

# **SYLLABUS**

## FOR

# DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME- SANDWICH)

[DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY]

# N-20 SCHEME

**IMPLEMENTED FROM 2020-2021** 



TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE (AUTONOMOUS)

**MADURAI-625011** 

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## TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE,

(Autonomous) MADURAI- 11 N-20 SCHEME

(Implemented from the Academic Year 2021 - 2022 onwards) CHAIRPERSON Tmt. J. VIJAYA Principal Tamilnadu Government Polytechnic College, Madurai-11

## Department of Polymer Technology SEMESTER - III, IV, V, VI & VII

## CONVENER

## Er.G.Kaliraj,

HOD, i/c,

Department of Polymer Technology,

Tamilnadu Government Polytechnic College,

Madurai - 625 011.

9443961852

## **MEMBERS**

1	Dr.N.Murugan, Lecturer (UG), Department of PolymerTechnology, V.S.V.N.Polytechnic College, Virudhunagar
2	DrK.Vimalashanmugam, Lecturer, Department of Polymer Technology, Tamilnadu Government Polytechnic College, Madurai – 625 011

## TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE(AUTONOMOUS), MADURAI - 11 DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY

(SEMESTER SYSTEM)

#### **N-20 SCHEME**

#### (Implemented from 2020 - 2021)

## <u>REGULATIONS</u>\*

## 1. Description of the Course:

## a. Full Time (3 years)

The Course for the Full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters\* and the First Year is common to all Engineering Branches.

## b. Sandwich (3½ years)

The Course for the Sandwich Diploma in Engineering shall extend over a period of three and half academic years, consisting of 7 semesters\* and the First Year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4<sup>th</sup> and/or during 7<sup>th</sup> semester the students undergo industrial training for six months / one year. Industrial training examination will be conducted after completion of every 6 months of industrial training.

## c. Part Time (4 years)

The course for the Part Time Diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters\*. The subjects of 3 years full time diploma courses being regrouped for academic convenience.

\* Each Semester will have 16 weeks duration of study with 35 hrs. / Week for Regular Diploma Courses and 18 hrs. / Week for Part Time Diploma Courses.

## 2. Conditions for Admission:

Condition for admission to the Diploma courses shall be required to have passed in The S.S.L.C Examination of the Board of Secondary Education, Tamil Nadu.

(Or)

The Anglo Indian High School Examination with eligibility for Higher Secondary Course in Tamil Nadu.

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

Any other Examinations recognized as equivalent to the above by the Board of Secondary Education, Tamil Nadu.

Note: In addition, at the time of admission the candidate will have to satisfy certain minimum requirements, which may be prescribed from time to time.

## 3. Admission to Second year (Lateral Entry):

A pass in HSC (academic) or (vocational) courses mentioned in the Higher Secondary Schools in Tamil Nadu affiliated to the Tamil Nadu Higher Secondary Board with eligibility for University Courses of study or equivalent examination & Should have studied the following subjects.

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		H.Sc Academic	H.Sc Voo	cational	Industrial
SI. Courses No		Subjects	Subjects	Studied	Training
		Studied	Related	Vocational	Institutes
			subjects	subjects	Courses
1	All the Regular and Sandwich Diploma Courses	Physics and Chemistry as compulsory along with Mathematics / Biology	Maths / Physics / Chemistry	Related Vocational Subjects Theory& Practical	2 years course to be passed with appropriate Trade

- For the Diploma Courses related with Engineering/Technology, the related/equivalent subjects prescribed along with Practicals may also be taken for arriving the eligibility.
- Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.

- Age Limit: No Age limit.
- Medium of Instruction: English

## • Eligibility for the Award of Diploma:

No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to the State Board of Technical Education and Training, Tamil Nadu, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Courses are as given below:

Diploma Course	Minimum	Maximum
	Period	Period
Full Time	3 Years	6 Years
Full Time	2 Years	5 Years
(Lateral Entry)	2 10010	
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

This will come into effect from N-20 Scheme onwards i.e. from the academic year 2020-2021. • Subjects of Study and Curriculum outline:

The subjects of study shall be in accordance with the syllabus prescribed from

time to time, both in theory and practical subjects.

The curriculum outline is given in Annexure -I.

## 4. Examinations:

Autonomous Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment. Autonomous Examinations are conducted for 100 marks and reduced to 75.

The total marks for result are 75 + 25 = 100 Marks.

## 5. Continuous Internal Assessment:

#### A. For Theory Subjects:

The Internal Assessment marks for a total of 25 marks, which are to be distributed as follows:

## i) Subject Attendance

# (Award of marks for subject attendance to each subject Theory/Practical will be asper the range given below)

80%	-	83%	1 Mark
84%	-	87%	2 Marks
88%	-	91%	3 Marks
92%	-	95%	4 Marks
96%	-	100%	5 Marks

## ii) Test #

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Average of these two test marks will be taken and the marks to be reduced to: 5 Marks

The Test-III is to be the Model Examination covering all the five units and the marksobtained will be reduced to: 5 Marks

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit _1&11	End of 6 <sup>th</sup> week	50	2Hrs
Test II	Unit _ III& IV	End of 12 <sup>th</sup> week	50	2Hrs
Test III	Model Examination: Covering all the Units. (Autonomous Examinations- question paper-pattern).	End of 16 <sup>th</sup> week	100	3 Hrs

# From the Academic Year 2020–2021 onwards.

Question Paper Pattern for the Test - I and Test — II is as follows. The tests should be conducted by proper schedule. Retest marks should not be considered for internal assessment.

## Without Choice:

Part A Type questions:	6 Questions x 1 mark	06 Marks
Part B Type questions:	7 Questions x 2 marks	14 Marks
Part C Type questions:	2 Questions x 15 marks	30 Marks

## 5 Marks

10 Marks

#### 50 Marks

## iii) Assignment

#### 5 Marks

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 5 marks.

## iv) Seminar Presentation

## 5 Marks

The students have to select the topics either from their subjects or general subjects which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present seminar (For First and Second Year, the students will be permitted to present the seminar as a group not exceeding six members and each member of the group should participate in the presentation. For the Third Year, the students should present the seminar individually.) The seminar presentation is mandatory for all theory subjects and carries 5 marks for each theory subject. The respective subject faculty may suggest topics to the students and will evaluate the submitted materials and seminar presentation. (2½ marks for the material submitted in writing and 2½ marks for the seminar presentation). For each subject minimum of two seminars are to be given and the average marks scored should be reduced to 5 marks.

All Test Papers, Assignment Papers / Notebooks and the seminar presentation written material after getting the signature with date from the students must be kept in safe custody in the department for verification and audit. It should be preserved for one semester after publication of Autonomous Exam results and produced to the flying squad and the inspection teamat the time of inspection/verification.

## **B. For Practical Subjects:**

The Internal Assessment mark for a total of 25 marks which are to be distributed as follows:-

- a) Attendance : 5 Marks (Award of marks as theory subjects)
- b) Procedure/ observation and tabulation/ Other Practical related Work : 10 Marks
   c) Record writing : 10 Marks
   TOTAL : 25 Marks
- All the Experiments/Exercises indicated in the syllabus should be completed and the

same to be given for final Autonomous examination.

- The observation note book / manual should be maintained for 10 marks. The
  observation note book / manual with sketches, circuits, programme, reading and
  calculation written by the students manually depends upon the practical subject
  during practical classes should be evaluated properly during the practical class hours
  with date.
- The Record work for every completed exercise should be submitted in the subsequent practical classes and marks should be awarded for 10 marks for each exercise as per the above allocation.

At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks (including Observation and Record writing) and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks).

• Only regular students, appearing first time have to submit the duly signed bonafide record note book/file during the Practical Autonomous Examinations.

All the marks awarded for Assignments, Tests, Seminar presentation and Attendance should be entered periodically in the Personal Theory Log Book of the staff, who is handling the theory subject.

The marks awarded for Observation, Record work and Attendance should be entered periodically in the Personal Practical Log Book of the staff, who is handling the practical subject.

# 6. Communication Skill Practical, Computer Application Practical and Physical Education:

The Communication Skill Practical and Computer Application Practical with more emphasis are being introduced in First Year. Much Stress is given to increase the Communication skill and ICT skill of students.

As per the recommendation of MHRD and under Fit India scheme, the Physical education is introduced to encourage students to remain healthy and fit by including physical activities and sports.

## 7. Project Work and Internship:

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.

TOTAL	: 25 Marks
	pattern)
Attendance	: 05 marks (Award of marks same as theory subject
Project Review II	: 10 marks
Project Review 1	:10 marks

## a) Internal assessment mark for Project Work & Internship:

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Autonomous Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

## b) Allocation of Marks for Project Work & Internship in Autonomous Examinations:

Demonstration/Presentation/Viva voce	:25 marks
Report	:25 marks
Writtent test	:30 marks
Internship Report	:20 marks

	TOTAL		:	100*	mar	'ks			

\*Examination will be conducted for 100 marks and will be converted to 75 marks.

## c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work & Internship Autonomous examination.

## 8. Scheme of Examinations:

The Scheme of examinations for subjects is given in Annexure - II.

## 9. Criteria for Pass:

- No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved byAICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the curriculum.
- 2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than 40% in Theory subjects and 50% in practical subjects out of the total prescribed maximum marks including both the Internal Assessment and the Autonomous Examinations marks put together, subject to the condition that he/she secures at least a minimum of 40 marks out of 100 marks in the Autonomous Theory Examinations and a minimum of 50 marks out of 100 marks in the Autonomous Practical Examinations.

## 10. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2023 onwards (Joined first year in 2020 -2021) will be done as specified below.

## First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

## First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

## First Class:

A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all the semesters put together and passes all the subjects within the stipulated period of study  $2 / 3 / 3\frac{1}{2} / 4$  years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

## Second Class:

All other successful candidates will be declared to have passed in Second Class.

The above classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2023 /April 2024 onwards (both joined First Year in 2020 -2021)

## 11. <u>Duration of a period in the Class Time Table:</u>

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and lunch break in a day should be uniformly maintained as7 hours corresponding to 7 periods of instruction (Theory & Practical).

\*\*\*\*\*\*

#### N - 20-SCHEME

(Implemented from the Academic year 2021-2022 onwards)

#### CURRICULUM OUTLINE

## THIRD SEMESTER (FULL TIME)

Subject	Subject Name	Hours Per Week				
Code	Subject Name	Theory	Drawing	Practical	Total	
4974310	Basic Organic Chemistry	4	-	-	4	
4070320	General Engineering	5	-	-	5	
4974330	Polymer Science	4	-	-	4	
4974340	Polymer Engineering Drawing Practical	-	-	5	5	
4974350	Polymer Science Practical	-	-	5	5	
4070360	General Engineering Practical	-	-	4	4	
4974370	Computer Aided Design Practical	-	-	5	5	
Co-	Physical Education	-	-	-	2	
activities	Library	-	-	-	1	
	TOTAL	13	-	19	35	

#### N - 20-SCHEME

(Implemented from the Academic year 2021-2022 onwards)

#### CURRICULUM OUTLINE

## FOURTH SEMESTER (FULL TIME)

Subject	Subject Name	Hours Per Week					
Code	Subject Name	Theory	Drawing	Practical	Total		
4974410	Rubber Materials	4	-	-	4		
4974420	Plastics Materials	4	-	-	4		
4974430	Basics of Chemical Engineering and Process Measurement	4	-	-	4		
4974440	Rubber Materials Analysis Practical	-	-	5	5		
4974450	Plastics Preparation & Analysis Practical	-	-	5	5		
4974460	Polymer Identification Practical	-	-	5	5		
4974470	Chemical Engineering and Process Measurement Practical	-	-	5	5		
Co- curricular	Physical Education	-	-	-	2		
activities Library		-	-	-	1		
	TOTAL	12	-	20	35		

#### N - 20-SCHEME

(Implemented from the Academic year 2021-2022 onwards)

#### CURRICULUM OUTLINE

## FIFTH SEMESTER (FULL TIME)

Subject	Subject Name		Hours Per Week Theory Drawing Practical Total			
Code	Subject Name	Theory				
4974510	Rubber Compounding and Product Manufacturing	4	-	-	4	
4974520	Plastics Processing - I	4	-	-	4	
4974530A	ELECTIVE THEORY I:					
4974530B	1. Polymer Composites 2. Tyre Technology	4	-	-	4	
4974530C	3. Polymer Recycling					
4974540	Entrepreneurship and Startup			4	4	
4974550	Rubber Compounding and Specimen preparation Practical	-	-	5	5	
4974560	Polymer Processing Practical	-	-	6	6	
4974570A	ELECTIVEPRACTICAL I: 1. FRP Technology Practical					
4974570B	2. Tyre Technology Practical 3. Polymer Recycling Practical	-	-	5	5	
4974570C						
Co- curricular	Physical Education	-	-	-	2	
activities	Library	-	-	-	1	
	TOTAL	12	-	20	35	

#### N - 20-SCHEME

(Implemented from the Academic year 2021-2022 onwards)

#### CURRICULUM OUTLINE

## SIXTH SEMESTER (FULL TIME)

Subject	Subject Name	Hours Per Week			
Code	Subject Name	Theory	Drawin g	Practical	Total
4974610	Plant Engineering and Management	5	-	-	5
4974620	Polymer Testing	5	-	-	5
4974630A	ELECTIVE THEORYII:				
4974630B	1. Polymer Mould Engineering 2. Packaging Technology	5	-	-	5
4974630C	Control Management				
4974640	Polymer Testing Practical	-	-	-	6
4974650A	ELECTIVEPRACTICALII: 1. Polymer Mould Engineering				
4974650B	Practical 2. Packaging Technology	-	-	-	5
4974650C	3. Polymer Product Quality Control Practical				
4974660	Project Work and Internship	-	-	6	6
Co- curricular	Physical Education	-	-	5	2
activities	Library	-	-	6	1
	TOTAL	15	-	17	35

## N - 20-SCHEME

(Implemented from the Academic year 2021-2022 onwards)

### CURRICULUM OUTLINE

## SEVENTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Hours Per Week					
	Subject Name	Theory	ory Drawing Practical Tota				
4974710	Industrial Training and Viva Voce	-	-	-	-		

#### Polymer Technology

## EQUIVALENT SUBJECTS IN N20 SCHEME FOR TNP2 SCHEME

	' TNP 2' - SCHEME			'N 20'- SCHEME
Course Code	Course Name/Subject	Term	Equivalent Course code	Equivalent Subject
16731	Basic Organic Chemistry	III	4974310	Basic Organic Chemistry
16732	Basics of Electrical and Electronics Engineering			No equivalent
16733	Basics of Mechanical Engineering			No equivalent
16734	CAD Practice	Ш	4974370	Computer Aided Design Practical
16735	Electrical and Electronics Engineering Practical			No equivalent
16736	Tool room practical			No equivalent
16737	Computer Application Practical			No equivalent
16741	Polymer Science	111	4974330	Polymer Science
16742	Rubber Materials	IV	4974410	Rubber Materials
16743	Plastics Materials	IV	4974420	Plastics Materials
16744	Chemical Process Instrumentation and Control			No equivalent
16745	Polymer Science Practical	111	4974350	Polymer Science Practical
16746	Polymer Preparation and Identification Practical			No equivalent
16747	Chemical Process Measurement and Control Practical			No equivalent
16751	Plastics Processing Technology	V	4974520	Plastic Processing
16752	Rubber Processing and Product Manufacture	V	4974510	Rubber Compounding & product Manufacturing
16753	Chemical Engineering			No equivalent
16754.A	Polymer Composites	V	4974530 A	Polymer composites
16754.B	Tyre Technology	V	4974530 B	Tyre Technology
16755	Chemical Engineering Practical			No equivalent
16756	Polymer Processing Practical	V	4974560	Polymer Processing Practical
16002	Life and Employability Skill Practical	V		No equivalent
16761	Plant Engineering and Management	VI	4974610	Plant Engineering and Management
16762	Polymer Testing	VI	4974620	Polymer Testing

16763.A	Polymer Mould Engineering	VI	4974630A	Polymer Mould Engineering
16763.B	Packaging Technology	VI	4974630B	Packaging Technology
16764	Polymer Testing Practical	VI	4974640	Polymer Testing Practical
16765	Computer Aided Mould Design Practical	VI		No equivalent
16766	Mould Making Practical	VI		No equivalent
16767	Project Work	VI	4974660	Project Work and Internship
16771	Industrial Training Report and Viva Voce	VII	4974710	Industrial Training and Viva Voce



## TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI-11

## N - 20 SCHEME

## DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: BASIC ORGANIC CHEMISTRY
Semester	: III Semester
Subject Code	: 4974310
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

## **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instr	uctions		Examination		
Subject	Hours /	Hours /	Marks			
Casjoor			Internal End To	Total	Duration	
	Week	Semester	Assessment	Semester		
				Examination		
BASIC	6 Hrs	64 Hrs	25	100*	100	3 Hrs
ORGANIC	•••••	••••••				• • • •
CHEMISTRY						

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

## **Topics and Allocation of Hours**

Unit	Topics	Hours
Ι	CLASSIFICATION, NOMENCLATURE AND PURIFICATION OF ORGANIC COMPOUNDS	12
II	ISOMERISMAND TYPES OF ORGANIC REACTIONS	12
	HYDRO CARBONS AND ALCOHOLS	11
IV	CARBONYL COMPOUND SANDAMINES	11
V	AROMATIC COMPOUNDS	11
	Test & Model Exam	7
	TOTAL	64

#### **RATIONALE:**

Organic chemistry is the branch of chemistry that deals with the structure, properties, and reactions of compounds that contain hydrocarbon. It is a highly creative science. Chemists in general and organic chemists in particular can create new molecules never before proposed which, if carefully designed, may have important properties for the betterment of the human experience.

