theorem - related problems.

Unit -III: Analytical Geometry (16 Hours)
Pair of straight lines: Pair of lines passing through origin - $ax^2 + 2hxy + by^2 = 0$ expressed in the form $(y-m_1x) (y-m_2x)=0$. General equation of the second -degree.$ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$, to represent pair of straight lines. Condition for second degree equation to represent pair of lines.

Circles : Equation of circle - Given centre and radius - General equation of circle finding center and radius, equation of circle described on the line joining the points $(x_1,y_1)$ and $(x_2, y_2)$ as diameter with simple problems.

Unit -IV: Trigonometry (16 Hours)
Compound angles: Expansion of sin $(A + B)$, cos $(A + B)$ and tan $(A + B)$ problems; solving the above expansions.

Multiple Angles: Trigonometrical ratios of multiple angles $(2A$ and $3A$ only) and sub-multiple angles - Simple problems.

Unit- V: Differential Calculus (16 Hours)

Limits: standard results

$$\text{Limit } x^n - a^n / x - a = na^{n-1}, \text{ Limit } \sin \theta / \theta = 1$$

$$x \to a \quad \theta \to 0$$

Differentiation: Definition - Differentiation of $x^n, \sin x, \cos x, \tan x, \cot x, \sec x, \cosec x, \log x, e^x, u \pm v, kv + c, uv, uvw, u/v$. Problems using the above results.

Successive differentiation: Successive differentiation and formation of differential equations up to second order.
**Text / Reference Books**

1. Mathematics for Polytechnic Colleges (First Semester) - P. Krishnamurthy, N. Thangasamy.

**Note:** Minimum of one assignment and one periodical test is mandatory from each unit.
DPT SEMESTER – I

GE 103 – ENGINEERING PHYSICS (80 Hours)

Unit I UNITS & DYNAMICS (20 hours)

Units and Dimensions- Fundamental quantities and derived units, systems of units (SI, CGS, FPS)- Dimensional Formula for area, volume, density, velocity, momentum, acceleration, force, impulse, work & power- Dimensional equation – Derivation of expression of period of simple pendulum using dimensions.

Dynamics- Scalar and vector quantities- Addition and Subtraction of vectors (Triangle method)- Resolution of vectors into two mutually perpendicular vectors

Force and motion- Force- Addition of forces – Triangle law of forces- Lami’s theorem- Momentum and Its Conservation- Speed, velocity and acceleration

Circular Motion - Relation between linear and angular distance, velocity and acceleration- Centripetal and Centrifugal force. Parabolic Motion- Time of flight of a projectile- Kinetic energy- Potential energy- Law of conservation of energy.

UNIT II ELASTICITY AND SURFACE TENSION (20 Hours)

Elasticity- Stress–strain - Hooke’s law- Young’s Modulus, Bulk Modulus, Rigidity modulus and Poisson’s ratio – Determination of Young’s modulus- Torsional pendulum

Surface Tension and Viscosity - Surface tension - Surface energy- Angle of contact- Relation between surface tension and surface energy- Determination of surface tension by capillary rise method. Viscosity- Coefficient of viscosity- Streamline and turbulent flow- Reynolds number- Poiseuille’s formula- Stoke’s formula- Terminal velocity.

UNIT III HEAT (20 Hours)


Modes of heat transfer and their examples

UNIT IV LIGHT (20 Hours)

Optics - Snell’s law of refraction- critical angle- Total internal reflection- Optical fiber- convex and concave mirrors- focus, image formation and concave lens- focal length, simple microscope- magnifying power- velocity of light- relation between velocity, wavelength and frequency of light.

Laser - Introduction- principle- population Inversion- Spontaneous and stimulated emission, optical pumping- characteristics- types of laser (not in detail) - applications.
Text /Reference Books

3. “Physics Part I & II”, Halliday and Resnick

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – I

GE 104 – ENGINEERING CHEMISTRY (80 Hours)

Unit I STRUCTURE AND BONDING (20 Hours)


Chemical Bonding: Theory of valency- ionic bonding, covalent bonding- (with examples for formation of simple compounds. Coordinate covalent bonding & hydrogen bonding.

Acids & Bases: Concept of acids & bases - pH & pOH concept - pH scale-Buffer solutions.


Unit II ORGANIC CHEMISTRY AND FUELS (20 Hours)


Fuels: Definition - types of fuels - advantages of gaseous fuels - calorific value - crude oil - distillation - extraction of petroleum products using fractional distillation method- knocking & its prevention - octane number.

Unit III ELECTROCHEMISTRY (20 Hours)


Unit IV ENGINEERING MATERIALS (20 Hours)

Engineering Materials: Definition, classification, properties and uses of the following engineering materials - abrasives, ceramics, ferrous and nonferrous metals, adhesives

Plastic Materials: Thermoplastics – Thermoset and Thermo plastics & their differences

Rubber Materials: Natural rubber - Preparation from latex - Disadvantages of natural rubber, Synthetic rubber – Preparation. Need for vulcanization.
Text / References Books


Note: Minimum of one assignment and one periodical test is mandatory from each unit.
GE 105 – FUNDAMENTALS OF COMPUTER ENGINEERING (80 Hours)

Unit I (16 Hours)
Introduction to Computer – Generation of computers-classification-Central Processing Unit (CPU), Memory Unit, Input/ Out Devices : Keyboard, Mouse (Optical), Digitizer, Scanner, Web Camera, Monitor (CRT, TFT) , Printers, Plotters, Bar Code Reader, Secondary Storage Devices-Floppy, Hard Disk, CD, DVD, Flash Drive, Block Diagram Showing Interconnection of Computer Parts

Operating System - Definition of Operating System (OS), Types of OS- Single user, Multi user, Multi Programming, Time Sharing, Multi Processing.

Unit II (24 Hours)

Unit III (24 Hours)

Power Point -Introduction to Power Point, Creating a Presentation/Slide, Adding Animation in Slide, Running a Slide Show

Unit IV (16 Hours)


Text / Reference Books
2. Rapidex Computer course , Jayant pushtak mandal, Neogy.

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – I

GE 106 – ENGINEERING DRAWING – I (120 Hours)

Unit I (30 Hours)

The Importance of Engineering Graphics: Explanation of the scope and objective of Engineering Drawing – its importance as a graphic communication- need for preparing drawing as per standards – BIS, SP 46.


Free hand Lettering and Numbering: Need for legible lettering and numbering on drawings – selection of suitable size of lettering for different drawing, writing of Engineering drawing titles and notes using both vertical and sloping styles.

Dimensioning: Function of dimensioning - need for dimensioning - engineering drawing according to BIS – Notation used in dimensioning – Dimension line – Extension line – Arrow heads and leader – System of dimensions - Method I and Method II.