Beyond our bodies' DNA, peptides, proteins, and enzymes, organic compounds are all around us and in industries such as the rubber, plastics, fuel, pharmaceutical, cosmetics, and detergent, coatings, dyestuffs, and agrichemicals industries. Clearly, organic chemistry is critically important to our high standard fliving.

There is tremendous excitement and challenge in synthesizing a molecule never before made synthetically or found in nature. Tailoring the properties of that molecule via chemical synthesis to produce beneficial effects to meet the needs of the present and future human existence is both challenging and rewarding.

## **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able,

- To learn about the classification of the organic compounds.
- To know about the different methods of purification of the organic compound.
- To understand the different types of isomerism.
- To study about the different types of organic reactions.
- To know about the methods of preparation, properties and uses of basic organic compounds required for the preparation of polymer.
- To distinguish between primary, secondary and tertiary a mine.
- To learn method of separation of primary, secondary and tertiary a mines.
- To learn about the fractional distillation of coal tar and the various fractions.

# **BASIC ORGANIC CHEMISTRY**

#### Content: Theory

Unit	Nameofthe Topic				
I	<b>CLASSIFICATIONANDPURIFICATIONOFORGANICCOMPOUNDS</b> Classification of organic compounds - Alkane, Alkene, Alkyne, alcohol(Monohydric, dihydric and trihydric) and amine (primary, secondary and tertiary)-Purification of organic compounds-Principles of crystallization, sublimation, simple distillation, fractional distillation and Column chromatography.	12 Hrs			

	ISOMERISMANDTYPESOFORGANICREACTIONS	
	Isomerism - structural isomerism - chain isomerism, position isomerism,	
	functional isomerism, metamerism and automerism (Ketonolt	
	automerism only) - Stereoisomerism - optical isomerism (Lactic acid	
П	only)-Geometrical isomerism(Maleic acid and Fumaric acid).	12 Hrs
	Types of organic reactions-I-Electrophile and nucleophile-Examples	
	-Substitution reactions-Addition reaction-Addition inolefinic	
	compounds - Markonikoff's Rule - Peroxide effect - Elimination	
	reaction(MechanismofE2andE1types are not included)	
	HYDROCARBONSANDALCOHOLS	
	Preparation methods, properties and uses of METHANE, ETHANE	
	METHANOL (from water gas and by oxidation of CH4 ).	11 Hrs
	ETHANOL (from ethylene, molasses and starch), GLYCEROL (from fats	
	and oils and from propylene)	
	CARBONYLCOMPOUNDSANDAMINES	
	General methods of preparation, properties and uses of	
IV	FORMALDEHYDE, ACETONE, ACETIC ACID, and AMINES (Primary	11 Hrs
	secondary and tertiary amine) - Difference between primary, Secondary	
	and tertiary amines - Separation of primary, secondary and tertiary	
	amines by Hoffmann method	
	AROMATICCOMPOUNDS	
v	Coaltar-Fractional distillation of coaltar-Different products and their	11 Hrs
	uses - Commercial preparation of benzene from (i) coal tar and	
	(ii)Petroleum-Properties of benzene.	

## TextBooks:

- 1. B.S.Bahland ArunBahl TextbookoforganicChemistry
- 2. P.L.SoniandH.M.Chawla-TextbookoforganicChemistry

## **ReferenceBooks:**

- 1. K.S.TewariS.N.MehrotraandN.K.Vishnoi -Textbookoforganicchemistry
- 2. B.K.Sharma, G.P.PokhariyalandS.K.Sharma.- Organic Chemistry-Vol-IandII
- 3. S.P.ShuklaandG.L.Trivedi-ModernOrganicChemistry
- 4. +1and +2Chemistry-Tamil Nadu TextbookCorporation.

## TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI-11

## N - 20 SCHEME

## DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

## (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: GENERAL ENGINEERING
Semester	: III Semester
Subject Code	: 4070320
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

## **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Inst	ructions		Examination		
Subject	Hours Hours / Marks			Marks		
	/ Week	Semester	Internal Assessment	End Semester Examination	Total	Duration
GENERAL ENGINEERING	5 Hrs	64 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

## **Topics and Allocation of Hours**

Unit	Topics	Hours
I	STRENGTH OF MATERIALS AND METROLOGY	12
II	LATHE AND DRILLING MACHINES	12
	MILLING AND GRINDING MACHINES	11
IV	ELECTRICITY AND ELECTRICAL DISTRIBUTION SYSTEM	11
V	ELECTRICAL TRANSMISSIONS	11
	Test & Model Exam	7
	TOTAL	64

#### RATIONALE:

The subject allows the students to gain knowledge in understanding the various mechanical properties of materials, Lathe, drilling, milling and grinding machines, Electrical Distribution systems and Electrical Transmissions.

#### **OBJECTIVES:**

On completion of this subject, the students can able to understand the following concepts:

- Various Mechanical properties of the materials and types of stresses.
- Understand the measuring techniques.
- Understand the construction and working of lathe, Lathe, drilling, milling and grinding machines.
- Importance of Electrical Distribution system.
- Importance of Electrical Emergency systems.
- Importance of Electric motor and it's working principle.
- Importance of D.C.Generator and it's working principle.

## **DETAILEDSYLLABUS**

#### **Contents: Theory**

Unit	Name of the Topic	Hours
	STRENGTH OF MATERIALS AND METROLOGY	
	Simple stresses and strains - types of stresses - tensile and compressive stresses - Elasticity - Elastic limit - Hook's law - Modulus of elasticity, Linear and lateral strains - Poisson's ratio - Factor of safety - volumetric strain - bulk modulus - shear stresses - shear modulus - Young's modulus	
I		12 Hrs
	Precision linear measuring instruments - Vernier caliper – Vernier Height gauge, External Micrometers-Internal micrometers- Depth micrometers. Precision Angular measuring instruments Bevel protractor, Sine bar, Sprit level. Gauges-Feeler gauges-Limit gauges- Plug gauges-Ring gauges-Snap gauges, Slip gauges, Comparators – Types of comparators - Mechanical comparators - dial gauges only. Surface plate and its accessories.	

11	LATHE AND DRILLING MACHINES Lathe: Types of lathes –Principle parts-Head stock – Back geared type – All geared type – Tumbler gear mechanism – Apron mechanism – Carriage cross slide – Automatic, Longitudinal and Cross feed mechanism – Tail stock and its function, Work holding devices - Face plate -3 jaw chuck - 4 jaw chuck - Catch plate and carrier – Types of centers. Machining operations done on lathe, Lathe attachment – Tool post grinder – Milling attachment, Methods of taper turning, Thread cutting, Cutting speed - Feed - Depth of cut . Drilling Types of drilling machines - Bench type – Floor type - Pillar drilling machine -Radial drilling machine – Gang drilling machine –Multi spindle type. Specifications, Drilling tools-Flat drill-Twist drill- Nomenclature of twist drill, Methods of holding drill bits - Drill chucks - Socket and sleeve, Drilling operations–drilling - reaming - counter sinking - counter boring - spot facing – tapping, Cutting speed and Feed.	12Hrs
III	MILLING AND GRINDING MACHINES Milling Types of milling machines, Column and knee type- plain milling machine-Universal milling machine and Vertical milling machine. Specification of milling machines, Principles of operation, Work holding devices, Tool holding devices-Standard Arbor – Stub arbor-Adapter, Spring collet, Milling cutters –Plain- slab- slitting saw- side-Angle- End- Tslot, wood - ruff key, Fly cutter and Form milling cutters. Nomenclature of plain milling cutter. Milling process - Conventional milling and climb milling, Milling operations- straddle and gang milling – Vertical milling attachment. Grinding: Classification of Grinding machines, Specifications, Rough grinders – Floor stand grinders- Bench grinders- Portable grinder – Belt grinders- Precision grinders – Cylindrical grinder - Plain and universal grinder - Center less grinder, Internal grinder-Chucking type- Planetary type-Centreless type, Surface grinder- Reciprocating table with horizontal spindle- Rotary table with horizontal spindle- Reciprocating table with vertical spindle- Rotary table with vertical spindle. Grinding wheels	11Hrs
IV	<b>ELECTRICITY AND ELECTRICAL DISTRIBUTION SYSTEM.</b> Definition the following terms: Electricity- Voltage- Voltmeter- Ampere- Ammeter-watts- wattmeter- Ohms. Statement of Ohm's Law- simple problems in Ohm's Law. Grounding and the purpose of grounding the motors and equipments. Types of current- AC Current & DC current- comparison of AC & DC current. Electrical Distribution systems: Transformers- Motor Control Centers (MCC) - Fuses- Circuit breakers- Switch. (Functions of the above with brief description).	11

	ELECTRICAL TRANSMISSIONS	
V	Electric motor- purpose of electric motor- D.C motor- principle and characteristics of D.C Motor- Synchronous motor and Induction motor-construction and working principle of D.C electric motor. Electric motors and maintenance: Starting the motor, motor vibration, temperature and lubrication, cleaning and ventilation & overload motors. D.C Generator- Principle, construction and working of D.C Generator.	11

## **Reference Books:**

- Theory of Mechanics by R.SKhurmi- EurasiaPublishingHouse. Mechanical Technology by R.S.Khurmi S.Chand and Co., 1988 1.
- 2.
- Workshop Technology Vol I & Vol II HajraChoudhury 3.
- Production Technology O.P. Khanna 4.
- AtextbookofElectricaltechnologyVol.1andVol.2byB.L.Theraja,S.Chandpublishers. 5.

## TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI-11

## N - 20 SCHEME

## DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

## (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: POLYMER SCIENCE
Semester	: III Semester
Subject Code	: 4974330
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

## **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours Hours / / Semester	Marks				
		Internal Assessment	End Semester	Total	Duration	
	Week			Examination		
POLYMER SCIENCE	4 Hrs	64 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

## **Topics and Allocation of Hours**

Unit	Topics	Hours
I	CHEMISTRY OF POLYMERISATION	12
	COPOLYMERISATION AND POLYMERISATION TECHNIQUES	12
	POLYMER MOLECULAR WEIGHTS & POLYMER SOLUTIONS	11
IV	STRUCTURE OF POLYMER, POLYMER CRYSTALLISATION & GLASS TRANSITION TEMPERATURE	11
V	POLYMER REACTIONS AND RHEOLOGY	11
	Test & Model Exam	7
	TOTAL	64

## RATIONALE:

It gives the student the knowledge of basic polymerization chemistry and their significance in polymer industries. With this information student can understand the structure of polymers and their effect on properties.

## **OBJECTIVE:**

On completion of the units of syllabus contents the students will be able

- To understand the basic terminologies in Polymer chemistry.
- To appreciate the kinetics behind each polymerisation reactions.
- To understand the various polymerization techniques.
- To identify the factors influencing glass transition temperature
- To understand the theory behind polymer crystallization.
- To identify the types of degradation and polymer reactions.

## POLYMER SCIENCE

#### **Content: Theory**

Unit	Name of the Topic	Hours
	CHEMISTRYOFPOLYMERISATION	
	Evolution of polymers - Definition of Monomer, Polymer , Polymerisation	
	and Degree of polymerisation - Newtonian vs Non Newtonian fluid -	
	Classification of polymers - Based on Chemical microstructure -	
	Basedongeometricalmicrostructure-	
	ChainpolymerisationvsSteppolymerisation-	12 Hrs
I	ChainPolymerisation:FreeRadicalpolymerisation-Initiation - Propagation -	
	Termination by disproportionation and chaintransfer-Inhibitors-	
	Ionicpolymerisation:Cationicpolymerisation-Anionicpolymerisation-	
	CoordinationpolymerizationwithZiegler-Natta	
	as catalyst - Step polymerisation: Polycondensation polymerisation	
	-Polyaddition polymerisation -Ringopening polymerization	

	POLYMERISATIONTECHNIQUESANDKINETICS	
	Polymerisation techniques:Bulk polymerisation-Solution polymerisation	
	-Suspensionpolymerisation-Emulsionpolymerisation-	
	MeltPolycondensation-SolutionPolycondensation-	40 Uro
П	InterfacialPolycondensation - Kinetics of polymerisation (Initiation,	12 Hrs
	Propagation andtermination):Freeradicalpolymerisation-	
	Cationicpolymerisation-	
	Anionic polymerisation-Polycondensationpolymerisation with non-	
	catalyzed andacidcatalyzed.	
	POLYMERMOLECULARWEIGHTS&ITSDETERMINATION	
	Polymer molecular weight concept: Number average concept - Weight	
	average concept -Polydispersity and molecular weight distribution in	
	polymers - Molecular weight determination : Cryoscopy - Ebulliometry -	44 Што
111	Osmometry: Membrane and Vapour pressure osmometry -	TTHIS
	Viscometry:OstwaldandUbbelohdeViscometry-Endgroupanalysis-	
	Ultracentrifugation-SedimentationVelocitymethod-Lightscattering	
	method-Polymerfractionation:GelpermeationChromatography.	
	POLYMERSOLUTION, POLYMERCRYSTALLISATION&GLASSTRAN	
	SITIONTEMPERATURE	
	<b>SITIONTEMPERATURE</b> Polymersolutions:The process of polymer dissolution-Effect of molecular	
	<b>SITIONTEMPERATURE</b> Polymersolutions:The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization:Amorphouspolymer vs	
IV	SITIONTEMPERATURE Polymersolutions:The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization:Amorphouspolymer vs Crystalline polymers - Degree of crystallinity - Crystallinity vs	11 Hrs
IV	SITIONTEMPERATURE Polymersolutions:The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization:Amorphouspolymer vs Crystalline polymers - Degree of crystallinity - Crystallinity vs Crystallisability - Crystal vs Crystallites - Effect of crystallinity on the	11 Hrs
IV	SITIONTEMPERATURE Polymersolutions: The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization: Amorphouspolymer vs Crystalline polymers - Degree of crystallinity - Crystallinity vs Crystallisability - Crystal vs Crystallites - Effect of crystallinity on the properties of polymers - Glass transition temperature: Definition of Tg -	11 Hrs
IV	SITIONTEMPERATURE Polymersolutions: The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization: Amorphouspolymer vs Crystalline polymers - Degree of crystallinity - Crystallinity vs Crystallisability - Crystal vs Crystallites - Effect of crystallinity on the properties of polymers - Glass transition temperature: Definition of Tg - factors influencing the glass transition temperature-Determination of	11 Hrs
IV	SITIONTEMPERATURE Polymersolutions: The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization: Amorphouspolymer vs Crystalline polymers - Degree of crystallinity - Crystallinity vs Crystallisability - Crystal vs Crystallites - Effect of crystallinity on the properties of polymers - Glass transition temperature: Definition of Tg - factors influencing the glass transition temperature-Determination of Glass transition temperature-Dilatometer method	11 Hrs
IV	SITIONTEMPERATURE Polymersolutions: The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization: Amorphouspolymer vs Crystalline polymers - Degree of crystallinity - Crystallinity vs Crystallisability - Crystal vs Crystallites - Effect of crystallinity on the properties of polymers - Glass transition temperature: Definition of Tg - factors influencing the glass transition temperature-Determination of Glass transition temperature-Dilatometer method POLYMERDEGRADATIONANDREACTIONS	11 Hrs
IV	SITIONTEMPERATURE Polymersolutions: The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization: Amorphouspolymer vs Crystalline polymers - Degree of crystallinity - Crystallinity vs Crystallisability - Crystal vs Crystallites - Effect of crystallinity on the properties of polymers - Glass transition temperature: Definition of Tg - factors influencing the glass transition temperature-Determination of Glass transition temperature-Dilatometer method POLYMERDEGRADATIONANDREACTIONS Polymerdegradation: Types of degradation- Thermal degradation,	11 Hrs
IV	SITIONTEMPERATURE Polymersolutions:The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization:Amorphouspolymer vs Crystalline polymers - Degree of crystallinity - Crystallinity vs Crystallisability - Crystal vs Crystallites - Effect of crystallinity on the properties of polymers - Glass transition temperature: Definition of Tg - factors influencing the glass transition temperature-Determination of Glass transition temperature-Dilatometer method POLYMERDEGRADATIONANDREACTIONS Polymerdegradation:Types of degradation- Thermal degradation, Mechanical degradation, Photo degradation, Oxidative degradation and	11 Hrs
IV	SITIONTEMPERATURE Polymersolutions: The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization: Amorphouspolymer vs Crystalline polymers - Degree of crystallinity - Crystallinity vs Crystallisability - Crystal vs Crystallites - Effect of crystallinity on the properties of polymers - Glass transition temperature: Definition of Tg - factors influencing the glass transition temperature-Determination of Glass transition temperature-Dilatometer method POLYMERDEGRADATIONANDREACTIONS Polymerdegradation: Types of degradation- Thermal degradation, Mechanical degradation, Photo degradation, Oxidative degradation and Hydrolytic degradation. Polymer reaction: Hydrolysis - Acidolysis -	11 Hrs 11 Hrs
IV	SITIONTEMPERATURE Polymersolutions: The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization: Amorphouspolymer vs Crystalline polymers - Degree of crystallinity - Crystallinity vs Crystallisability - Crystal vs Crystallites - Effect of crystallinity on the properties of polymers - Glass transition temperature: Definition of Tg - factors influencing the glass transition temperature-Determination of Glass transition temperature-Dilatometer method POLYMERDEGRADATIONANDREACTIONS Polymerdegradation: Types of degradation- Thermal degradation, Mechanical degradation, Photo degradation, Oxidative degradation and Hydrolytic degradation. Polymer reaction: Hydrolysis - Acidolysis - Aminolysis_ Hydrogenation -CrossLinkingreactions(Vulcanisationof	11 Hrs 11 Hrs
IV	SITIONTEMPERATURE Polymersolutions:The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization:Amorphouspolymer vs Crystalline polymers - Degree of crystallinity - Crystallinity vs Crystallisability - Crystal vs Crystallites - Effect of crystallinity on the properties of polymers - Glass transition temperature: Definition of Tg - factors influencing the glass transition temperature-Determination of Glass transition temperature-Dilatometer method POLYMERDEGRADATIONANDREACTIONS Polymerdegradation:Types of degradation- Thermal degradation, Mechanical degradation, Photo degradation, Oxidative degradation and Hydrolytic degradation. Polymer reaction: Hydrolysis - Acidolysis - Aminolysis_ Hydrogenation -CrossLinkingreactions(Vulcanisationof elastomer with sulphur and with non sulphuragent and Cure reactions of	11 Hrs 11 Hrs

## TextBooks:

- V.R.Gowarikar, N.V.Viswanathan&JayadevSridhar-PolymerScience -Newageinternationalpublishers - 1986, Reprint-2011.
- 2. FredW.Billmeyer TextBookofPolymerScience-WileyInterscience-1971.

## ReferenceBooks:

- Anilkumar&S.K.Gupta -Fundamentals of Polymer Science Tata McGraw Hill Pub.Co. 1978.
- 2. Odian.G-Principlesof Polymerisation- McGraw-Hill, NewYork -1970
- Blackley& Halsted Emulsion Polymerisations: Theory and Practice -McGraw-Hill,NewYork -1975
- 4. MuruganN-FundamentalsofPolymerScience-StudyMaterial
- 5. I.HermanS.Haufman and Joseph J.Falce Introduction to Polymer Science andTechnology-WileyInterSciencePublications-1977.

## TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI-11

## N - 20 SCHEME

## DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

## (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: POLYMER ENGINEERING DRAWING PRACTICAL
Semester	: III Semester
Subject Code	: 4974340
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

## **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Inst	Instructions Examination				
Subject	Hours	Hours /		Marks		
	/ Semester Week	Internal Assessment	End Semester Examination	Total	Duration	
POLYMER ENGINEERING DRAWING PRACTICAL	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### RATIONALE:

Diploma Holders are required to read and interpret drawings. Therefore it is essential that they have competency in preparing drawings and sketches of various parts. Therefore this subject is essentially required. Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use.

#### **OBJECTIVES:**

Oncompletionoftheexperiments given in the syllabust he students will be able

- To draw the different views of a solid polymer specimen
- To depict the sectional views of parts the mould
- To draw the sectional views of assembled mould
- To draw the sectional view of polymer products

# POLYMER ENGINEERING DRAWING

## SECTIONAL VIEWS (THEORYONLY):

Need for sectioning - cutting plane - Section lines - Types of Sections - Full Section - Half Section - Removed Section - Revolved Section - Partial Section - Off set Section - Section in gofthinand large-Marking Dimensions 15hours

#### SOLIDSPECIMEN:

Top, Front and Side view of the following:

- 1. Dumb bell specimen
- 2. Compression Button specimen
- 3. Flexural Specimen
- 4. Not chedlzod Specimen
- 5. Not chedCharpy Specimen

## **MOULDPLATE:**

Full Sectional views of the following:

- 1. Top plate of single cavity tensiles lab-two plate mould
- 2. Bottom plate of single cavity tensiles lab-two plate mould
- 3. Top plate of multicavity compression button-two plate mould
- 4. Bottom plate of multicavity compression button-two plate mould

## **ASSEMBLEDPART:**

Full Sectional views of the following:

- 1. Two plate single cavity tensiles lab mould
- 2. Two plate multicavity compression button mould

## POLYMERPRODUCT:

Full Sectional views of the following:

- 1. O-Ring
- 2. V-belt
- 3. Simple Rubber Ball
- 4. Plastic medicine bottle
- 5. Plastic threaded cap

#### **REFERENCEBOOKS:**

- Engineering Drawing by P.K.Kapur and P.K.Sapra- Tata McGraw Hill 1. PublishingCompanyLimited,NewDelhi-1990.
- 2. A Text Book of Machine Drawing by **P.S.Gill**- Kataria& Son Publishing House, NewDelhi-2010.
- 3. A Text Book of Machine Drawing by N.D.Bhatt&V.M.Panchal - Charotor Publishing, Anand -2011.

#### 15 hours

15hours

15hours

20hours

4. Mould Design Data Book by CIPET.

# LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	DrawingTable	30
2.	MiniDrafter	30

## Reference:

- 1. Polymer Engineering Drawing Lab manual
- 2. Engineering Drawing and rapics K.Venuopal, 5th edition, New Age InternationalPublisher,2004.

## TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI-11

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: POLYMER SCIENCE PRACTICAL
Semester	: III Semester
Subject Code	: 4974350
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

## **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours	Hours / Semester	Marks			
	/		Internal	End Semester	Total	Duration
	Week		Assessment	Examination		
POLYMER						
SCIENCE	5 Hrs	80 Hrs	25	100*	100	3 Hrs
PRACTICAL		001110	20	150	100	01113

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **RATIONALE:**

In Diploma level engineering education, skill development plays a vital role. This can be achieved by gaining the hands on training with various equipments relevant to their field ofstudy. This is accomplished by doing polymerrelated experiments in practical classes.

#### **GUIDELINES**:

All the Ten experiments given in the list of experiments should be completed and given for the end semester practical examination. In order to develop best skills in handling Instruments/Equipment and taking reading in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory. The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitted a batch of 30 students during Autonomous Examinations.

## **OBJECTIVES:**

Oncompletionoftheexperiments given in the syllabust he students will be able

- To prepare the polymer solution
- To determine the molecular weight of PVC using K value
- To find the molecular weight of Polyester resin using hydroxyl value
- To prepare the polymers using various polymerization techniques

## **POLYMER SCIENCE PRACTICAL**

## LISTOFEXPERIMENTS

#### Determination of the following properties: -

- 1. Specific gravity using pychnometer
- 2. Specific gravity using an Instrumental method
- 3. Density
- 4. Swelling characteristics
- 5. Ash content.
- 6. Acid Value
- 7. Melting point
- 8. Gel time
- 9. Viscosity average molecular weight of polymers
- 10. Shrinkage of polymers
- 11. Moisture content of polymers.

# LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	Name of Equipment/Instrument	Quantity
1.	Hot air oven	1
2.	Electronic weighing balance	1
3.	Burette	5
4.	Ostwald Viscometer	5
5.	Magnetic Stirrer	5
6.	Conical flask	5
7.	Heating Mantle	5
8.	Round bottom flask	5
9	Liebig condenser	5
10.	Water bath	1

## Reference:

- 1. Experimental Polymer science by V.R.Gowrikaret.al.,
- 2. Polymer science Lab Manual by CIPET
#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: GENERAL ENGINEERING PRACTICAL
Semester	: III Semester
Subject Code	: 4070360
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

# **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours	Hours /		Marks		
	/	Somostor	Internal	End	Total	Duration
	, Wook	Concolor	Assessment	Semester		
	week			Examination		
GENERAL						
ENGINEERING	4.11=0	C 4 Uro	25	400*	100	2 1 1 1 1 1
PRACTICAL		04 MrS	20	100	100	J J ⊓rS

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

# **RATIONALE:**

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments, which are used to identify the strength of material, identify the parts of valves, and in handling electrical machineries and instruments. These will help to handle various equipments in process industries for a chemical engineer.

# **LISTOFEXPERIMENTS**

#### LATHE SHOP:

- 1. Plain Turning
- 2. Step Turning
- 3. Tapper Turning
- 4. Knurling

#### **SPECIAL MACHINES:**

- 1. Milling
- 2. Drilling (radial only)

#### EEE :

- 1. Determination of Unknown Resistance by ohms law.
- 2. Energy measurement in a single phase circuit using Lamp load.
- 3. Load test on a single phase transformer.
- 4. Verification of Series and parallel circuit.

# LIST OF EQUIPMENTS

- 1. Lathe
- 2. Drilling Machine
- 3. Milling Machine
- 4. Rheostat of various range
- 5. Ammeters(MC and MI)of various ranges
- 6. Voltmeters(MC and MI)of various ranges
- 7. Wattmeter-300v/5A-2.5A/UPF
- 8. Energymeter-300v/5A

### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 - 2022 onwards)

Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY
Subject Code	: 4974370
Semester	: III Semester
Subject Title	: COMPUTER AIDED DESIGN PRACTICAL

# **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Inst	ructions		Examination		
Subject	Hours	Hours /		Marks		
	/	Compostor	Internal	End	Total	Duration
	/	Semester	Assessment	Semester		
	Week			Examination		
COMPUTER						
AIDED DESIGN			05	400*	400	
PRACTICAL	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks **RATIONALE:** 

In Diploma level engineering education, design skills development plays a vital role. These can be achieved by using drawing software. This is accomplished by sketching Polymer related parts using Auto CAD.

# **Objectives:**

On completion of the experiments given in the syllabus the students will be able

✤ To use the tools and commands of AutoCAD software to draw the various views of a part.

- To mark the dimensions of the drawing
- To draw the sectional views of the polymer specimen
- To draw the sectional views of the two plate polymer specimen mould

# **COMPUTER AIDED DESIGN PRACTICAL**

#### LIST OF EXPERIMENTS

#### (80Hours)

Introduction - Applications - Advantages over manual drafting - Software requirements - windows desktop - AutoCAD screen interface - menus - toolbars - How to start AutoCAD - commandgroups-Howtoexecutecommand-typesofcoordinatesystems-absolute-relative-polar. Creating objects (2D) - using draw commands - Line, Arc, Circle, Ellipse, Donut, Polygon, Point, Pline, sketch, Trace- creating2Dsolid.

Creating Text- dtext, mtext,textstyle- Mline, Spline - Drawing with precision - Osnapoptions - drafting setting- Limits - Units-drawing aids- Fill, Snap, Grid, Ortho lines- Function keys. Editing and Modify commands - object selection methods - erasing object -oops- canceling and undoing a command - copy - move - array -offset - scale - rotate - mirror - break- trim - extend -explode.

Divide - measure - stretch - lengthen - changing properties - color -Line types -Ltscale-Matching properties-editing with grips-Pedit -ddedit-mledit.

Controlling the drawing display - blipmode -view group commands- zoom redraw, regen, regen auto, pan, viewers-real time zoom. Creation of blocks - Wblock- inserting a block - block attributes- hatching -pattern types-boundary hatch-working with layers. Basic dimensioning - editing dimensions - dimension styles - dimensioning system variables. Isometric Drawing - Isometric projection - Drawing Isocircles - Dimensioning Isometric objects. File commands -file import and export-plotting drawing - external references - 3Dfundamentals-2D to3D conversion.

S.No.	Topics	Hrs
1.	Introduction	4
2.	Draw Group commands, Osnap options, Drafting setting and Functionkeys	2
3.	CommandsPractice	2
4.	Edit and Modify Group commands, Pledit, Text edit	2
5.	Commands Practice	2
6.	Viewgroups, Inquiry, Block commands	2
7.	Commands Practice	2
8.	Hatching, Layer, colorand line types	2
9.	Commands Practice	2
10.	Creating Isometric Drawing	2
11.	Isometric Drawing Ex. Practice	2
12.	File commands, Plotting, External reference	2
13.	3DFundamentals	4

	Simple Mould Drawings(in2Donly)-	
	i. Dumb bell specimen	
14.	ii. Compression button	25
	iii. Not chedlzod specimen	
	iv. Not chedCharpy specimen	
	Simple Mould Drawings(in2Donly)-	
15.	ii. Two platesing lecavityTensiles lab mould	25
	iii. Two plate multicavity compression button mould	

#### LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED ABATCHOF 30STUDENTS):

(FOR

S.No.	Name of Equipment/Instrument	Quantity
1.	Computers with atleast P4 Configuration	30
2.	AutoCAD 2007 & above software	1

*Note:* Software lower than version AutoCAD2007should not be used.

### Reference:

1. Computer Aided Design Lab manual.



#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: RUBBER MATERIALS
Semester	: IV Semester
Subject Code	: 4974410
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

## **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours Hours /	Marks				
Veek	Semester	Internal Assessment	End Semester Examination	Total	Duration	
RUBBER MATERIALS	4 Hrs	64 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
I	NATURAL RUBBER	12
II	SYNTHETIC RUBBERS-GENERAL PURPOSE	12
	SYNTHETIC RUBBERS -SPECIAL PURPOSE	11
IV	SYNTHETIC RUBBERS-HIGH PERFOMANCE	11
V	RUBBER COMPOUNDING MATERIALS & SPECIAL ADDITIVES	11
	Test & Model Exam	7
	TOTAL	64

#### **RATIONALE:**

This subject gives the knowledge of various instruments used to measure various processesparameters. This course will impart knowledge on working principle, construction, repair, and use of these instruments. The diploma holder should be in a position to deal with all these kinds of equipment's in the polymerind ustry.