Geometric Construction: Construction of regular polygon - given the length of its side, Conics-construction of ellipse, parabola and hyperbola by eccentricity method, construction of cycloid, construction of involutes of square and circle, drawing of tangents and normal to the above curves.

Unit II (40 Hours)

Principles of Orthographic Projection: Explanation of the meaning of orthographic projection using a viewing box and a model- number of views obtained need of only three views for displaying the object - explanation of the meaning of first angle and third angle projection – symbol of projection-Front view, top view and side view-sketching these views for a number of engineering objects

Unit III (20 Hours)

Projection of Points, Lines and Planes: Projection of points in different quadrants, 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). Methods of finding true length and its inclination with the reference planes. Projection of planes and polygonal surface – parallel to one plane and perpendicular to other plane (in first quadrant).
Unit IV                                         (30 Hours)

**Projection of Solids** : Projection of simple solids like prism, pyramid, cylinder and cone when the axis is parallel to one plane and perpendicular to other plane in first quadrant.

**Text / Reference Books**


**Note**: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – I

GEL 107 - ENGINEERING PHYSICS LAB                  (60 Hours)

1. Determination of thickness of a metal wire using screw gauge
2. Determination of diameter of a cylindrical bar using vernier calliper
3. Determination of time period of simple pendulum.
4. Experiment to verify Hook’s law
5. Experiment to verify Lami’s law
6. Determination of focal length of convex lens
7. Determination of focal length of concave lens
8. Determination of Young’s modulus using non-uniform bending method
9. Determination of moment of inertia and rigidity modulus using torsional pendulum

Reference Books
DPT
SEMESTER – I

GEL 108 – ENGINEERING CHEMISTRY LAB (60 Hours)

1. Volumetric Analysis

   Acidimetry - Alkalimetry
   (a) Estimation of Hydrochloric acid
   (b) Estimation of Sulphuric acid
   (c) Estimation of Sodium hydroxide given standard sodium carbonate solution & Hydrochloric acid as a link solution)

2. Permanganometry
   (a) Estimation of potassium permanganate
   (b) Estimation of strength of Oxalic acid

3. EDTA Titration
   (a) Estimation of total hardness of water for the water sample

4. pH Determination
   (a) Determination of pH using pH meter

5. Preparation of Standard Solutions
   (a) Preparation of 1N, 0.5N & 0.1N solution of sodium carbonates
   (b) Preparation of 1N solution of oxalic acid

Text / Reference Books

1. Practical Chemistry for Class 11th and 12th, S. Chand Publishers.
2. ISC Practical Chemistry for Class 11th and 12th by S.P. Sharma, S.Chand Publishers.
DPT
SEMESTER – I

PTL 101 – WORKSHOP PRACTICE (120 Hours)

Workshop Safety (10 Hours)

General shop floor safety, safety on fitting bench and safety on machines, handling of machinery and materials

1. Familiarization of Workshop Tools (20 Hours)

Hand tools, Marking tools: Scribers, compass, dividers, outside and inside caliper, hermaphrodite caliper, ordinary scribing block, universal scribing block, angle plate, V-block, centre punch, dot punch, prick punch, try square, beveled try square, surface plate, straight edge, combination set.

Cutting tools: Chisels – flat, crosscut, half round, diamond point.

Files: single cut and double cut files- rough, bastard, medium, smooth, dead smooth files – flat, square, pillar, round, triangular, half round, knife and needle files, rifler files (spoon file).

Hack saw: Types of frame - Solid frame and adjustable frame – blades of different grade.

Striking tools: Ball peen, Straight peen, Cross peen, Steel hammers and Double-faced plastics hammers (soft hammer).

Holding devices: Bench vice, hand vice, swivel base vice

Miscellaneous tools: screwdrivers, Open end spanner, double end spanner, adjustable spanner, box spanner and ring spanner

2. Study and Practice on Measuring Instruments/Equipments (20 Hours)


Geometrical measurements: Straightness, Flatness, Parallelism, Squareness, Concentricity.

Standard Gauges: Type of gauges, Radius gauges, Feeler gauges, Screw pitch gauge, Taper gauge & Thickness gauges.

3. Filing and Fitting Practice (70 Hours)

Filing Exercise: Balancing of hand file, producing flat surface, making parallel surface, making perpendicular surface, radius filing, and taper filing, maintaining dimension.

Universal fitting: Filing to maintain overall size- Hacksaw cutting, finishing by filing, filing to maintain fit between male and female pieces.

Template making practice: to make profile geometry by cutting and filing.

Cube fitting: Filing to maintain overall size – filing square hole in the middle – filing a cube to suit the square hole with slide fit.
DPT
SEMESTER – II

GE 201- COMMUNICATION ENGLISH-II (80 Hours)

Unit I (16 Hours)
Grammar – Changing of sentence into negative without changing the meaning; Writing definitions; Composition – Conversion of graphics (pie-chart, bar-chart, table, Flow Chart).

Unit II (16 Hours)
Degrees of comparison; Letter writing – Business and official letters (Letter of quotation, letter of clarification, letter placing orders).

Unit III (16 Hours)
Sequencing of jumbled sentences; Answering the verbal questions in affirmative and negative; Letter writing- Letter for seeking permission for industrial visit, Letter to the Editor, Inviting a VIP.

Unit IV (16 Hours)
Synonyms and Antonyms; Spelling and Punctuations; forming meaningful sentences for the words given; Letter writing- Letter of (request for leave, Bonafide certificate, testimonials); Check list.

Unit V (16 Hours)
Writing purpose statements ; Concord; Modal verbs; Letter writing – letter of application for a job with Bio-data/ Curriculum Vitae; Sending the job application through e–mail (along with the attachment); Technical Report writing (Analytical report, Project report, inspection report, production report, investigation report, field report).

Text/Reference Books


Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT SYLLABUS

GE 202 - APPLIED MATHEMATICS (80 Hours)

Unit I: Vector Algebra (16 Hours)


Product of Vectors - Scalar and vector product of two vectors - Angle between two vectors

Applications of vectors - Work done-moment - Scalar and vector triple product

Unit II: Integral Calculus (16 Hours)

Integration - Definition - Integral values using reverse process of differentiation. Integration using decomposition method. Integration by substitution - Integrals of the form ∫[f(x)]^n f'(x) dx, n ≠ 1.

∫f'(x)/f(x) dx, ∫[f(x)] f'(x) dx

Standard Integrals - Integral of the form ∫dx/(a^2 ± x^2), ∫dx/x^2 - a^2, ∫ dx/√(a^2 - x^2)

Integration by parts - Integration by parts and Bernoull'i's form to evaluate ∫ x sin nx dx, ∫ x cos nx dx, ∫ x^2 d^nx, ∫ x^n log x dx, ∫ log x dx.

Unit III: Applications of Differentiation (16 Hours)


Unit IV: Applications of Integration (16 Hours)

Definite integral, Area and volume - Area of circle, Volume of sphere and cone – Simple problems. Solution of differential equations - variable separable

Unit V: Probability & Statistics (16 Hours)

Definitions - Axioms - addition formula, mutually exclusive event, addition Theorem on Probability, conditional probability - Multiplication theorem.


Discrete Distributions - Binomial Distributions - Expression for mean, variance and standard deviation - simple problems.

Text / Reference Books

1. Applied Mathematics for Polytechnic Colleges (Second Semester) - P.Krishnamurthy, N.Thangasamy.
2. Higher Secondary - First Year - Tamil Nadu Text Book Cooperation.

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – II

GE 203 - FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING (80 Hours)

Unit I: DC & AC Circuits: (16 Hours)
Fundamentals of AC voltage and current – Peak, average, RMS value of sine wave, Frequency, time period, amplitude, power, power factor, Single Phase/ 3 phase connection, Delta Connections - relationship between phase and line voltages, current in star and Delta connections.

Unit II: DC Generator, DC Motor: (16 Hours)
DC Generator & DC Motor - Construction – Principles of operation, types and applications, Emf equation of Dc machine, Necessity for starter, three points, four point starters.

UNIT III: AC machines: (16 Hours)
Transformer– Types of transformers (Current & Voltage) - principle of operation and construction EMF equation – losses in a transformer – efficiency.
Principle of operation of single phase capacitor start induction motor – applications – three phase induction motors – squirrel cage and slip ring IM (construction and working principle)

Unit IV: Special motor and electrical safety: (16 Hours)

Unit V: Basic Electronics and Logic Gates: (16 Hours)
Semiconductor materials – N type and P type – PN Junction – forward and reverse bias, characteristics of PN junction diode – Half wave rectifier, full wave rectifier, bridge rectifier,. Transistor – construction of NPN and PNP types.
Logic Gates – positive and negative logic, definition, symbol, truth table, Boolean expression for OR, AND, NOT, NOR, NAND, EXOR and EXNOR gates & its basic application.
Text / Reference Books

4. B.L. Theraja, Fundamentals of Electrical and Electronics Engineering, S.Chand & Co.

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – II

GE 204 – ENGINEERING DRAWING – II (100 Hours)

Unit I (28 Hours)

Sectional views of objects

Need for sectional drawing of an engineering object- 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.

Auxiliary views

Need of auxiliary views – auxiliary views given engineering drawings

Development of surfaces

Development of lateral surfaces of simple and truncated solids- prisms, pyramids, cylinders and cones- development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

Unit II (28 Hours)

Pictorial drawings

Principles of isometric projection, construction of isometric scales- Isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones -isometric projection of simple Engineering.

Perspective drawing

Principle of perspective projection – Type of perspective projection – Perspective projection of prisms, pyramids and cylinders by visual ray method.

Unit III

Fastening Devices (14 Hours)

Basic Fastening Devices - Temporary and permanent fastenings - areas of applications - Bolts and nuts - different types of bolted joints for different applications - purpose of locking nuts - types of lock nuts. Exercises in drawing bolted connection using standard proportion. Exercises in the selection of appropriate fastening devices to meet the given working conditions

Unit IV

Assembly and Detail Drawings of Machine Part (30 Hours)

Exercises in assembly and detailed drawings of sleeve & cotter joint, socket & spigot joint, knuckle joint, muff coupling, half lap muff coupling, protected flanged coupling, Plummer block, Tail stock and Screw jack

**Text / Reference Books**

2. Engineering Drawing by N. D Bhutt.

**Note:** Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – II

PT 201 – FUNDAMENTALS OF POLYMER SCIENCE (80 Hours)

Unit – I  Introduction to Polymer Science (16 Hours)


Unit – II  Polymerization (24 Hours)


Unit – III  Polymer Structure and Properties (20 Hours)


Unit – IV  Polymer Characterization (20 Hours)


Text / Reference Books

1. Polymer Science – Gowariker V.R. & others.
2. Text book of Polymer Science – Billmeyer F.W.

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
PT 202 – PLASTICS MATERIALS – I (80 Hours)

Unit – I Natural Polymer (08 Hours)
Nomenclature of Polymers – Sources of Raw Materials – Methods of Manufacture – General Characters & Properties, processing behaviour and applications of natural polymers such as Shellac Resin – Natural Rubber – Casein.

Unit – II Commodity Plastics - Olefinic & Styrenic Plastics (24 Hours)
Sources of Raw Materials – Method of Manufacture – General Characteristics & Properties – Processing Behaviour and applications of

Low Density Polyethylene, Linear Low Density Polyethylene, High Density Polyethylene, High Molecular weight High Density Polyethylene, Polypropylene (Homo & Copolymer), Polystyrene, High Impact Polystyrene, Acrylonitrile Butadiene Styrene, Styrene Acrylonitrile Expanded Polystyrene

Unit – III Commodity Plastics - Vinyl & Cellulosic Plastics (24 Hours)
Sources of Raw Materials – Method of Manufacture – General Characteristics & Properties – Processing Behaviour and applications of

Polyvinyl chloride & Chlorinated Polyvinyl chloride, Polyvinylidene Chloride, Polyvinyl Acetate, Polyvinyl Alcohol, Cellulose Nitrate, Cellulose Acetate, Cellulose Acetate Butyrate, Regenerated Cellulose, Polymethyl Methacrylate, Polyacrylonitrile, Thermoplastic Elastomers.

Unit – IV Thermoset Plastics (24 Hours)

Text / Reference Books

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
GEL 205 – ELECTRICAL AND ELECTRONICS ENGINEERING LAB (40 Hours)

1. Electrical Engineering Lab (20 Hours)
   1. Study of measuring instruments – Ammeter – Volt meter – Watt meter etc.
   2. Determination of unknown resistance by Ohm’s Law.
   3. Energy measurement in a single phase circuit using lamp load.
   4. Power measurement in a single phase circuit.
   5. Load test on a single phase transformer.
   7. Verification of series and parallel circuit.
   8. Study of DC & AC machine starters.

2. Electronics Engineering Lab (20 Hours)
   1. Characteristics of PN junction diode.
   2. Characteristics of transistor.
   3. Construction of bridge rectifier.
   4. Verification of Logic gates.
   5. Characteristics of Photo Diode, LED and thermister & zener diode.
   7. Study of microprocessor, microcontroller & drives.