### **OBJECTIVE:**

On completion of the units of syllabus contents the students will be able,

- Principles of tapping of latex from rubber trees,
- Preservation and concentration methods
- Production of dry rubbers their grading
- Various types of NR and their importance
- Classification of synthetic rubbers
- Preparation, properties, applications and vulcanization of various general purpose synthetic rubbers like IR, SBR, BR& EPDM.
- Preparation, properties, applications and vulcanization of various special purpose synthetic rubbers like IIR, XIIR, NBR, CR
- Preparation, properties, applications and vulcanization of various general purpose synthetic rubbers like Q,CM,CSM&FKM
- Concepts of polymer blends their advantages and applications
- Various compounding ingredients
- Specialty additives
- Classification of fibers –their characteristics

# **RUBBER MATERIALS**

#### **Contents:Theory** Unit Nameofthe Topic Hours NATURAL RUBBER Latex: Tapping of latex from rubber trees-Preservation-Concentration methods-Centrifuging-creaming-evaporation-electrodecondesationgrading Dry Rubber: Production of Ribbed smoked sheet, Pale crepe, Brown L 12 Hrs crepe and Crumb rubbers-composition-properties-Grading: Visual grading, SMR grades, Technically Specified rubber, Technically classified rubbers-oil extended natural rubber-Deprotonised NR-Epoxidised NR-Thermoplastic NR-vulcanization of NR. Reclaimed rubber: Reclaiming process- scrap rubber- Digester process process - reclaimator process - Dynamic –Heater (or) Pan devulcanization – advantages and disadvantages. SYNTHETIC RUBBERS-GENERAL PURPOSE Classification of synthetic rubber according to their used and properties. Polyisoprene-structure-manufacture-properties-applicationsvulcanization 12 Hrs Ш Styrene Butadiene rubber-raw materials-manufacture of emulsion SBR-Solution SBR-properties-applications-commercial grades- vulcanization Ethylene Propylene rubber –polymer structure-EPDMmanufacture-properties-application-vulcanization

	SYNTHETIC RUBBERS – SPECIAL PURPOSE	
111	Butyl and Halo Butyl Rubbers: Structure – manufacture - properties – vulcanization - applications of Butyl and Halo Butyl rubber	11 Hrs
	Nitrile rubber: structure- manufacture - properties- vulcanization - applications - vulcanization Neoprene: structure- manufacture- properties- vulcanization – applications- vulcanization Polyurethane rubber: Di-isocyanates used-principle of casting poly urethane – one step and two step casting –form polyurethanes – thermoplastic polyurethane rubber-structure-properties-applications. Polysulfide rubber: structure-types-properties-grades. Ethylene vinyl acetate: structure-manufacture-properties-applications.	
	SYNTHETIC RUBBERS-HIGH PERFOMANCE	
	Silicone rubbers: structure- Manufacture -properties- vulcanization – applications- commercial grade.	
IV	Epichloro Hydrin: Properties-applications- vulcanization-commercial grade	
	Chlorosulphonated(HYPALON) and Chlorinated Polyethylene: Structure-properties-commercial grades and applications- vulcanization Fluorocarbonelastomers: Commercial types-properties-application- vulcanization	11 Hrs
	RUBBER COMPOUNDING MATERIALS & SPECIAL ADDITIVES	
	Compounding Ingredients and their functions:	
V	Vulcanizing agents-activators-accelerators: Types-antioxidants and antiozonants – retarders - softeners- plasticizers-peptizing agents- fillers: classification – reinforcing, semi reinforcing and non-reinforcing fillers - black and non-black fillers – Carbon black grades - Classification of Non-black fillers – effects of non-black fillers on properties of rubber vulcanisate-Textiles for reinforcements: Classification of fibers-their characteristics	11 Hrs

### TEXTBOOKS:

- 1. Mauric Moton Rubber Technology Robert Krieger Publishing Co.- 1973.
- 2. I Franta, Elastomers and Rubber compounding materials –Elsevier -1989

3. Indian Rubber Institute Rubber Engineering - - Tata McGraw Hill Publishing Co. New Delhi 1998

#### **Reference Books:**

- 1. C.M.Blow Rubber Technology and Manufacture Butterworths Publication 1971.
- 2. G.Alliger Vulcanization of Elastomers Reinhold Publishing co. 1965.
- 3. Harry Baron Modern Synthetic Rubbers.

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 - 2022 onwards)

Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY
Subject Code	: 4974420
Semester	: IV Semester
Subject Title	: PLASTIC MATERIALS

# **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Inst	ructions	Examination				
Subject	Hours	Hours / Semester	Marks				
oubject	/ Week		Internal Assessment	End Semester Examination	Total	Duration	
PLASTIC MATERIALS	4 Hrs	64 Hrs	25	100*	100	3 Hrs	

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
I	COMMODITY PLASTICS	12
II	CELLULOSE PLASTICS, FLUORO PLASTICS & SATURATED POLYESTERS	12
	THERMO PLASTIC ELASTOMERS , PLASTICS BLENDS & ALLOYS	11
IV	SPECIALITYANDHIGH PERFORMANCE PLASTICS	11
V	ENGINEERING PLASTICS	11
	Test & Model Exam	7
	TOTAL	64

#### **RATIONALE:**

It gives the student the knowledge of basic properties and applications of commodity and engineering plastics and rubbers and their significance in polymerind us tries. With this information student can select a suitable polymer to manufacture the required products.

#### **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able,

- To differentiate the plastic materials based on their properties
- To select a suitable plastic material for a particular application
- To correlate the influence of structure on the properties of the plastic

#### **PLASTICMATERIALS**

#### **Contents:Theory**

Unit	Nameofthe Topic	Hours
I	COMMODITYPLASTICS     Plastics-Classifications-Abbreviations.     Polyethylene   Types   Method   of   Manufacturing     ofLowDensityPolyethylenebyhighpressureprocess-High   Density     Polyethylene   by Philips process - Structure - Properties and applications     Polypropylene-   Types-   Structure - Method of Manufacturing by Ziegler     Process Properties and applications.     Polystyrene:   Manufacture   of Polystyrene - Structure & Properties and applications     Sturang   capablemetre - MIDS   SAN   and   APS	12 Hrs
	properties and application	
II	Polyvinyl chloride: Structure of monomer and polymer - manufacture ofPVC-Types:flexibleandrigidPVC-propertiesandapplicationsofPVC. Polyvinyl Alcohol – Method of manufacturing – structure and properties Polymethylmethacrylate:Structureofmonomerandpolymer-Method of manufacturing- Properties(meritsanddemerits)andapplicationsofPMMA.	12 Hrs.
III	<b>CELLULOSE PLASTICS, FLUORO PLASTICS &amp; SATURATED POLYESTERS</b> Cellulose plastics: Method of Manufacturing of cellulose acetate and cellulose acetate butyrate, cellulose nitrate – their structure - properties and applications. Fluoro Plastics : PTFE – Method of manufacturing – Properties - Applications Method of Manufacturing of Polyethylene terephthalate (PET) and Poly butylene	11 Hrs

	SPECIALITYANDHIGH PERFORMANCE PLASTICS	
	Speciality plastics: Polyphenylene oxide (PPO), Polyphenylenesulphide (PPS), polysulfones (PSU), Poly ether ether ketone (PEEK), Polyamide-imides (PAI), Polyether imides (PEI) - Raw materials, structure, properties, processing behavior and applications -Liquid crystalline polymers	
IV	Phenolic resin(Novolak and Resol) – Urea Formaldehyde resins – UnsaturatedPolyesterresin – Epoxyresin	11 Hrs
	ENGINEERING PLASTICS	
v	ABS-Nylon-6–Nylon-6,6-Polycarbonate– Method of Manufacturing, Properties and applications - Acetal resins – Method of Manufacturing, structure, properties and applications	11 Hrs

# <u>TextBooks:</u>

- 1. J.A.Brydson-PlasticMaterials-7<sup>th</sup>Ed-Butterworths-Heinemann-London(1999)
- 2. D.C. Miles, J.H. Briston Polymer Technology Chemical Publishing Co.-New York(1972)
- 3. RobertV.Milby -PlasticsTechnology McGrawHill BookCo.-1973.

#### ReferenceBooks:

- 1. C.M.Blow- Rubber TechnologyandManufacture- Butterworths Publication-1971.
- 2. G.Alliger VulcanizationofElastomers-ReinholdPublishingco.1965.
- 3. HarryBaron-ModernSyntheticRubbers.
- 4. A.S.Athalye-PlasticsMaterialsHandbookVoll&II-Multi-techPublishers(2002)
- 5. Gachter / Muller- PlasticsAdditives(4thed)- HanserPublishers(1996).
- 6. W.C.Wake-FillersforPlastics-Iliffe,London(1971)
- 7. H.V.Boenig Polyolefins:Structure and Properties Elsevier(1986)
- 8. W.S.Penn PVCTechnology-Applied science, London (1991)
- 9. Murugan N-UnderstandingPlasticsmaterials- StudyMaterial.
- 10. GeoffreyPritchard-PlasticsAdditives-Chapmann&Hall(1998).
- 11. S.Schwartz&H.Goodman Plastics Material and Processes Van NostrandReinhold Co. -1982.

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: BASICS OF CHEMICAL ENGINEERING AND PROCESS MEASUREMENT
Semester	: IV Semester
Subject Code	: 4974430
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

# TEACHING AND SCHEME OF EXAMINATION

			No.	of weeks per se	emester:	16 weeks
	Instructions		Examinatio			
				n		
Subject			Marks			
•	nours	Hours /	Internal	End	Total	Duration
	1	Semester	Assessment	Semester	lotai	
	Week		/100000110111	Examinatio		
				n		
BASICS OF						
CHEMICAL						
ENGINEERING	∕l ∐re	64 Ure	25	100*	100	2 ∐re
AND PROCESS	4 115	04 115	23	100		3 11 3
MEASUREMENT						

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks **Topics and Allocation of Hours** 

Unit	Topics	Hours
Ι	HYDROSTATICS AND FLUID MECHANICS - PUMPS AND HYDRAULIC APPLIANCES	12
II	HEAT TANSFER	12
	BASIC CONCEPT OF MEASUREMENT, MEASUREMENT OF TEMPERATURE , PRESSURE AND FLOW	11
IV	FLOW AND RHEOLOGICAL MEASUREMENT	11
V	AUTOMATIC AND COMPUTERIZED PROCESS CONTROL	11
	Test & Model Exam	7
	TOTAL	64

#### **RATIONALE:**

A Chemical Engineer during his/her professional career primarily works in industries manufacturing various chemical products. It is therefore necessary to provide information to Chemical Engineering students about new materials, chemicals involved and manufacturing process of some important and frequently used chemical products.

#### **OBJECTIVES:**

On Completion of the units of Syllabus contents the students will be able,

- To explain the behavior of the fluid and its mechanics.
- To determine the flow behavior using a suitable method.
- To distinguish the various modes of heat transfer
- To appreciate the principle behind heat exchange process
- To select a suitable instrument to measure the temperature and pressure
- To distinguish the various modes of control actions

### **Basics of Chemical Engineering and Process Measurement**

#### **Contents:Theory**

Unit	Name of the Topic	Hours
	HYDROSTATICS ANDFLUIDMECHANICS - PUMPSANDHYDRAULICAPPLIANCES, VALVES	
I	Properties of fluids- density- specific weight- specific volume- specific gravity- vapour pressure. Pressure- fluid pressure - Pascal's law of Transmissibility -Atmospheric pressure-Gauge pressure-Absolute pressure.	12Hrs
	Flow of fluids- Laminar flow- Turbulent flow -Newtonian and Non- Newtonian fluids -viscosity - Kinematic viscosity - Bernoulli's Theorem Principle and Applications	
	Pumps-Principle and working of a centrifugal pump- principle of gear pumps	
	Major properties and types of hydraulic fluids - the construction and operation of hydraulic Press and hydraulic Jack	
	HEATTANSFER	
II	Conduction - Fourier's law - thermal conductivity - conduction through plane wall,Convection-natural convection-forced convection-Radiation- Kirchhoff's law-blackbody-Stefan Boltzmann law-Emissivity - grey body - heat transfer equipment- heat exchangers - 1-2 ,2- 4heatexchangersconstructiondetails& Working	11Hrs

	BASIC CONCEPT OF MEASUREMENT, MEASUREMENT OF TEMPERATURE AND PRESSURE	
III	Purpose of Instrumentation - Functional elements of Instruments – Static and Dynamic characteristics of Instruments - Signaling and Recording Instruments – Circular and Strip chart. Temperature measuring Instruments- Liquid and Gas filled Thermometer- Resistance Thermometer - Thermocouples – Optical Pyrometer.	12Hrs
	Pressure measuring Instruments - Bourdon gauge - Vacuum measurement - Ionization gauge. Electrical pressure Transducers - Strain gauge pressure Transducers	
	FLOW AND RHEOLOGICALMEASUREMENT	
IV	Flow measurement – construction, principle and working of orifice meter–venturimeter-Rotometer	11Hrs
	Rheologicalmeasurement -Working principle, Parts and functions of Parallel plate viscometer -Saybolt viscometer - Red wood viscometer - Coneandplateviscometer- MFItester.	
	AUTOMATIC AND COMPUTERIZED PROCESS CONTROL	
v	Process Variables - Block diagram, Principle and Purposes of Feedback, Feed forward control system- Pneumatic controllers with P,I,D,PI,PD and PID control actions - Final control element - Application of automatic control in (1) Batch Reactor - control of Temperature and Pressure, (2) Heat Exchanger - control of Temperature and Flow	11Hrs
	Analog and Digital computers - conversion of Analog signal to Digital& vice versa - computer supervisory control – Distributed Control System (DCS) – working principle with block diagram	

### <u>TextBooks:</u>

- 1. W.L.McCabe&J.C.Smith Unit Operations of Chemical Engg. McGraw Hill Book Co.1985.
- 2. W.L.Badger&J.T.Banchero Introduction to Chemical Engg. McGraw Hill Book Co. 1988.
- 3. R.S.Khurmi-HydraulicsandHydraulicappliances.
- 4. A Text Book of Chemical Process Instrumentation and Control by P.D.Kulkarni&D.B.Dhone, NiraliPraksham , 2017
- 5. Automatic Process Control by Donald P.Eckman, Sixth edition, Wiley Eastern Limited.,

#### **ReferenceBooks:**

- 1. RobertH.Perry- Perry'sChemicalEngg.HandBook -McGrawHillBookCo.
- 2. Process Modeling, Simulation and control for Chemical Engineers by Luyben, McGraw Hill Kogakasha Ltd.

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

#### : 2074: DIPLOMA IN POLYMER TECHNOLOGY

Subject Code

Course Name

- : 4974440
- Semester
- : IV Semester

Subject Title

#### : RUBBER MATERIALS ANALYSIS PRACTICAL

# **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Inst	ructions	Examinatio			
Subject	Hours / Week	Hours / Semester	Internal Assessment	Marks End Semester Examinatio n	Total	Duration
RUBBER MATERIALS ANALYSIS PRACTICAL	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **RATIONALE:**

In Diploma level engineering education skill development plays a vital role. These can beachievedbyexperienceinhandlingvariousequipment. This is accomplished by doing engineerin grelated experiments in practical classes.

#### **GUIDELINES**:

All the Ten experiments given in the list of experiments should be completed and given for the end semester practical examination.

 In order to develop best skills in handling Instruments/Equipment and taking reading in The practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.

The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitted a batch of 30 students during Autonomous Examinations. On completion of the units of syllabus contents the students will be able

# **RUBBER MATERIALS ANALYSIS PRACTICAL**

#### LISTOFEXPERIMENTS

- 1. Water Absorption
- 2. DBP number of carbon black
- 3. Determination of Total solids content
- 4. Determination of Dry rubber content
- 5. Determination of Mechanical stability of latex
- 6. Determination of Total alkalinity
- 7. Determination of swelling characteristics of given sample
- 8. Determination of density of given rubber sample
- 9. Determination of specific gravity of given rubber sample
- 10. Determination of ash content in given rubber sample
- 11. Determination of chemical degradation of given rubber sample

# LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR A BATCH OF30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	Working table with electrical, tap and burner facility	2
2.	Electronic weighing balance	1
3	Hot air oven	1
4	Bulk density apparatus with vibrator	1
5	Magnetic stirrer	5
6	Heating mantle	5
7	Liebig condenser	5
8	pH meter	1
9	Specific gravity bottle	10

10	Titration stand	10
11	Burette	10
12	Pipette	10
13	Conical flask	10
14	Beaker	10
15	Water bath	1

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

Subject Code : 4974450

Semester : IV Semester

Subject Title

: PLASTICS PREPARATION AND ANALYSIS PRACTICAL

## **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examinatio			
Subject	Hours / Week	Hours / Semester	Marks   Internal End Total   Assessment Examinatio n		Duration	
PLASTICS PREPARATION AND ANALYSIS PRACTICAL	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can beachievedbyexperienceinhandlingvariousequipment. This is accomplished by doing polymer pre paration related experiments in practical classes.

#### GUIDELINES:

- Alltheexperimentsgiveninthelistofexperimentsshouldbecompletedandgivenfortheends emesterpracticalexamination.
- In order to develop best skills in handling Instruments/Equipment and taking reading in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory..
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitted a batch of 30 students during Board Examinations.

#### **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able,

- To prepare various thermoplastic and thermoset polymers
- To determine the various analytical properties of polymers
- To analyses the composition of latex
- To categorize the latex based on presence of alkalinity

#### PLASTIC PREPARATION AND ANALYSIS PRACTICAL

#### LIST OF EXPERIMENTS

#### Determination of the following properties:-

- 1. Preparation of Novolakresin
- 2. Preparation of Resolresin
- 3. Preparation of Urea Formaldehyderesin
- 4. Preparation of Epoxyresin using Bisphenol-A
- 5. Preparation of Polystyrene
- 6. Specific gravity
- 7. Bulk Density of moulding powders
- 8. Filler content
- 9. Shrinkage of polymers
- 10. Moisture content

# LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR A BATCH OF30STUDENTS):

S.No.	NameofEquipment/Instrument	Qua ntity
1.	Working table with electrical, tap and burnerfacility	2
2.	Electronicweighingbalance	1
3	Hotairoven	1
4	Bulkdensityapparatuswithvibrator	1
5	Magneticstirrer	5
6	Heatingmantle	5
7	Liebigcondenser	5
8	pHmeter	1
9	Specificgravitybottle	10

10	Titrationstand	10
11	Burette	10
12	Pipette	10
13	Conicalflask	10
14	Beaker	10
15	Waterbath	1

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY
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- Subject Code
- : 4974460
- Semester : IV Semester

Subject Title

: POLYMER IDENTIFICATION PRACTICAL

## **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examinatio n			
Subject	Hours	Hours /	Marks			
	/ Semester	Internal	End Semester	Total	Duration	
	Week		Assessment	Examinatio		
POLYMER						
IDENTIFICATION PRACTICAL	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can beachievedbyexperienceinhandlingvariousequipment. This is accomplished by doing polymer pre paration related experiments in practical classes.

#### GUIDELINES:

- All the experiments given in the list of experiments should be completed and given for the end semester practical examination.
- In order to develop best skills in handling Instruments/Equipment and taking reading in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory..
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitted a batch of 30 students during Board Examinations.

#### **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able,

- To carry out the preliminary test to find to find the type of polymer
- To identify the given polymer accurately using elemental analysis method
- To differentiate the properties of the polymer
- To classify the given polymer by chemical method

# POLYMER IDENTIFICATION PRACTICAL

#### **Preliminary tests:**

- 1. Preliminary Identification of polymers(Any3Plastics)
- 2. Preliminary Identification of polymers(Any3Rubbers)

# **Element all Identification and Confirmatory test:**

- 1. Identification of polymers containing no elements(any1Rubber)
- 2. Identification of polymers containing no elements(any1Plastics)
- 3. Identification of Halogen containing polymer (any1Rubber)
- 4. Identification of Halogen containing polymer (any1Plastics)
- 5. Identification of Nitrogen containing polymer (any1Rubber)
- 6. Identification of Nitrogen containing polymer(any1Plastics)
- 7. Identification of Sulphur containing polymer(any1Rubber)
- 8. Identification of polymers blend containing one or more element(any1polymer)

# LISTOFEQUIPMENTS/INSTRUMENTS, MATERIAL, MANUALSREQUIRED (FOR ABATCHOF30STUDENTS):

S.No.	Name of Equipment/Instrument	Quantity
1.	Polymer preparation table electrical, tap and burner facility	2
2.	Electronic weighing balance	1
3.	Water bath	1

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: CHEMICAL ENGINEERING AND PROCESS MEASUR PRACTICAL
Semester	: IV Semester
Subject Code	: 4974470
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

# TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

EMENT

	Instructions		Examinatio n			
Subject	Hours Hours /	Hours /	Marks			
		Internal	End	Total	Duration	
	,	Comester	Assessment	Semester		
	Week			Examinatio n		
CHEMICAL						
ENGINEERING						
AND PROCESS	5 Ure	Ω0 ∐re	25	100*	100	2 ∐re
MEASUREMENT	51115	001113	23	100	100	51115
PRACTICAL						

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipment. This is accomplished by doing engineering related experiments in practical classes.

#### **GUIDELINES**:

All the Ten experiments given in the list of experiments should be completed and given for the end semester practical examination.

In order to develop best skills in handling Instruments/Equipment and taking reading in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.

The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitted a batch of 30 students during Autonomous Examinations.

#### **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able,

- To determine the flow rate of the material using Orifice meter, Venturimeter and Rotameter
- To find out the pump efficiency of the Centrifugal pump
- To estimate the temperature using thermocouple and RTD module
- To determine the characteristics of control valve
- To study about different modes of action of Controllers using SCADA

#### BASICS OF CHEMICALENGINEERING AND PROCESS

## MEASUREMENT CONTROL PRACTICAL LISTOFEXPERIMENTS

- 1. Study and operation on Orifice meter
- 2. Study and operation on Venturi meter
- 3. Study and operation on Rotameter
- 4. Study and operation on Centrifugal pump
- 5. Characteristics of Temperature sensor using Thermocouple module
- 6.Characteristics of Temperature sensor using RTD module
- 7. Study of ON- OFF controller using Temperature controller Trainer kit by monitoring the Process in SCADA mode
- 8. Study of ON- OFF controller using Level controller Trainer kit by monitoring the process In SCADA mode
- Study of P, PI control using PID controller Trainer Kit by monitoring the process in SCADA mode
- 10. Study of PID control using PID controller Trainer Kit by monitoring the process in SCADA mode

11.Study of valve flow coefficients and inherent Characteristics of Linear, Equal % and quick opening

#### LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED A BATCH OF 30 STUDENTS):

(FOR

S.No.	NameofEquipment/Instrument	Quanti ty
1.	Orificemeter	1
2.	Venturimeter	1
3.	Rotameter	1
4.	Centrifugalpump	1
5.	Temperature sensors like Thermocouple, RTD	1
6.	Pneumatic Control Valve (Linear, Equal %and Quick opening)setup	1
7.	Temperature Control Trainer kit with SCADA	1
8.	Liquid Level Control Trainer kit with SCADA	1
9.	Pressure Control Trainer kit with SCADA	1

#### **REFERENCE BOOKS:**

- 1. Chemical Engineering Manual by W.L.McCabe & J.C.Smith
- 2. Chemical Engineering Manual by W.L.Badger & J.T.Banchero



#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

## (Implemented from the Academic Year 2021 - 2022 onwards)

Course	Name
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- : 2074: DIPLOMA IN POLYMER TECHNOLOGY
- Subject Code
- : V Semester

: 4974510

Subject Title

Semester

: RUBBER COMPOUNDING AND PRODUCT MANUFACTURING

# **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject Hours	Hours	Hours /		Marks		
	Semester	Internal	End	Total	Duration	
	, Wook	Cemester	Assessment	Semester		
	WEEK			Examinatio n		
RUBBER						
COMPOUNDING						
AND PRODUCT	4 Hrs	64 Hrs	25	100*	100	3 Hrs
MANUFACTURING						

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
I	TYRES AND TUBES	12
II	COATED FABRICS, BELTS AND CABLES	12
III	HOSE AND FOOT WEAR	11
IV	MOLDED PRODUCTS AND METAL BONDED COMPONENTS	11
V	LATEX PRODUCTS AND ADHESIVES	11
	Test & Model Exam	7
	TOTAL	64

#### RATIONALE:

Rubber products are made from various formulations by any one of the processing methods. It is, therefore, highly necessary to have good understanding about the principles of processing and also different problems encountered during processing and to rectify thesame to get good products. This subject enables the students to apply the understanding of various rubber processing techniques used in rubber industries.

### **OBJECTIVES:**

Onc ompletion of the units of syllabus contents the students will be able to:

- Identify the type of tyre based on its function and component
- Formulate the compound required for tyre building
- Classify the type of belt based on construction and function
- Preparethecompoundtomanufacturevariousbelts
- Differentiatethetypeofhosebasedonconstruction and function
- Selectthesuitableprocessing equipment to manufactureaparticularproduct
- Formulatethecompoundrequiredforfootwearmanufacture
- Designtheformulation fvarious latexproducts

#### \*

# **RUBBER COMPOUNDING AND PRODUCT MANUFACTURE**

#### Contents: Theory

Unit	Name of the Topic	Hours
Unit	Name of the Topic     TYRESANDTUBES     Tyres: Definition - Types - Specification of a tyre - Function of a tyre, abbreviationused intyre specification.     Conventional(Pneumatic)Tyres: Tubed and Tubeless tyres-bias, belted bias and radial tyres - components - formulations - manufacture of pneumatic tyres - tyre building - molding and vulcanization: press curing, bag-o-	Hours 12 Hrs
	maticcuring, autoclavecuring- aftertreatment. SolidTyres:Formulation(highhardness,lowheatbuildup),manufacturing, application- Tubes:AutomotiveandBi-cycletubes-formulations-manufacture.	

	COATEDFABRICS, BELTSANDCABLES	
	Coated fabrics: Formulations - manufacturing of coated fabrics -	
	applications of coated fabrics.	
	Belts:Types:Conveyorbelting,Transmissionbelting,	
II	Conveyorbelting-components,formulation,building,vulcanization-	12 Hrs
	Transmissionbelting: manufacturing, vulcanization.	
	V-belts:types-components,formulations,manufacture,vulcanization.	
	Cables: Types: Components, Insulation, jackets - their formulations -	
	manufacturingofcables.	
	HOSEANDFOOTWEAR	
	Hose: Components: tube, reinforcement, cover - formulation of	
	compoundsfor hose - types - long length moulded hose, machine made,	
	handmadeand circular woven (BRIDED) hoses - Radiator hose- oil hose -	
III	Petrol hose <b>Rubberfootwear</b> : component of a foot wear - hot air	11 Hrs
	vulcanized-compression moulded, direct moulding process for shoe	
	bottoming; microcellular rubber soled foot wear, solid rubber soled foot	
	wear, injectionmolded sole and heel units, safety foot wear, conductive	
	ofantistaticfootwear.	
	MOLDEDPRODUCTSANDMETALBONDEDCOMPONENTS	
	<b>MouldedProducts:</b> Formulations and manufacture of Diaphragms,	
	oilseals, Bellows, O-rings, play balls: Tennis - formulation, manufacturing -	
	hardrubber:formulation,manufacture,propertiesandapplications.	
IV	Rubbertometalbondedcomponents:Bondingmethods-Metalcleaning-	11 Hrs
	surfacepreparationCompoundspreparationforbonding,application of	
	bonding medium, molding - Rubber rollers: formulation	
	forgeneralpurpose,textileroll,papermillrollandhardrubberroll-curing,	
	applicationsofrubberrolls.	

	LATEXPRODUCTSANDADHESIVES	
	Latexproducts: Preparationoflatex dispersion and emulsion	
	Dipped goods: formulation, compounding, manufacturing of Toy	
	balloons,gloves (industrial and surgical) and contraceptives - Threads-	
v	formulationscompounding-outline of themanufacturingmethods	44 11-0
	Latex foam: - Formulation, compounding Manufacture of latex foam	11 Hrs
	andpillows, mattresses and automotive seats Talalay process and	
	Dunlopprocess	
	Adhesives: Formulation of NR adhesives, latex adhesives, tyre	
	cordadhesives,	
		1 I

#### TextBooks:

- 1. Rubber Tech., and Manufacture by C.M.Blow-Plastic and Rubber InstituteButterWorths-1982
- 2. PlasticsMaterials andProduct TestingVol.I&IICIPET,Chennai
- 3. Rubber Engineering Indian Rubber Institute Tata McGraw Hill Publishing Co. Ltd. -NewDelhi -1998

### ReferenceBooks:

- 1. PlasticsbyJJ.HarryDuboisandFrederickW.John-VanNostrandReinholdCo.
- 2. PlasticsTechnologyby RobertV.Milby-McGrawHillBookCo.-1973
- 3. TechnologyofRubberProductsbyG.P.Mayurya-S.B.P.Publication
- 4. Complete Manufacturing Details and Know-how on Tyres Tubes Hoses and Belts by R.S. Gupta -SIRIPublications.
- 5. Hand Book of Rubber and Rubber Goods Industries by K.E.Dhingra SIRIPublications.

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Code : 4974520

Semester : V Semester

Subject Title

: PLASTICS PROCESSING

## **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours / Week	Hours / Semester	Marks			
Cusjeer			Internal Assessment	End Semester Examinatio n	Total	Duration
PLASTICS PROCESSING	4 Hrs	64 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
I	COMPRESSION AND TRANSFER MOULDING	12
П	INJECTION MOULDING	12
	EXTRUSION AND FOAMS	11
IV	BLOW MOULDING AND THERMO FORMING	11
V	ROTATIONAL MOULDING, CALENDERING AND JOINING OFPLASTICS	11
	Test & Model Exam	7
	TOTAL	64

# **RATIONALE:**

Raw polymeric materials are converted into products by any one of the processing methods. It is, therefore, extremely necessary to have good understanding about the principles of processing and also different problems encountered during processing and to rectify the same to get good products in the processes. This subject enables the students to apply the understanding of various processing techniques used in almost all polymer industries

# **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able to:

- Select a suitable processing method to manufacture a plastics product as per the requirement
- \* Differentiate one process from the other
- \* Identify the various components of the plastics processing machinery
- \* Define the function of various components of the plastics processing machinery
- \* Define the principle behind each plastics processing method
- \* Choose a suitable method to join the various plastics parts

# PLASTIC PROCESSING

Unit	Nameofthe Topic	Hours
I	<b>COMPRESSION,ANDTRANSFERMOULDING</b> Introduction to compression moulding process - types of compressionpress-mouldingcycle-bulkfactor- effectofpreheatingandperforming -troubleshooting. Basic principle of transfer moulding process - types of transfer mouldingprocess - pot and plunger types - moulding cycle - limitations of transfermouldingprocess- comparisonofcompressionmouldingprocessversustransfermouldingproce	12 Hrs
	SS.	
I	<b>INJECTIONMOULDING</b> Basic principles of injection moulding process- cycle time - single stage - 2 stage screw machines - plunger type machine - reciprocating screwtype machine - parts of reciprocating screw injection moulding machineanditsfunctions-injectionmouldingmachineunits: Injectionunit- barrel material - nozzles types (general purpose, Reverse taper and freeflow) - nozzle shut off valve (Needle type) - heaters (cartridge and bandheaters) - clampingunit-togglesystem-hydraulic system-Tiebarless -daylight-clampingpressure-Processparameters-Time-Temperature - Pressure - Injection rate and Screw speed - specificationof injection moulding machine - plasticizing capacity - trouble-shooting -elementary knowledge of injection moulding for thermosets - elementaryknowledge ofRIM.	12 Hrs

	III	<b>EXTRUSIONANDFOAM</b> Basic principle of extrusion - L/D ratio - compression ratio - Parts of anextruder - screen pack - breaker plate - types of extruder - single screwextruder - multi screw extruder - sizing unit - winding and cutting unit -applicationsofextruderprocess-tubularblowfilmextrusion-monolayer -multilayer-sheetextrusion-co-extrusion-troubleshooting. Types of Plastic foam (flexible & rigid) - basic principles of structuralplasticfoamprocess-Lowpressuremoulding-	11 Hrs
-		highpressuremoulding -Applications.	
	IV	BLOWMOULDING&THERMOFORMING     Basic principles of blow moulding process - parison die head (divergentandconvergent)-parisonprogramming-     extrusionblowmouldingprocess - cycle time - injection blow moulding process - injection stretchblow moulding process - blow up ratio - die swell- advantages andlimitationsof blowmouldingprocess-troubleshooting.     Basic principle of thermoforming - heating sources - radiant - contactheating - hot air heating - mould - female, male and matched mould -andmouldmaterialsanddraftangle-drawratioofsheet-thermoformingtechniques-vacuumformingtechniques:straightvacuumforming-drapeforming-Pressureformingtechnique:plug assist forming - bubble or blister forming - snap back forming -advantagesandlimitationsofthermoforming-troubleshooting.	11 Hrs
	V	ROTATIONALMOULDING, CALENDERINGANDJOININGOFPLASTICS Basicprincipleofrotationalmouldingprocess-Typesofrotationalmoulding- Batchtypemachineprocess-Carouseltypemachineprocess- Straightline(Shuttle)machineprocess-Applicationsofrotationalmoulding- Advantage and troubleshooting. Basic principles of calendering process- types of calenders - sheetsthicknesscontrolarrangements-nip- contourgrinding-straighteningofrollbending - roller cambering (crowing effect)-crossaxis. Adhesive bonding - Method - Advantages and limitations of adhesive bonding-Ultrasonic welding-Method-Vibration welding-Thermal Heat sealing-Method	11 Hrs

### TextBooks:

- 1. D.H.Marton, Jones-PolymerProcessing- ChapmanandHall(1989)
- 2. Irvin Rubin -InjectionMoulding: TheoryandPractice-Wiley,(1972).