Text / Reference Books

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand & Publications
2. Electronic Devices and Circuits, Sanjeev Gupta, Dhanpat Rai Publications.
PTL 203 – UTILITIES & SERVICE EQUIPMENTS LAB (80 Hours)

1. Study of Air Compressor Elements, Safety Features, Drive Mechanism, Lubrication.


4. Study of FRL unit and Air Dryer in Pneumatic System & Hopper Drier.


7. Study of Chilling Plant/Cooling Tower.


9. Study and Usage of Various Electrical Tools & Instruments like Voltmeter, Ammeter, Multimeter (Analogue and Digital), Wattmeter & Energy Meter & Meg ohm meter

10. Study of Single Phase and Three Phase power supply. Identification of phase, Neutral and Earth pits.

11. Importance of three phase wiring and its effectiveness, laying of three-phase wiring for an Electric Motor or any other three phase machine.

12. Study and Identification of common Electrical materials such as Wires, Cables, Switches, Fuses, Plugs, Connectors, Sockets etc.

13. Calculation of power and energy consumption.

14. Various types of protective devices such as: Wire Fuse, Cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal fuse, single/multiple miniature circuit breakers, over and under current relays, contactors, and Different types of switches, MCCB.

15. Study of Fluorescent lamp and CFL.


17. Study of Half wave / Full wave rectifier.

18. Study of different types of heater used in plastics processing Machinery using Voltmeter & Ammeter find out the unknown wattage of heater.
PTL 204 - WORKSHOP PRACTICES – II (160 Hours)

Workshop Safety (10 Hours)
General shop floor safety, safety on fitting bench and safety on machines handling of materials

Pedestal Grinding (20 Hours)
Sharpening of Cutting Tools - Single point and Knife tools, Form Tools, Parting and Grooving Tools, Thread Cutting Tools.

Practice on Drilling Machine (20 Hours)
Familiarization with Drilling Machine - Principal parts, work holding device, Cutting Tools & Tool holding device.
Marking and Punching the layout.
Drilling and Tapping.
Drilling and Reaming.
Counter boring and Counter sinking.

Practice on Lathe (40 Hours)
Familiarization with lathes principal parts, work holding device, Cutting tools & tool holding device.
Plain turning and Step turning.
Taper turning.
Drilling and Reaming.
Boring and counter boring.
Thread cutting and knurling.

Practice on Milling Machine (30 Hours)
Familiarization with Milling Machine - Principal parts, work holding device, Cutting Tools & Tool holding device.
Plain surface Milling.
Slot Milling.
Pocket Milling.

Practice on Surface Grinding Machine (30 Hours)
Familiarization with Grinding Machine - Principal parts, work holding device, grinding wheels.
Plain Surface Grinding.
Slot Grinding.
Angular Surface Grinding.

Plumbing (10 Hours)
Pipe cutting and Thread cutting practice.
Coupling joint.
Elbow joint.
T - joint.
DPT
SEMESTER – II

PT 301 – PLASTICS MATERIALS – II

Unit – I  Engineering Plastics

Sources of Raw Materials – Method of Manufacture – General Characteristics & Properties – Processing Behaviour and applications of Engineering Plastics

Polyoxymethylene, Polyamide (PA6, PA66, PA610, PA11, PA12 and PA46), Polysterers (PET, PBT), Poly Carbonate , Polyphenylene Oxide, UHMWHDPE, Polytetrafluoroethylene, Polyvinyl fluoride, Polyvinylidene fluoride, Thermoplastics Polyurethane

Unit – II  Speciality Plastics

Sources of Raw Materials – Method of Manufacture – General Characteristics & Properties – Processing Behaviour and applications of

Polysulphone,, Polyphenylene sulphide, Polyarylsulphone, Polyether Ketone, Polyether Ether Ketone, Polyimide, Polyamideimide, Liquid Crystal Polymers.

Unit – III  Polymer Blends & Alloys

Introduction to polymer blends & alloys - Definitions and nomenclature - reasons for making polymer blend - how to select blend components - preparation of alloys & blends - economy of blending.

Unit – IV  Bio-degradable Plastics & Bio plastics


Text/ Reference Books


Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – III

PT 302 – PLASTICS PROCESSING TECHNOLOGY – I (80 Hours)

Unit – I Introduction (8 Hours)

Unit – II Injection Moulding Process (24 Hours)

Unit – III Extrusion (16 Hours)
Twin screw extruder - principle - types - process - merits & demerits - Vented barrel extruder - hopper loading devices - Drying equipments - Process, machinery - downstream equipments - dies for producing products such as - film - blow film, cast film - Sheets - Tubes and pipes, corrugated pipes - Mono filaments - Box strapping - Wire & Cable Coating / Lamination.
Unit – IV  Blow Moulding  
(16 Hours)

Unit – V  Compression Moulding & Transfer Moulding  
(16 Hours)

Text / Reference Books
1. Injection Moulding Theory & Practice – Rubin, Irvin.

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – III

PT 303 – PLASTICS TESTING – I  (80 Hours)

Unit – I

Concepts of Testing & Identification of Plastics  (20 Hours)

Basic concepts of testing - Specification and Standards - National and International Standards - Test specimen preparation - Pre-conditioning and test atmosphere.

Identification of plastics by simple tests - Visual examination - Density - Melting point - Solubility test - Flame test - Chemical tests, Density by Density-gradient column

Particle size by sieve analysis and moisture content analysis

Unit – II

Material Characterization  (16 Hours)


Unit – III

Mechanical Properties  (28 Hours)

Short-term Mechanical Properties: Tensile properties - Flexural properties - Compressive properties - Shear properties - Impact properties - Tear resistance - Hardness - Abrasion resistance – Frictional properties

Long-term Mechanical Properties - Creep and Stress relaxation

Unit – IV

Thermal Properties  (16 Hours)


Text / Reference Books

1. Text Book on Fundamentals of Plastics Testing - Prof. (Dr.) S.K..Nayak

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – III

PT 304 – ADDITIVES & COMPOUNDING (60 Hours)

Unit – I  Introduction to Additives (8 Hours)
Introduction - Technological Requirements - Classification - Chemistry and Mechanism -
Selection Criteria - General effect on Properties - Evaluation and functions of additives.

Unit – II Additives (16 Hours)
Antioxidants - Stabilizers (Heat & UV) - Plasticizers - Fillers and reinforcements - Impact
Modifiers - Lubricants - Slip and Anti-block agents - Processing aids - Blowing agents -
Flame Retardants - Anti-static and Conductive additives - Nucleating agents - Colourants -
Additives for Recycling , Nano fillers

Unit – III Compounding Techniques (12 Hours)
Selection of Polymers and Compounding ingredients - General objectives - possibilities and
limitations of mixing and compounding - Method of incorporation of additives into polymer
materials.

Unit – IV Compounding Equipments (16 Hours)
Mixing and mixing equipments. Principles - Operating characteristics - Machine construction
- Specifications - Process control systems and working details of Batch mixers and
continuous mixers - High speed mixer - Two roll mill - Banbury Mixer - Ribbon blender -
Planetary mixers - Single Screw extruder - Twin Screw extruders

Unit – V Plastics for Product applications (8 Hours)
Principles of Material selection, consideration of conventional materials competitive with
plastics - Case studies on material suitability (e.g., Plastics Gears, Feeding Bottle, Bowels
for micro wave ovens). Usage of plastics in major industries like Agriculture, Packaging,
Building, Transport, Electrical, Electronics and Telecommunications, Medical and Furniture
etc.

Text / Reference Books

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of M/c/ Equipment/ Mould</th>
<th>Description of Practical Exercise to be done*</th>
<th>Exercise Code No.</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hand Operated Injection Moulding Machine</td>
<td>(i) Safety precautions to be taken in Shop floor (ii) Study of machine in Idle-Run Observation (IRO), Parts &amp; Functions, Operating Principles, Free Sketch of Machine parts e.g. Nozzle, Torpedo, Hopper, Rack &amp; Pinion Barrel etc., shot capacity definition. (iii) Operation practice to produce moulding on different hand injection moulds. Moulding Conditions, Recording the observation and results in practical record book.</td>
<td>PP-01 PP-02</td>
<td>35 35</td>
</tr>
<tr>
<td>3</td>
<td>Blow moulding Hand operated</td>
<td>(i) Study of hand Blow Moulding machines, free-sketch of M/c with parts &amp; study of part function, specification of machine, Study of parison-die with sketch. (ii) Die-centering practice, operation of hand blow machines to produce components - observations, cycle time analysis - procedure of operation and observations. Blowing requirement.</td>
<td>PP-05 PP-06</td>
<td>30 30</td>
</tr>
<tr>
<td>4</td>
<td>Scrap Grinding</td>
<td>(i) Machine study in IRO, specification of machine, study of parts &amp; function, line diagram of machine. (ii) Operation-practice with different materials with different sizes and output study in Kg/hour for different materials.</td>
<td>PP-07 PP-08</td>
<td>30 30</td>
</tr>
<tr>
<td></td>
<td>Two practical test on Plastic Processing Lab VIVA-VOCE</td>
<td></td>
<td></td>
<td>4 Hours Per Test 2 Hours</td>
</tr>
</tbody>
</table>

* Practical exercises on operation of machines shall be done as per the operating manual instruction of the respective machines.
*One test may be conducted in the middle of the Semester and the other one at the end of the Semester followed by Viva-Voce.
### PTL 306 – PLASTICS TESTING LAB – I

(200 Hours)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Exercise</th>
<th>No. of Hrs.</th>
</tr>
</thead>
</table>
| 1.     | Identification of Plastics by Simple methods  
Primary Tests – Elemental Analysis – Confirmation Tests | 100         |
| 2.     | Determination of Density by Displacement Method                                  | 10          |
| 3.     | Determination of Melting Point                                                   | 10          |
| 4.     | Determination of Filler Content                                                  | 10          |
| 5.     | Determination of Moisture Content                                                | 05          |
| 6.     | Determination of Volatile Content                                                | 05          |
| 7.     | Determination of Ash Content and Loss on Ignition                               | 10          |
| 8.     | Determination of Linear Shrinkage and Shrinkage on Transverse Direction          | 10          |
| 9.     | Determination of Carbon Black Content and Dispersion                            | 10          |
| 10.    | Determination of Rate of Burning                                                | 10          |
| 11.    | Determination of Dilute Solution Viscosity                                      | 10          |
| 12.    | Determination of K-value for PVC resin                                           | 10          |
PT 401 – Fundamentals of Plastics Product And Mould Design (80 Hours)

Unit – I  Product Design (20 Hours)
Product Design Concepts – shape and size, function, aesthetics, life, tooling aspects on product design – process variables Vs product design - product design thumb rules for plastics - cost reduction through product design concepts - design of external, internal undercuts - side openings - hinges - assembly through resilience properties - case studies.

Unit – II Injection Mould Design (26 Hours)
Mould design concepts - Introduction - concept of design - design principles - parting line - mould elements - types of moulds - construction of core and cavities - position of gate - gate balancing – ejection - types of ejections - mould cooling - mould alignment - ancillary parts of the mould.

Types of Injection Moulds - Two plate mould - Direct Sprue injection - Single Impression - Multi Impression - Side Gated – Three Plate Moulds - Stack Moulds - Multi Day Light Moulds, Hot runner moulds

Split moulds - external undercut - internal undercut - delayed action - cam track actuation - hydraulic core pulling devices - split cavities - split cores - threaded inserts - internal and external.

Methodical approach to mould design - determination of economical number of cavities – mould standards bolsters - standard mould parts - mould design check list.

Unit – III Compression Mould Design (20 Hours)
Types of compression moulds, open flash, semi-positive type, positive, displacement moulds, types of loading chambers, bulk factor, flash thickness, pot design, projected area, compression pressure, clamping force, no. of impression by technological method, heating system, types of heaters, heat loss, heat requirement & heater capacity.

Transfer Mould Design - Types of transfer moulds, integral pot transfer mould, auxiliary ram transfer mould, transfer pot design, projected area, transfer pressure, clamping force, pressure pad design, design of sprue runner and gate, advantages and disadvantages of transfer mould - design related calculations.

Unit – IV Blow Mould Design (14 Hours)


Design of other Moulds-Thermoforming-vacumm forming-rotational mould RIM moulds

Text / Reference Books
2. Injection Mould Design for Thermoplastics – Pye, R. G. W.
3. Plastics Product Design Engineering – Dubois H.
4. Runner design / Feed systems

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
Unit – I  Rotational Moulding  (12 Hours)

Unit – II  Thermoforming  (24 Hours)

Unit – III  Calendering  (12 Hours)

Unit – IV  Fibre Reinforced Plastics (FRP)  (16 Hours)
Introduction - FRP processing methods - contact moulding - hand layup, spray up method - vacuum bag and pressure bag moulding, filament winding, centrifugal casting, pultrusion, matched die moulding.

Unit - V  Secondary Processes  (16 Hours)
Powder coating, casting, machining, joining of plastics - Decoration of plastics - Metalizing - Printing & Painting etc - Post moulding operations, Assembly techniques, In mould labeling

Text / Reference Books
1. Compression Moulding – Iyesaw, A.I.

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – IV

PT 403 – PLASTICS TESTING – II (60 Hours)

Unit – I    Electrical & Optical Properties (20 Hours)
Dielectric strength - Dielectric constant and Dissipation factor - Insulation resistance -
Volume and Surface resistivity - Arc resistance - Antistatic tests.
Refractive index - Luminous transmittance - Clarity and Haze - Photo-elastic properties -
Colour measurements and Gloss.