### ReferenceBooks:

- 1. E.C.Bernhardt-Processing of Thermoplastics Materials -Reinhold, New York.
- 2. J.S.Walker&E.R.Martin- InjectionMouldingofPlastics-Butterworths,London.
- 3. Bown, J-Injection MouldingofPlasticsComponents-McGraw-Hill(1979).
- 4. Holmes-Walker, W.A-Polymer Conversion, AppliedSciencePublishers-(1975)
- 5. JohnD.Beadle-PlasticsForming-Macmillan,London(1981)
- 6. Fisher, E.G-BlowMouldingof Plastics-Iliffe, London (1991)
- 7. Elden, R.A. and Swann, A.D-Calendering of Plastics -Iliffe, London (1991)
- 8. JamesE.S., Margolis- Decorative of Plastics Hanser Publishers (1986)
- 9. GleannLBeall-RotationalMoulding-HanserPublishers(1998)

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

#### Course Name

: 2074: DIPLOMA IN POLYMER TECHNOLOGY

Subject Code

: V Semester

: 4974530A

Subject Title

Semester

: ELECTIVE THEORY- I: POLYMER COMPOSITES

# **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours H / Se Week	Hours /	Marks			
Cubject		Semester	Internal Assessment	End Semester Examinatio n	Total	Duration
POLYMER COMPOSITES	4 Hrs	64 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
I	RESIN AND REIN FORCEMENT MATERIALS	12
II	DESIGN AND FABRICATION OF MOULDS	12
	PROCESSING METHODS	11
IV	POST PROCES ING METHODS	11
V	APPLICATIONS OF COMPOSITES	11
	Test & Model Exam	7
	TOTAL	64

#### **RATIONALE:**

This course helps the students to understand the various processing methods involved in thepreparationoffiberreinforcedplastics. Theywill choose aparticular resin, reinforcing materials and other additives used to manufacture a FRP product. Also, the basic design concept and fabrication of mould.

#### **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able to:

- \* Select the suitable raw material for the given application
- \* Choose the suitable processing method to manufacture the required FRP product
- \* Fabricate the polymer composite as per the requirement
- \* Identify the necessary post processing method for finishing of the FRP product

### POLYMER COMPOSITES

### **Contents:Theory**

Unit	Name of the Topic	Hours
I	<b>RESIN AND MATRIX SYSTEM</b> Basic concept of fiber reinforced plastics - History and development of fiber reinforced plastics - Properties of composites and comparison of fiber reinforced plastics and metals - Resins used, un saturated polyester resin, vinyl ester resins, epoxy resins, PP and ABS -Reinforcing materials used	12 Hrs
II	<b>REINFORCEMENT MATERIALS</b> Fibre Reinforcements - Glass fibre and its types, carbon, aramid, natural fibres, Boron, Ceramic Fibers- Miscellaneous additives used, catalyst, accelerator, fillers, pigments and mould release agents - Their functions in moulding.	12 Hrs
111	FABRICATION AND PROCESSING Basic concept of fabrication of moulds for fiber reinforced plastics - Selection of mould materials - Type of moulds used - Preparation of prepregs- SMC - DMC compounds - Their properties - Processing method of fiber reinforced plastics - Hand lay up - Spray up - Vacuum bag - Pressure bag - Compression moulding - Injection moulding - Auto clave moulding - Centrifugal casting - Filament winding -Pultrusion-Matched die moulding and resin transfer moulding.	11 Hrs

IV	<b>POST PROCESSING METHODS</b> Post processing methods - Cutting - Trimming - Machining - Joining- Filling - grinding - buffing - drilling - turning - slitting - Preparation for decorating - Mechanical fastening - Adhesive bonding and painting- Moulding defects and their remedies.	11 Hrs
V	APPLICATIONS & amp; TESTING OF COMPOSITES Applications of FRP - Household applications Building and Construction applications - Land transportation applications - Automobile applications - Rail transport applications- Marine applications - Aero space applications - Medical applications. Testing of Composites - Non Destructive Testing (X ray image, Ultrasonic test only), Fiber volume fraction - Thermal test	11 Hrs

### TEXTBOOKS:

L.Holloway-Compositematerials-Elsevier, Amsterdam, 1966

## **REFERENCES:**

- 1. BrianParkyn-Glass Reinforced Plastics-Ilifee, 1970.
- 2. Gibbs&Cox-Marine Design Manual for FRP-McGrawHill Book Co. -1960.
- 3. P.Ghosh- Fiber science and technology-Tata McGrawHill, New Delhi,2004
- 4. GeofferyPritchard-ReinforcedPlasticsDurability-WoodheadPublilshing -2000.
- 5. R.H.Sonneborn-FiberglassReinforcedPlastics-Reinhold,NewYork,1954
#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY
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Subject Code : 4974530B

Semester : V Semester

Subject Title

: ELECTIVE THEORY- I: B.TYRE TECHNOLOGY

#### **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours	ours Hours / Semester Veek	Marks			
	/ Week		Internal Assessment	End Semester Examinatio n	Total	Duration
TYRE TECHNOLOGY	4 Hrs	64 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
I	TYRE COMPONENTS AND ITS FUNCTIONS	12
II	TYRE REINFORCEMENT AND TYRE PERFORMANCE	12
	TYRE MANUFACTURING	11
IV	TYRE BUILDING	11
V	TYRE TESTING	11
	Test & Model Exam	7
	TOTAL	64

#### **RATIONALE:**

The subject aims at providing students the knowledge of various types of tyres and their manufacturing technique. The knowledge of Tyre reinforcement materials- Tyremoulddesign, curing and post curing methods and measurement of tyre properties will also beimparted.

#### **Objectives:**

On completion of the units of syllabus contents the students will be able to know about

- Introduction and development of tyres.
- Tyresizing and Marking on the tyres.
- Differentty pes of tyres and different components of tyres
- Manufacturing techniques of various tyres.
- Tyre reinforcement materials.
- Tyre mould design and methods of building green tyres
- Tyrecuringmethods,postcureinflation,qualitycontroltests,
- Measurementoftyreproperties,dimension
- Tyreconstructionanalysis,
- Rollingresistanceandnon-uniformitydimensionalvariations
- Type balance, mileage, evaluations, tyre flaws and separations, X-rayholography.

#### **TYRE TECHNOLOGY**

#### Contents:Theory

Unit	Nameofthe Topic	Hours
I	<b>TYRECOMPONENTSANDITSFUNCTIONS</b> Introduction and development of tyres. Tyre sizing and Marking on thetyres. Different types of tyres - bias, bias belted radial, tube type andtubelesstyres. Differentcomponentsofa tyre,itsgeometry, basic functions.Functionsofapneumatictyre.	12 Hrs
II	TYREREINFORCEMENTANDTYREPERFORMANCE Cord-rubbercompositesanditspropertiesandfailuremechanismofcord reinforcedrubber. Tyre forces on dry and wet road surface. Traction forces on dry, wet, ice,snow and irregular pavements, Breaking and traction of tyres. Tyre wear,rubber friction and sliding mechanism, various factors affecting frictionandsliding.Tyrestressesanddeformation,tyrenoise,mechanismof noisegeneration,effectoftreadpattern,vehiclespeedetc.	12 Hrs
III	<b>TYREMANUFACTURING</b> Manufacturing techniques of various tyres like two wheeler and car tyres,trucktyres,OTR,formulationsforvariousrubbercomponents.Tyrereinfor cementmaterials(Textile,steel,glassetc.).Criteriaofselection, differentstylesandconstruction,textiletreatment.	11 Hrs

IV	<b>TYREBUILDING</b> Tyremoulddesign,greentyredesignprinciples,methodsofbuildinggreentyresfor bias,biasbelted,radialandtube-lesstyres,greentyre treatments.Tyrecuringmethods,postcureinflation,qualitycontroltests.	11 Hrs
v	TYRETESTINGMeasurement of tyre properties, dimension, Tyre construction analysis,Endurance test wheel and plunger tests, traction, noise measurements,cornering coefficient aligning torquecoefficient,loadsensitivity andload transfer sensitivity, Rolling resistance, non-uniformity dimensionalvariations, concentricityandplysteer.Typebalance,mileage,evaluations,tyreflawsandseparations,X- rayholography.BIS standardsfortyres.	11 Hrs

#### TEXTBOOKS:

L.Holloway-TyreTechnology-Elsevier, Amsterdam, 1966

#### **REFERENCES:**

- 1. F.J.Kovac, TireTechnology, 4thedition, GoodyearTireand RubberCompany, Akron, 1978.
- 2. E.Robecchi, L.Amiki, MechanicsofTire, 2Vols, Pirelli, Milano, 1970.

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

: 2074: DIPLOMA IN POLYMER TECHNOLOGY

- Subject Code
- : V Semester

Subject Title

Semester

: ELECTIVE THEORY- I: POLYMER RECYCLING

#### **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours H / Se Week	Hours /	Marks			
		Semester	Internal Assessment	End Semester Examinatio n	Total	Duration
POLYMER RECYCLING	4 Hrs	64 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
Ι	PLASTIC WASTE GENERATION & SEPARATION TECHNIQUES	12
II	PROCESSING OF COMMINGLED PLASTIC WASTE	12
	RECYCLING OF POLYOLIFINS, PET & PVC	11
IV	RECYCLING OF ENGINEERING THERMO PLASTICS	11
V	RECYCLING OF THERMOSET COMPOSITES AND TYRE	11
	Test & Model Exam	7
	TOTAL	64

Course Name

: 4974530C

#### **RATIONALE:**

The subject aims at providing students the knowledge of various types of polymer recycling techniques. The subject will help the students to understand the importance of polymer recycling.

### **Objectives:**

On completion of the units of syllabus contents the students will be able to:

- Identify the sources of plastics waste generation
- Segregate the polymer waste for recycling
- Recall the recycling codes of commodity and engineering plastics.
- Select suitable recycling Techniques

## POLYMER RECYCLING

#### **Content:Theory**

3.

Unit	Nameofthe Topic	Hours
I	PLASTICWASTEGENERATION&SEPARATIONTECHNIQUES Plasticsproductionandconsumption- Plasticwastesgenerationsourceandtypes-sortingandseparationtechniques- 4R&I-Recyclingmethods - Primary, Secondary and tertiary recycling of plastics - Plasticroad.	12 Hrs
II	PROCESSINGOFCOMMINGLEDPLASTICWASTE Sizereductionofrecycledplastics- cutting/shredding,densification,pulverization and chemical size reduction processes- municipal solid wasteandcomposition- recyclingofplasticsfromurbansolidwastes-household waste - industrial sector -density and mechanical properties ofrecyclable plastics- Processing of commingled / mixed plastic waste -superwood,plasticlumber	12 Hrs
111	<b>RECYCLINGOFPOLYOLIFINS,PET&amp;PVC</b> Recycling of polyolefins - polyethylene films - Polypropylene batteryrecycling- Recycling of HDPE fuel tanks - PET recycling methods - PETfilmrecycling-Applicationsof polyolefinandPET recyclate -PVC Recycling	11 Hrs
IV	<b>RECYCLINGOFENGINEERINGTHERMOPLASTICS</b> Recycling of Engineering thermoplastics- PC, PBT, Nylon, PPO, ABS andpolyacetalsandtheirblends	11 Hrs

#### RECYCLINGOFTHERMOSETCOMPOSITESANDTYRE

 Recycling of Polymer thermoset composites - regrind processes -SMCscrap - pyrolysis and energy recovery -Types of rubber products rubbergrinding methods - tyre grinding - rubber crumb applications -Reclaimingand de-vulcanization processes tyre derived fuel and energy recovery -Pyrolysisofscraptyres-Actonplasticwastemanagement

#### TEXTBOOKS:

- 1. Polymerrecycling, Science, TechnologyandApplications, JohnScheirs, JohnWiley&Sons ,England1988
- 2. RecyclingofPlasticMaterials(Ed), FrancescoPaoloLaMantia, ChemTecPublishing.
- 3. PlasticsWasteManagement(Ed)|,NabilMustafa,MarcelDekker,NewYork,1995.

#### **REFERENCES:**

- 1. Degradeablepolymers, RecyclingandPlasticWasteManagement(Eds)AnnChristineAlbertson andSamuelJ.Huang, Marcel Dekker, NewYork.
- 2. PolymerRecycling, JohnSchiles
- 3. Recycling & Plastics Waste Management, Edited by Dr.J.S.Anand, CIPET, 1997.

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY
Subject Code	: 4974540
Semester	: V Semester

Subject Title

: ENTREPRENEURSHIP AND STARTUP

#### **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours	ours Hours / Semester /eek	Marks			
Subject	/ Week		Internal Assessment	End Semester Examinatio n	Total	Duration
ENTREPRENEUR SHIP AND STARTUP	4 Hrs	64 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
I	ENTREPRENEURSHIP-INTRODUCTION AND PROCESS	10
II	BUSINESS IDEA AND BANKING	10
	STARTUPS, E-CELL AND SUCCESS STORIES	10
IV	PRICING AND COST ANALYSIS	10
V	BUSINESS PLAN PREPARATION	10
	Revision, Field visit and Preparation of case study report	14
	TOTAL	64

#### RATIONALE:

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes ineducational curriculum particularly to establish relevance to emerging socio-

economicenvironments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and startup saimsatin stilling and stimulating humanurge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and there by ensure good means of living for every individual, provides jobs and develop Indian economy.

#### **OBJECTIVES:**

At the end of thestudyof5thsemesterthestudentswillbeableto

- To excite the students about entrepreneurship
- Acquiring Entrepreneurial spiritandre sourcefulness
- Understanding the concept and process of entrepreneurship
- Acquiring entrepreneurial quality, competency and motivation
- Learning the process and skills of creation and management of entrepreneurial venture
- Familiarization with various uses of human resource for earning dignified means of living
- Know its contribution in and role in the growth and development of individual and the nation.
- Understand the formation of E-cell
- Survey and analyze the market to understand customer needs
- Understand the importance of generation of ideas and product selection
- Learn the preparation of project feasibility report
- Understand the importance of sales and turn over
- Familiarization of various financial and non financial schemes
- Aware the concept to fin cubation and startsups.