Unit – II    Chemical Properties (16 Hours)
Introduction – Immersion test – Stain Resistance of Plastics – Environmental Stress
Cracking Resistance (ESCR).

Flammability
Introduction – Flammability Test – Ignition Properties – Oxygen Index Test – Flammability of
Cellular Plastics – Smoke Density Test – UL90 Flammability Test.

Unit – III    Weathering Properties (12 Hours)
Introduction – environmental factors affecting plastics – Accelerated weathering tests –
outdoor weathering of plastics – Resistance of plastics to biological systems.

Bio-degradability Testing
Test methods and standards for bio-degradable plastics - Criteria used in evaluation of bio-
degradable plastics - Description of current test methods.

Unit – IV    Product Testing (12 Hours)

Text / Reference Books
1. Text Book on Fundamentals of Plastics Testing - Prof. (Dr.) S.K. Nayak

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – IV

PT 404 – POLYMER COMPOSITES AND APPLICATIONS (60 Hours)

Unit – I  Introduction to Composites (16 Hours)

Unit – II  Reinforcements and additives (16 Hours)
Fillers & Reinforcement for composites – Natural Fiber – Cellulose, Jute, Coir, Linen, Vegetable Fiber, Banana fibre properties and applications

Unit – III  Composite Processing Methods (20 Hours)

Unit – IV  Applications of Composites (8 Hours)

Text / Reference Books
1. FRP Manufacturing Process – Philip Ball.
3. FRP Technology – Weatherhead.

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
### DPT SEMESTER – IV

#### PTL 405 – PLASTICS PROCESSING LAB – II

(240 Hours)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of M/c Equipment/Mould</th>
<th>Description of practical exercise to be done*</th>
<th>Exercise Code No.</th>
<th>No. of Hours</th>
</tr>
</thead>
</table>
| 1       | Injection Moulding Semi Automatic | (i) Safety precautions to be taken in Shop floor  
(ii) Study of semi automatic Injection moulding machines of all types. Comparative study of Pneumatic type & Hydraulic type of machines operating principles of machines with nomenclature of parts, machines specifications.  
(iii) Operation of Pneumatic & Hydraulic type of Semi automatic Injection moulding machines, to produce components in different moulds. Cycle-time analysis, observations of process parameters & Procedure to be recorded. | PP-09 | 40 |
|         |                             |                                               | PP-10            | 30           |
| 2       | Extrusion Processes | (i) Study of extruders , Free sketch of machines, their parts and parts-function, List of products manufactured by Extrusion process. Study of different types of extrusion process.  
(ii) 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 machines, defects, causes & remedies, Practice of operating machine to produce different sizes of blown film. Study of the machine parts & function from screw drive to the caterpillar. Practice of Die setting on the machine, Procedure for setting up of parameters & operation practice in running the machine to produce Pipe/Tube/ Film. | PP-11 | 30 |
|         |                             |                                               | PP-12            | 40           |
| 3       | Compression & Transfer moulding-Semi auto & Automatic | Parameter setting, operation-practice on different Compression & Transfer Moulds, observation & procedure of startup & shut down of machine. Setting up procedure for operation of machine, Safety precautions, type of mould clamping arrangement available on Machine-Platen, Mould clamping procedure on machine, Operation of machine by setting the optimum temperature, curing time, clamping force, ejector-stroke etc. on continuous basis, Analysis of product defects & remedies, Analysis of cycle-time, Practice on operation of compression & Transfer moulds with thermoset materials. | PP-13 | 40 |

Two practical test on Plastic Processing Lab  
VIVA-VOCE  
8 Hours Per Test  
4 Hours  
240

* Practical Exercises on operation of machines shall be done as per the operating-manual instruction of the respective M/cs.  
*One test may be conducted in the middle of the Semester and the other one at the end of the Semester followed by Viva-Voce.
### PTL 406 – PLASTICS TESTING LAB – II

(160 Hours)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Exercise</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Specimen Preparation by Injection Moulding</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>Specimen Preparation by Compression Moulding</td>
<td>10</td>
</tr>
<tr>
<td>3.</td>
<td>Specimen Preparation by Cutting</td>
<td>10</td>
</tr>
<tr>
<td>4.</td>
<td>Specimen Preparation by Punching</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Hot Roll Milling for Melt Mixing</td>
<td>10</td>
</tr>
<tr>
<td>6.</td>
<td>Determination of Tensile Properties</td>
<td>10</td>
</tr>
<tr>
<td>7.</td>
<td>Determination of Flexural Properties</td>
<td>10</td>
</tr>
<tr>
<td>8.</td>
<td>Determination of Compressive Properties</td>
<td>10</td>
</tr>
<tr>
<td>9.</td>
<td>Determination of Izod &amp; Charpy Impact Strength</td>
<td>10</td>
</tr>
<tr>
<td>11.</td>
<td>Determination of Hardness (Shore – A &amp; D, Rockwell Hardness, Barcol Hardness)</td>
<td>10</td>
</tr>
<tr>
<td>12.</td>
<td>Determination of Melt Flow Index</td>
<td>10</td>
</tr>
<tr>
<td>13.</td>
<td>Determination of Heat Distortion Temperature</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Determination of Vicat Softening Temperature</td>
<td>20</td>
</tr>
<tr>
<td>15.</td>
<td>Determination of Rate of Burning</td>
<td>10</td>
</tr>
<tr>
<td>16.</td>
<td>Determination of Limiting Oxygen Index</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Determination of Volume Resistivity &amp; Surface Resistivity</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Determination of Arc Resistance</td>
<td>10</td>
</tr>
<tr>
<td>19.</td>
<td>Determination of Dielectric Strength</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Determination of Clarity &amp; Haze</td>
<td>10</td>
</tr>
</tbody>
</table>
## PTL 407 – CAD LAB (80 Hours)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the Exercise</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Hand Injection Mould Design</td>
<td>04</td>
</tr>
<tr>
<td>2.</td>
<td>Design of Mould Elements / Standard Mould Base</td>
<td>08</td>
</tr>
<tr>
<td>3.</td>
<td>Single Impression Two Plate Mould</td>
<td>08</td>
</tr>
<tr>
<td>4.</td>
<td>Multi-impression Two Plate Mould</td>
<td>08</td>
</tr>
<tr>
<td>5.</td>
<td>Three Plate Mould (Multi-impression)</td>
<td>16</td>
</tr>
<tr>
<td>6.</td>
<td>Split Mould Design</td>
<td>16</td>
</tr>
<tr>
<td>7.</td>
<td>Mould Design for Internal Undercuts</td>
<td>16</td>
</tr>
<tr>
<td>8.</td>
<td>Mid Term Test</td>
<td>04</td>
</tr>
</tbody>
</table>

**Total** 80
DPT
SEMESTER – V

PT 501 – ADVANCED PLASTICS PROCESSING (80 Hours)

Unit – I Specialized Injection Moulding Process (28 Hours)

Advanced Microprocessor Controlled Machines - Merits & Demerits - Co-Injection Moulding -
Two Colour Injection Moulding - Gas Assisted Moulding - Water Assisted Moulding -
Reaction Injection Moulding - Liquid Injection Moulding – Lost Core Moulding – Structural
Foam Moulding – Low Pressure foam - high pressure foam – Sandwich Moulding – Thin
Wall Product Moulding

All Electric Injection Moulding Machines - Tie bar less Injection Moulding, Automated
Conveyor system, Automatic Material loading

Unit – II Advanced Blow Moulding Process (24 Hours)

Classification of Advanced Blow Moulding Processes - Stretch Blow Moulding – Preforms –
Extrusion Stretch Blow Moulding – Injection Stretch Blow Moulding – Principles and
Operation – Forced Extrusion - Accumulator Blow Moulding - Double Wall Blow Moulding -
Multi-layer Blow Moulding.

Unit – III Advanced Extrusion Process (20 Hours)

Profile Extrusion - Material - Process - Process optimization - Down stream equipments -
Dies and applications.

Multi-layer films, co-extruded sheets, Pipes, Corrugated pipes.

Unit - IV: Textile processing (8 hrs)

Polymer processing for textiles, needle punching, melt blow , fibre spinning

Text / Reference Books

3. Introduction to Nano Technology – Charles P., Poor Jr. & Frank J. O.

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – V

PT 502 – MAINTENANCE OF PLASTICS PROCESSING & TESTING EQUIPM ENTS
(60 Hours)

Unit – I
Introduction to Maintenance

(8 Hours)
Importance and Objectives of Maintenance, Preventive Maintenance, Breakdown Maintenance, Predictive Maintenance, Schedule Maintenance, Maintenance Planning, Factors to be considered for Installation / Erection and Commissioning of Plastics Processing & Testing Machinery, General Method of Alignments and Leveling, Study of safety rules and regulations

Unit – II
Electrical

(20 Hours)
Repair and maintenance of the electrical equipments – Electrical induction motors (slip ring motors and squirrel cage motors), Variable Speed Motors, their characteristics and speed control.

Maintenance of Starter, Circuit Breakers (Air Circuit Breakers and Miniature Circuit Breakers)

Limit Switches & Timers, Relays, Temperature Controllers, and Thermocouples, Heaters (mica and ceramic type)

Unit – III
Mechanical

(12 Hours)
Screw, Barrel, Parts of Screw & Barrel clearance between screw and barrel, Non return valve, Thrust Bearing Unit, Gear Boxes, Calendar roll, Mill roll – platen parallelism measurement, Platen parallelism measurement, Moving parts maintenance

Unit IV
Hydraulics

(20 Hours)

Text / Reference Book

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – V

PT 503 - MOULD MANUFACTURING  (80 Hours)

Unit – I  (12 Hours)
Material for Moulds

Unit – II  (12 Hours)
Mould Making Techniques - Conventional methods
Introduction of mould parts and manufacturing, Different types of machines used, Cutting Tools - Tool Materials. Study of various machining operations -Turning, Shaping, Planning, Drilling, Grinding (Surface, Cylindrical), Milling (Horizontal / Vertical). Manufacturing of various mould elements.

Unit – III  (24 Hours)
Mould Making Techniques - Special Machine Tools
Introduction to Special Machine Tools - Jig Boring Machine, Pentograph, Electrical Discharge Machining (EDM) – Working Principle – Cutting Tools used in Mould manufacturing and maintenance. , wire cut and applications
Introduction of CNC Machines - Types - Application of CNC machines for mould making and maintenance.

Unit - IV  (20 Hours)
Mould Polishing & Assembly
Mould Assembly - Check list for Mould Assembly - Fitting and Assembly of various Mould Elements- Core Insert, Cavity Insert, Sprue Bush - Ejection System Assembly - Blue Matching and Die Spotting-Venting - Final Inspection - Fitting of Locating Ring and carrier bar.

Unit – V  (12 Hours)
Mould Maintenance

Text / Reference Books
2. Plastics Moulds and Dies, Sors.
3. Injection Moulds, V.D.I.
4. Injection Mould Design –Pye R.G.W.

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
### PTL 504 – PLASTICS PROCESSING LAB – III (300 Hours)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of M/c/ Equipment/ Mould</th>
<th>Description of practical exercise to be done*</th>
<th>Exercise Code No.</th>
<th>No. of Hours</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Automatic Injection Moulding Machine</td>
<td>Safety Precautions to be taken while handling Machine, Mold &amp; Tools on shop floor. Idle-Run Observation (IRO) &amp; study of injection unit, Clamping unit, Process control knobs, safety precautions, start-up procedure, shut-down procedure, sketch of machine platens, Clamping system, type of nozzle used in machine etc., study of hydraulic system used in the machine. Machines operation-Practice, Process parameter setting for a particular mould on the machine, Operation of Machine in Hand, Semi automatic and automatic-mode to produce components, observations of all parameters, cycle-time analysis, use of different plastics materials for moulding &amp; comparison, moulding faults analysis for causes and remedies.</td>
<td>PP-14</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Thermoforming (Vacuum Forming, Pressure Forming)</td>
<td>Study of process principle, type of moulds &amp; material used, Mounting &amp; Clamping of plastic sheet, heating &amp;vacuum system, cooling, trimming and finishing. Familiarization with the machine controls for operation, Operation practice by trainee, observation on Cycle-time, processing-defects &amp; remedies.</td>
<td>PP-18</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Plastics-Coating, Sealing, Welding, Screen-Printing, Solvent cementing &amp; mechanical joining.</td>
<td>Principle of coating process, coating equipments, type of coating, type of material used, sequence of operation in coating. Principle of operation of Heat-sealing equipments, bag sealing, High frequency &amp; hot gas welding &amp; Hot stamping operation with specific reference to pipe. Familiarization of screen printing process, methodology for screen preparation, type of inks used. Joining of PVC pipes and fitting with solvent cement, Mechanical joining of plastic parts by bolting, inserts, threading etc.</td>
<td>PP-20</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Study of Mould &amp; its maintenance</td>
<td>Study of different types of moulds &amp; Dies-injection , blow&amp; compression moulds, Mould maintenance &amp; storage</td>
<td>PP-21</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>FRP Process</td>
<td>Study of types of resins, Fibres &amp; additives used in the process, material selection &amp; equipment requirement. Sequence of process operation in Hand lay-up process, Operation practice for hand lay-up process for producing FRP products like helmet, trays, plate, chairs etc. mould material &amp; making, curing, part ejection &amp; finishing. Precautions during the Process-defects &amp; analysis for the remedies</td>
<td>PP-22</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>
7. Study of ancillary Equipments | Hopper Dryer, Chiller, Mould Temperature Controller, Cooling Tower, Mixer | PP-23 | 20

| Two practical test on Plastic Processing Lab | VIVA-VOCE | 8 Hours Per Test | 4 Hours | 300 |

*Practical exercises on operation of machines shall be done as per the operating manual instruction of the respective M/cs.