### DETAILED SYLLABUS

Unit	NameoftheTopics	Hours
1	Entrepreneurship-IntroductionandProcess	
	Concept, Functions and Importance	
	MythsaboutEntrepreneurship	10
	ProsandConsofEntrepreneurship	
	ProcessofEntrepreneurship	
	BenefitsofEntrepreneur	
	Competenciesandcharacteristics	
	EthicalEntrepreneurship	
	EntrepreneurialValuesandAttitudes	
	Motivation	
	Creativity	
	Innovation	
	Entrepreneurs-asproblemsolvers	
	<ul> <li>Mindset of an employee and anentrepreneur</li> </ul>	
	BusinessFailure-causesandremedies	
	RoleofNetworkinginentrepreneurship	
2	BusinessIdeaandBanking	
	TypesofBusiness:Manufacturing,TradingandServices.	
	Stakeholders:sellers,vendorsandconsumers	10
	E-commerceBusinessModels	
	<ul> <li>Types of Resources - Human, Capital and Entrepreneurialtools</li> </ul>	

	GoalsofBusiness;GoalSetting	
	<ul> <li>Patent,copyrightandIntellectualpropertyrights</li> </ul>	
	<ul> <li>Negotiations-Importanceandmethods</li> </ul>	
	CustomerRelationsandVendorManagement	
	<ul> <li>Sizeandcapitalbasedclassification of businessenterprises</li> </ul>	
	Roleoffinancialinstitutions	
	RoleofGovernmentpolicy	
	Entrepreneurialsupportsystems	
	<ul> <li>Incentiveschemesforstategovernment</li> </ul>	
	<ul> <li>IncentiveschemesforCentralgovernment</li> </ul>	
3	Startups,E-cellandSuccessStories	
	ConceptofIncubationcentre's	
	<ul> <li>Activities of DIC , financial institutions and otherrelevance institutions</li> </ul>	10
	<ul> <li>SuccessstoriesofIndianandglobalbusinesslegends</li> </ul>	
	FieldVisittoMSME's	
	Varioussourcesofinformation	
	Learntoearn	
	Startupanditsstages	
	<ul> <li>RoleofTechnology-E-commerceandSocialMedia</li> </ul>	
	Roleof E-Cell	
	E-CelltoEntrepreneurship	
4	PricingandCostAnalysis	
4	CalculationofUnitofSale.UnitPriceandUnitCost	
4	PricingandCostAnalysis     CalculationofUnitofSale,UnitPriceandUnitCost     TypesofCosts-VariableandFixed,OperationalCosts	10
4	PricingandCostAnalysis         • CalculationofUnitofSale,UnitPriceandUnitCost         • TypesofCosts-VariableandFixed,OperationalCosts         • BreakEvenAnalysis	10

	Understandthemeaningandconceptofthe term	
	CashInflowandCashOutflow	
	PrepareaCashFlowProjection	
	PricingandFactorsaffectingpricing	
	<ul> <li>Understand the importance and preparation of</li> </ul>	
	IncomeStatement	
	<ul> <li>LaunchStrategiesafterpricingandproofof concept</li> </ul>	
	<ul> <li>Branding-Businessname,logo,tagline</li> </ul>	
	Promotionstrategy	
5	BusinessPlanPreparation	
	Generation of Ideas.	10
	<ul> <li>BusinessIdeasvs.BusinessOpportunities</li> </ul>	
	<ul> <li>Opportunity Assessment - Factors, Micro and Macro MarketEnvironment</li> </ul>	
	<ul> <li>SelectingtheRightOpportunity</li> </ul>	
	Productselection	
	Newproductdevelopmentandanalysis	
	<ul> <li>Feasibility Study Report - Technical analysis, financialanalysisand commercial analysis</li> </ul>	
	<ul> <li>MarketResearch-Concept,ImportanceandProcess</li> </ul>	
	MarketingandSalesstrategy	
	Digitalmarketing	
	SocialEntrepreneurship	
	RiskTaking-Concept	
	Typesofbusinessrisks	
	ExecutionofBusinessPlan	

#### **REFERNCE BOOKS:**

- 1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, SahityaBhawan Publications, Agra -282002
- 2. Dr.G.K.Varshney, Business Regulatory Framework, Sahitya Bhawan Publications, Agra

-282002

- 3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship, McGraw Hill(India)PrivateLimited,Noida-201301
- 4. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small businessmanagement, PearsonEducationIndia, Noida-201301
- 5. CharantimathPoornima M. Entrepreneurship Development and Small BusinessEnterprises,PearsonEducation,Noida-201301
- Trott, InnovationManagement andNewProductDevelopment, PearsonEducation, Noida -201301
- 7. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing HousePvt. Ltd.,NewDelhi-110044
- 8. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, NewDelhi
- 9. I.V.Trivedi, RenuJatana, Indian Banking System, RBSAPublishers, Rajasthan
- 10. SimonDaniel, HOWTOSTARTABUSINESSININDIA, BUUKS, Chennai-600018
- 11. Ramani Sarada, The Business Plan Write-Up Simplified A practitioners guide to writingthe BusinessPlan, NotionPressMedia Pvt.Ltd., Chennai600095.

#### Autonomous Examination – Evaluation Pattern Internal Mark Allocation

Assignment(Theoryportion)*	-	10
SeminarPresentation	-	10
Attendance	-	5
Total	-	25

# Note: \* Two assignments should be submitted. The same must be evaluated and converted to 10 marks.

Guidelinesforassignment:

First assignment	- Unit I
Second assignment	- Unit II
Guidelines for Seminar Presentation	- Unit III

Each assignment should have five three marks questions and two five marks questions

#### AUTONOMOUS EXAMINATION

#### NOTE:

- 1. The students should be taught all units and proper exposure and field visit also arranged. All the portions should be completed before examinations.
- 2. The students should maintain theory assignment and seminar presentation. The assignment and seminar presentation should be submitted during the Autonomous Practical Examinations.
- The question paper consists of theory and practical portions. All students should write the answers for theory questions (45Marks) and practical portions (55Marks) should be completed for board examinations.
- 4. All exercises should be given in the question paper and students are allowed to select by lot. If required the dimensions of the exercises may be varied for every batch. No fixed time allotted for each portion and students have liberty to do theexaminationfor3Hrs.
- 5. For Written Examination: theory question and answer: (45Marks)
- 6. Ten questions will be asked for 3marks each. Five questions from each unit 1 & 2.(10X3=30).
- ForPracticalExamination:Thebusinessplan/FeasibilityreportorReportonUnit4& 5 should be submitted during the board practical examinations. The same haveto beevaluatedforthereport submission(40marks).
- 8. Viva-vocecarries(15Marks)

### **DETAILED ALLOCATION OF MARKS**

SI.	Description	Marks
No		
Part A	Written Examination-Theory Question and answer	45
	(10questionsx3 marks:30marks&(3questionsx5	
	marks:15marks)	
Part B	Practical Examination - Submission on Business	40
	Plan/ Feasibility Report or Report on Unit 4&5	
Part C	Viva voce	15
	Total	100

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: RUBBER COMPOUNDING AND SPECIMEN PREPARATION PRACTICAL
Semester	: V Semester
Subject Code	: 4974550
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

#### TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours Hou / Sem	Hours /	Marks			
		Semester	emester	End Semester	Total	Duration
	Week		Assessment	Examinatio n		
RUBBER						
COMPOUNDING						
AND SPECIMEN	6 Hrs	80 Hrs	25	100*	100	3 Hrs
PREPARATION	01110	001113	20	100	100	01113
PRACTICAL						

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doingengineeringrelated experiments in practical classes.

#### **Objectives:**

On completion of the experiments given in the syllabus the students will be able to:

Prepare the gum rubber compound and master batch using two roll mill

- Prepare the filled rubber compound using two roll mill
- Carry out blending of two different rubber in at worollmill
- Prepare various rubber compound testing specimen as per the standards

#### List of experiments:

- 1. Preparation of gum compound
- 2. Preparation of master batch
- 3. Preparation of carbon black filled NR compound
- 4. Preparation of carbon black filled synthetic rubber compound
- 5. Preparation of non-black filled NR compound
- 6. Preparation of non-black filled synthetic rubber compound
- 7. Preparation of non sulphur based rubber compound
- 8. Preparation of blended rubber compound
- 9. Preparation of tensile test specimen
- 10. Preparation of compression test specimen
- 11. Preparation of tear test specimen
- 12. Preparation of abrasion test specimen

## LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	Name of Equipment/Instrument	Quantity
1.	Tworollmill	1
2.	Mixingmillknife	2
3.	Electronicweighingbalance	5
4.	Compression moulding hydraulicpress	2
5.	Brassrod	2
6.	Tensileslabmould	1
7.	Compressionbuttonmould	1
8.	Abrasionbuttonmould	1
9	Dumbbellcutter	1
10.	Angulartearcutter	1

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

- Subject Code : 4974560
- Semester : V Semester

Subject Title

: POLYMER PROCESSING PRACTICAL

#### TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours	Hours /		Marks		
	/ Week	Semester	Internal Assessment	End Semester Examinatio n	Total	Duration
POLYMER PROCESSING PRACTICAL	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

### **RATIONALE:**

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

### **Objectives:**

On completion of the experiments given in the syllabus the students will be able to:

- Calculate the cycle time of various processes
- Optimise the cycle time of a process to manufacture a plastics product using a particular machine
- Prepare the thermosetres in based composite laminate by casting method
- MakeaFRPlaminatebyhandlay-uptechnique
- Prepare alatexproductbydippingprocess

## **Listofexperiments:**

- 1. Processing of polymer using Compression Molding
- 2. Processing of polymer using Extrusion
- 3. Processing of plastics using Hand Injection Molding
- 4. Processing of plastics using Semi automatic Injection molding
- 5. Processing of plastics using Semiautomatic Blow Molding
- 6. Processing of plastics using Thermoforming
- 7. Recycling of polymer using Scrap Grinding
- 8. Preparation of FRP by handlay- up technique
- 9. Casting of thermoset resin
- 10. Manufacture of Latex product by Dipping process

## LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	Hand operated injection mouldingmachine withmould	1
2.	Semi-automatic injection mouldingmachine withmould	1
3.	Semi-automatic blow mouldingmachine withmould	1
4.	Singlescrewextruderwithsizing,wi ndingunitanddie	1
5.	Compression moulding hydraulicpresswithmould	1
6.	Vacuum thermoforming machinewith mould	1
7.	Scrapgrinder	1
8.	Electronicweighingbalance	1
9	Glovemould(pair)	2
10.	Balloonmould	2
11.	SlabmouldforFRPlaminate	2
12.	AirCompressor	1
13.	Hotairoven	1

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: ELECTIVE PRACTICAL- I: POLYMER COMPOSITES PRACTICAL
Semester	: V Semester
Subject Code	: 4974570A
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

#### **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours H / Se Week	Hours / Semester	Marks			
			Internal Assessment	End Semester Examinatio n	Total	Duration
POLYMER COMPOSITES PRACTICAL	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **RATIONALE:**

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

#### **Objectives:**

On completion of the experiments given in the syllabus the students will be able to:

- Calculate the gel time and peak exothermic temperature
- Prepare various fibre based polymer composite laminate
- Prepare various particulate filled polymer composite laminate
- Measure various mechanical properties of polymer composite
- Make a prepregs of polymer composite

## List of experiments:

- 1. Determination of gel time and peak exothermic temperature of thermoset resin
- 2. Preparation of Glass fiber reinforced thermoset laminate
- 3. Preparation of Natural fiber reinforced thermoset laminate
- 4. Preparation of thermoset laminate using particulate filler
- 5. Preparation of prepregs
- 6. Preparation of specimens for Mechanical testing
- 7. Determination of Tensile strength
- 8. Determination of Flexural strength
- 9. Determination of flammability of thermoset laminate
- 10. Manufacture of a simple polymer composite product by Handlay-up technique

## LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	Name of Equipment/Instrument	Quantity
1.	UTM with accessories and fixtures	1
2.	Slab(Laminate)mould	1
3.	Tensile specimen mould	1
4.	Flexural specimen mould	1
5.	Laminate cutter	2
6.	Product mould	2
7.	Hot airoven	1
8.	Electronic weighing balance	1

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: ELECTIVE PRACTICAL- I: B.TYRE TECHNOLOGY PRACTICAL
Semester	: V Semester
Subject Code	: 4974570B
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

#### **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours	Hours /		Marks		
	1	Semester	Internal Assessment	End Semester	Total	Duration
	Week		Assessment	Examinatio n		
TYRE TECHNOLOGY	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

#### **Objectives:**

Oncompletion of the experiments given in the syllabust he students will be able to:

- Identifyoftyre,itsmarkingandcomponents
- Preparerubber compound for thevariousparts of the tyre using two rollmill
- Measurevariousmechanicalpropertiesrequiredforatyre
- Repair a punctured tyrebyasimplemethod

#### List of experiments:

- 1. Identification of tyre and its marking
- 2. Identification of components of tyre
- 3. Preparation of tyretreadcompound using two roll mill
- 4. Preparation of side wall compound using two roll mill
- 5. Determination of hardness of tyre tread and sidewall compound vulcanisate
- 6. Determination of tensile strength of tyre tread and sidewall compound vulcanisate
- 7. Determination of Compression set of tyre tread compound vulcanisate
- 8. Determination of Abrasion resistance of tyre tread compound vulcanisate
- 9. Determination of flex cracking resistance of side wall compound vulcanisate
- 10. Repair of puncture in tube and tubeless tyre

## LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	TyreCutter	2
2.	Tworollmill	1
3.	Tensilespecimenmould	1
4.	Flexspecimenmould	1
5.	Compressionbuttonmould	1
6.	Abrasionspecimenmould	1
7.	Handlens	2
8.	Electronicweighingbalance	1
9.	Tworollmillknife	2
10.	Brassrod	2
11.	Dumbbellcutter	1
12.	Durometer(shoreA)	1

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: ELECTIVE PRACTICAL- I: C.POLYMER RECYCLING PRACTICAL
Semester	: V Semester
Subject Code	: 4974570C
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

#### TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours	Hours Hours / / Semester Week	Marks			
Subject	/ Week		Internal Assessment	End Semester Examinatio n	Total	Duration
POLYMER RECYCLING PRACTICAL	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **RATIONALE:**

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

#### **Objectives:**

On completion of the experiments given in the syllabus the students will be able to:

- Reduce the size of polymer waste by grinding
- Separate plastics waste by density method
- Compare the various mechanical properties of recyclate compound with the virgin compound
- Prepare a product from polymer waste

## List of experiments:

- 1. Size reduction of Plastic waste by grinding
- 2. Separation of Plastic waste by density method
- 3. Compaction of plastic flakes and density comparison
- 4. Tyre crumb from used tyre
- 5. Blending of plastic recyclatein blender
- 6. Preparation of polymer recyclate blend
- 7. Manufacture plastic product from recycled polymer
- 8. Comparison of tensile properties of recycled polymer with virgin polymer
- 9. Comparison of hardness properties of recycled polymer with virgin polymer
- 10. Comparison of MFIof recycled plastic with virgin plastic

## LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	Screw type Injection mouldingmachine withmould	1
2.	Tworollmill	1
3.	Scrapgrinder	1
4.	MFI Tester	1
5.	Tensilespecimenmould	1
6.	Productmould	2
7.	Compressionbuttonmould	
8.	Electronicweighingbalance	1
9.	Tworollmillknife	2
10.	Brassrod	2
11.	Dumbbellcutter	1
12.	Durometer(shoreA &D)	1



#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY
Subject Code	: 4974610
Semester	: VI Semester
Subject Title	: PLANT ENGINEERING AND MANAGEMENT

### **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours /	Hours /	Marks			
Cabjeet			Internal	End	Total	Duration
		Semester	Assessment	Semester		
	Week			Examinatio		
				n		
PLANT						
ENGINEERING						
	5 Hrs	80 Hrs	25	100*	100	3 Hrs
	• • • • •					•••••
MANAGEMENT						

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
I	PRINCIPLESOFMANAGEMENT	15
II	ORGANISATIONANDQUALITYCONTROL	15
III	MARKETINGFUCNTIONS-INDUSTRIALRELATIONS ANDSAFETY	15
IV	ENVIRONMENTALMANAGEMENT	14
V	DISASTERMANAGEMENT	14
	Test & Model Exam	7
	TOTAL	80

### **RATIONALE:**

In this subject the basic concepts on the various principles of management about scientific management, entrepreneurship, different types of organanisation is covered to enable the students to understand working of various management principles. Students also get an opportunity to learn about PPC, Leadership and the modern quality control techniques. In this subject due emphasis is given for marketing functions, Industrial relation and safety and also Environmental management and disaster management techniques which are highly essential for the present situation.