**The exercise shall be done in Tool Room Department.

*One test may be conducted in the middle of the Semester and the other one at the end of the Semester followed by Viva-Voce.
# PTL 505 – PLASTICS TESTING LAB – III

(240 hours)

Product Testing as per BIS Standards

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Exercise</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Testing of PVC Pipes and Fittings</td>
<td>24</td>
</tr>
<tr>
<td>2.</td>
<td>Testing of HDPE Pipes and Fittings</td>
<td>24</td>
</tr>
<tr>
<td>3.</td>
<td>Testing of LDPE Films</td>
<td>24</td>
</tr>
<tr>
<td>4.</td>
<td>Testing of PET Containers for Drinking Water</td>
<td>20</td>
</tr>
<tr>
<td>5.</td>
<td>Testing of PP and PC Feeding Bottle</td>
<td>20</td>
</tr>
<tr>
<td>6.</td>
<td>Testing of Water Storage Tank</td>
<td>20</td>
</tr>
<tr>
<td>7.</td>
<td>Testing of Foam</td>
<td>20</td>
</tr>
<tr>
<td>8.</td>
<td>Testing of FRP Products</td>
<td>20</td>
</tr>
<tr>
<td>9.</td>
<td>Testing of Irrigation Laterals &amp; Drippers</td>
<td>24</td>
</tr>
<tr>
<td>10.</td>
<td>Testing of Woven Sacks</td>
<td>20</td>
</tr>
<tr>
<td>11.</td>
<td>Migration Test to Stimulants</td>
<td>08</td>
</tr>
<tr>
<td>12.</td>
<td>Testing of Vinyl Flooring</td>
<td>16</td>
</tr>
</tbody>
</table>
DPT
SEMESTER – VI

PT-601 Plastics Recycling and Waste Management (60 Hours)

UNIT – I Plastics Wastes and its Separation (12 Hours)


UNIT – II Plastics Waste Management Techniques (24 Hours)


UNIT – III Machinery and Value addition (16 Hours)


UNIT – IV Plastics Waste and Environment (8Hours)

Environmental issues and Guidelines for Recycling of Plastics Wastes – Environmental legislation in India.

Text / Reference Books

3. Environmental Engineering & Management – Suresh k. Dameja

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
DPT
SEMESTER – VI

PT 602 – INDUSTRIAL MANAGEMENT AND COSTING (60 Hours)

Unit – I (16 hours)


Functions of Management: Planning, Organizing, Staffing, Directing, Controlling, Decision making.

Organizational Structure: Definition of organization, different types of organizational structure: - Line Function, Line & Staff Organization (brief description with advantages & disadvantages), Leadership, Motivation and Communication.


Unit – II (12 Hours)

Quality Planning and Control: Definitions of Quality, Requirements of Quality, Objectives of Quality Planning – Quality Control: - Operator’s Quality, Inspectors Quality Control, Managers Quality Control, Total Quality Control.

Quality Assurance: - Concept, Definition, Responsibility of Quality Assurance, Planning for Quality Assurance


Concept of TQM and Organizational Excellence: Concept, ten mantras of TQM, the link between ISO 9000 and TQM with the help of TQM Model – organization of TQM. Techniques of TQM - PDCA, Total Employee Involvement (TEI), POKA –YOKE – Failure proofing, JIT manufacturing.

Quality Circles - concept, characteristics, Brain storming method for solving Q.C. Problems.

Unit – III (16 Hours)

Behavioural Science


Industry – Entrepreneurship

Steps required to start small scale industry, procedure for registration (provisional and permanent registration) – sources of financial assistance, govt., assistance for development of SSI, preparation of project report, Tax: - an overview of income tax – excise duty, sales tax – procedure to be followed for sales tax.

Unit – IV (16 Hours)

Costing


Text / Reference Books

1. Industrial Engineering Management – Khanna O. P.
2. Cost Accounting Principles & Practice – Nigamal & Jain J. C.
3. Personal Management & Industrial Relations – Davar R. S.

Note: Minimum of one assignment and one periodical test is mandatory from each unit.
List of Practicals

1. Installation and Commissioning of Plastics Processing & Testing Machines.

2. To check the alignment and moving parts of various machinery like extrusion, injection moulding machine and blow moulding machine, UTM machine.

3. Repair and Maintenance of Hydraulic System in machines such as Injection Moulding, Blow Moulding Machines, Two Roll Mill, Compression Moulding Machine.

4. Positive and hydraulic actuators and motors.

5. Lubrication System, Central Lubrication System, O-rings, Oil Seals.

6. To carry out breakdown maintenance of electrical equipments like induction motors, variable speed motors, circuit breakers used in plastics processing & testing machinery.

7. Study of temperature control with thermocouples and timer (Digital & Analogue)

8. Transmission systems (Transmission and distribution of power system)


10. Study of D.O.L starters.

11. Study of Star-delta starter used in Injection Moulding M/c.

12. Study of PLC in processing & testing machines.

13. To carry out the preventive maintenance of machines like injection moulding machine, blow moulding machine, extruder, Microprocessor based injection moulding machine – Preparing maintenance charts for periodical inspection.

14. Repair and maintenance of various pumps.

15. Trouble shooting of various M/c and their remedies.
DPT
SEMESTER – VI

PTL 604 – PROJECT WORK (520 Hours)

Project Work

Project work aims at developing skills in the students where they can apply the totality of knowledge and skills gained through the course curriculum to find out a solution to the particular problem or to undertake a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group activity. Preferably there should not be more than 3 students in a group. The students should identify or given a project assignment at least two to three months in advance. The project work shall be identified in collaboration with industry may be preferred.

Each faculty member is expected to guide the project work of 5 – 6 students.

- Projects related to increasing productivity.
- Projects related to quality assurance.
- Projects related to estimation and economics of production.
- Projects connected with repair and maintenance of plant and equipment.
- Projects related to identification of raw material thereby reducing the wastage.
- Projects related to suggesting substitutes of the polymer being used.
- Any other related problems of interest of host industry.
- Industry project