#### **OBJECTIVES:**

On completion of the units of the syllabus, the student will be able:

- To understand the different types of ownership in industry
- To select the plant location and product
- To understand the important factors of production planning control
- To carry out suitable effective methods for inventory control
- To maintain good quality control
- To understand the different marketing techniques
- To appraise the safety performance
- To analyse the impact of pollution
- To select the suitable solid waste treatment techniques
- To understand various treatments and disposal methods for waste water
- To choose the suitable air pollution control methods
- To understand the disaster management
- To identify different causes for disaster management
- To understand the insurance claim and rehabilitation methods

## PLANT ENGINEERING AND MANAGEMENT

Unit	Nameofthe Topic	Hours
I	UNITI:PRINCIPLESOFMANAGEMENT Role of industry -Types of ownership-Proprietorship, partnership- Privatelimited-Publiclimited-Industrialco-operatives-Scientificmanagement -Functions of management -Types of organization -line-staff-functional organization -concept and Definition -Importance of Entrepreneurship - Promotion of self employment -Government policies -Advantages and limitations of entrepreneurship-Sites election-Principles of plant layout -Factors influencing plant location. Plant maintenance - importance - Breakdown maintenance, preventive maintenance and scheduled maintenance.	15 Hrs

	UNITII:ORGANISATIONANDQUALITYCONTROL	
11	Leadership in organization-Decision making-Communication-Motivation - Group dynamics -Production planning and control -Need for planning - Routing -Scheduling -Despatching -PERT -CPM -Inventorycontrol- ABCanalysisofsafetystock-EOQmethod-Purchasingprocedures -Records - Bincards - Quality control -Basic concepts -Definition-Terminology- Presentationofdata-Indianstandardsonqualitycontroltechnique- Qualitycertificationschemes-ISO9000etc.	15 Hrs
	UNIT III MARKETING FUNCTIONS, INDUSTRIAL RELATIONS	
	ANDSAFETY Marketing -Definition -Information -Functions -Pricing policy - Pricingtechniques-Sales-Definition-Personalselling-Promotionmix-	15 Hrs
	Advertising-Sales packaging-Promotion techniques Trade unions -Disputes -Settlement -Collective bargaining -Welfare concepts -Rights and responsibilities of employer and employee - Factories act 1948 -Industrial dispute act 1947 -Trade unions act 1926 -ESI act1948-Childlabouract Process safety -Hazard analysis -Risk analysis -Common causes of accidents -Safety training -Electrical hazard -Fire hazard -Explosion hazard -First aid.	
	UNITIV:ENVIRONMENTALMANAGEMENT	
	Introduction - Environmental Ethics - Assessment of Socio Economic Impact-Environmental Audit-Mitigation of adverse impacton Environment - Importance of Pollution Control - Types of Industries and Industrial Pollution. Solid waste management-Characteristics of Industrial wastes-Methods of Collection, transfer and disposal of solid wastes - Converting waste to energy-Hazardous waste management Treatment technologies. Waste water management - Characteristics of Industrial effluents - Treatment and disposal methods - Pollution of water sources and effects on human health. Air pollution management-Sourcesandeffects-Dispersionofairpollutants-Airpollution control methods-Air quality management. Noise pollution	14 Hrs
V	UNITV:DISASTERMANAGEMENT Introduction - Disasters due to natural calamities such as Earth quake,Rain, Flood, Hurricane, Cyclonesetc - Man made Disasters - Crisis duetofires, accidents, strikesetc- Loss of property and life. DisasterMitigationmeasures-Causesformajordisasters- RiskIdentification-HazardZones-Selection of sites for Industries and residential buildings-Minimum distances from Sea-Orientation of	
	Buildings - Stability of Structures - Fire escapes in buildings - Cycloneshelters-Warningsystems.DisasterPreparedness,Response,Recovery-Arrangements to be made in the	14 Hrs

industries / factories and buildings -Mobilization of Emergency	
Services - Search and Rescue operations -First Aids - Transportation	
of affected people - Hospital facilities - Firefighting arrangements -	
Communication systems - Restoration of Power supply-Getting	
assistance of neighbours / Otherorganizations in Recovery and	
Rebuilding works-Einancial commitments-Compensations to be paid-	
Insurances Rebabilitation	
insurances - Renabilitation.	1

#### Textbook:

- 1. O.P.Khanna Industrialengineering and management, Dhanpatrai&sons.
- 2. C.S.Rao-EnvironmentalEngineering and Pollutioncontrol,Wiely

#### ReferenceBooks:

- 1. IndustrialManagementbyDalilal&MansurAli
- 2. HandBookof ndustrial SafetyandHealth,TradeandTechnicalPress Ltd.,Modern, U.K.1980.

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

- Course Name : 2074: DIPLOMA IN POLYMER TECHNOLOGY
- Subject Code : 4974620
- Semester : VI Semester
- Subject Title : POLYMER TESTING

### **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Inst	ructions		Examinatio	on	
Subject	Hours	Hours /		Marks		
oubject	/ Week	Semester	Internal Assessment	End Semester Examinatio n	Total	Duration
POLYMER TESTING	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
I	INTRODUCTIONTOTESTINGANDSURFACEPROPERTIES	15
Ξ	MECHANICALPROPERITESOFPOLYMER	15
	THERMAL ANDRHEOLOGICALPROPERTIESOFPOLYMER	15
IV	ELECTRICAL ANDOPTICALPROPERITESOFPOLYMER	14
V	WEATHERING, CHEMICAL PROPERTIES, PRODUCT TESTING AND NON DESTRUCTIVE TEST	14
	Test & Model Exam	7
	TOTAL	80

#### **RATIONALE:**

This subject covers different properties of polymers namely mechanical properties, thermal properties, optical properties, electrical properties, weathering properties and chemical properties also the methods by which these properties can be determined. In this subject different test can be performed to product slike pipes, films, hoses and belts.

#### **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able to:

- Choose the condition for performing the tests
- ✤ Apply the procedure as per the standard for a particular property
- Analyse the factors affecting the test result
- Find the mechanical, optical, thermal, rheological, chemical, flammability and weathering properties of a Plastic material
- Identify the testing to be carried out for a polymer product as per the standard

### POLYMER TESTING

#### **Content:Theory**

Unit	TOPIC	Hours
I	INTRODUCTIONTOTESTINGANDSURFACEPROPERTIES Importance of testing - Various Standards - Need for specification - SpecimenvsSample-Testconditions-Specimenpreparation- Conditioningofspecimen-Factorsaffectingthetestresults- DefinitionofDenier,Tenacity,EPlandGSM Surface properties: Hardness - Durometer hardness (Shore A , D &F) - IRHD - Rockwell - equipment and procedure - Abrasion - Taber& DIN abrader - equipment and procedure - Five finger scratch test -equipmentandprocedure - 90°&180°peeloffstrength(adhesiveandcohesivefailure)-Procedure	15 Hrs
11	MECHANICALPROPERITESOFPOLYMER Tensile strength - Stress curve - Equipment and procedure (Elastomer,Ductile plastics, Thermoset plastics and film) - Tear resistance -Angular specimen and Elmendorf tear test - Procedure - Impactstrength-Izod-Charpy- Fallingdart -Equipmentandprocedure- Shear strength: Compressive strength - Flexural strength - Lap shearstrengthBurstingpressure test-Procedure	15 Hrs

111	THERMAL ANDRHEOLOGICALPROPERTIESOFPOLYMERThermal properties:Thermal conductivity - Measurement ofThermalconductivity-HeatdistortionTemperature(HDT)-VicatSofteningPoint(VSP)-Significanceandmethodofdetermination-TGA-equipmentandprocedure-DeterminationofGlasstransitiontemperature (DSC &DMAonly).RheologicalProperties:MeltFlowIndex-MooneyviscometerOscillatingDiscRheometer-methodofdeterminationFlammabilitytests:-Limitingoxygenindex-Horizontalburningmethod-methodofdetermination	15 Hrs
IV	ELECTRICAL ANDOPTICALPROPERITESOFPOLYMER Electrical properties: Introduction - Requirements of an insulator - Di- electricstrength-MeasurementofDi-electricstrength-Factorsaffecting Di- electric strength. Di-electric constant - Measurement of Di-electric constant - Arc resistance - Measurement of Arc resistance - Trackingindex-Volume resistivityand Surface resistivity. Opticalproperties:Refractiveindex-birefringence-LightTransmittance- Haze-Gloss-Definitionsandmethodofdetermination.	14 Hrs
V	<ul> <li>WEATHERING, CHEMICALPROPERTIES, PRODUCTTESTINGANDN ONDESTRUCTIVETEST</li> <li>Weathering properties: Accelerated weathering test - Significance andmeasurement - Chemical properties: Immersion test - Stain resistancetest-Solventstresscrackingresistance- EnvironmentalStressCracking Resistance (ESCR) - Gas and water vapour permeability -Significance andmethod ofdetermination</li> <li>ProductTesting: TestparametersrecommendedforPipes, Film, Hose andbelt.</li> <li>Nondestructive testing: Importance of non-destructive testing - VariousNDTmethodsavailable (Listonly)</li> </ul>	14 Hrs

#### TextBooks:

- 1. R.P.Brown, Physical Testing of Rubbers, 3<sup>rd</sup> edition, Smither Rapra Publishing, 1992.
- 2. VishuShah, Handbook ofPlasticTestingTechnology, WileyInter-science Publications, 1998.
- 3. J.HaslamandH.A.Willis, IdentificationandAnalysisofPolymer, ILIFFE, London, 1972.

#### ReferenceBooks:

- 1. G.Gordon Cameron Ellis Hand Book of Analysis of Synthetic Polymers-HonwoodLtd.,-1977
- 2. Maurice Morton -RubberTechnology-RobertE.KriegerPub.Co.1973.
- 3. A.S.Athalye-Identificationand testing of plastics Multitechpublishers -1992.
- 4. Howtoidentify plastics-CIPETPublication-2003.
- 5. PaulKluckow-Rubberand PlasticsTesting-Chapman&Hall,London-1963.
- 6. Murugan.N- BasicsofTesting ofPlastics StudyMaterial.
- 7. L.E.Nielsen-MechanicalpropertiesofPlastics-Reinhold, NewYork-1962.
- 8. J.H.Collins-TestingandAnalysisofPlastics-PlasticsInstitute-1955.
- 9. R.P.Brown-Handbookofplastictestingmethods-1971
- 10. K.J.Saunders-Identification of Platics & Rubbers-Chapman & Hall-1966.
- 11. M.E.Baird Electrical Properties of polymeric materials Plastics and RubberInstitute,London-1973.

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: ELECTIVE THEORY II:A. POLYMER MOULD ENGINEERING
Semester	: VI Semester
Subject Code	: 4974630A
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

#### **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Inst	ructions		Examinatio	n	
Subject	Hours	Hours /		Marks		
	/ Week	Semester	Internal Assessment	End Semester Examinatio	Total	Duration
POLYMER MOULD ENGINEERING	5 Hrs	80 Hrs	25	n 100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
Ι	MOULD MATERIALS & MOULD DESIGN FOR PART REQUIREMENT	15
Π	MOULD DESIGN FUNDAMENTALS, FEED, EJECTION & COOLING SYSTEM	15
=	INJECTION MOULD DESIGN	15
IV	COMPRESSION AND TRANSFER MOULD DESIGN	14
V	BLOW MOULD & EXTRUSION DIE DESIGN	14
	Test & Model Exam	7
	TOTAL	80

#### RATIONALE:

With the rapid expansion of Industries such as Paper, Sugar, Pharmaceutical, dyeing and food industries the demand for all these, technologists also increases. This specialized subject makes students aware about manufacturing process, quality control and packaging techniques.

#### **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able to:

- Recall the basic terminology involved in mould construction.
- Identify the various components of the mould and its functions
- Select the suitable material for various mould components
- Design the mould/die for a polymer product
- Apply the mould design concept in the feed and cooling system

#### PLASTICS MOULD AND DIE DESIGN

Unit	Nameofthe Topic	Hours
I	UNIT- I:MOULDMATERIALS&MOULDDESIGNFORPARTREQUIREMENT Introduction of mould materials - Elementary idea about Pre hardenedmouldmaterialsandstandardmouldbase. Introductiontoproductdesign-Designtomeetprocessingrequirements- Positioningofgates,runners,venting,weldlines-Design ofribs and bosses - Rim- Gussets - Radii - Fillets- Partingline.Warpage-Wall thickness - Draft.Undercuts -Internal, external .Inserts-Functionsofinserts-Effectofinsertsonmouldstrength	15 Hrs
II	UNIT- II:MOULDDESIGNFUNDAMENTALS,FEED,EJECTION&COOLING SYSTEM Basic terminology and mould construction - Cavity and core (integer,insert) - Bolster - Sprue bush - Register ring - Guide pillar - Guidebush - Parting line construction- Stepped parting line- Irregularparting surface - Local stepped and profile parting line. Feed system -sprue- runners- runner cross section-Balancingofrunner. Typesofgatingsystem-Winkle gate-Diaphragm gate -Spruegate - Edgegate-Fangate-Ringgate-Submarinegate-Pinpointgate - Tab gate - Selection ofgate and application - Types of ejection - Pin,steppedpin, D pin,blade,sleeve,stripper,air,doubleejection- Spruepullers -Spruebush. Cavity cooling techniques - Core cooling techniques - Bolster coolingtechniques-Sprue cooling-Ejectioncooling.	15 Hrs

III	UNITIII:INJECTIONMOULDDESIGN Types of injection moulds - General arrangement of 2 plate, 3 platemould-Single,multiimpressionmoulds-Singledaylight,multidaylight moulds - Split mould - Actuation techniques - Cam actuation,finger cam, dog leg - Actuation of side core and side cavity - Empiricalformulafordeterminationofnumberofcavities- Elementarycostestimatingprocedureformould.Hotrunnermould- Elementaryknowledge about hot runnermould.	15 Hrs
IV	<b>UNITIV:COMPRESSIONANDTRANSFERMOULDDESIGN</b> Compression mould types - flash, semi-positive, positive moulds - Advantages, limitations. Empirical formula for calculation of: Bulk factor,weight of moulding, no. of cavity required, shrinkage - Mould heating -Typesofheaters.Transfermoulds-Pot type moulds, Plunger type moulds.Simple calculation for: Size of transfer pot, transfer plunger, sprue dimension, transfer chamber, clamp pressure,transfer pressure	14 Hrs
V	BLOWMOULD&EXTRUSIONDIEDESIGN Die and mandrel design - Die head - Side feed - Spider or axial flowhead - Accumulator head - Parison programming - Parting line - Pinchoff design - Neck pinch off - Base pinch off - Flash pockets - Ventingandmouldsurfacefinish -Cooling. Extrusion Die geometry - Designing of pipe die - Production line - Torpedo, mandrel, land - length, approach section - Inline type - offsettype-Designofblownfilm-Sidefeeddie,bottomfeeddie- Designofsheet die - Production line - Coat hanger type - Design of profile die(one typeonly)-Elementaryideaaboutmonofilamentdie.	14 Hrs

#### TEXTBOOKS:

- 1. RonaldD.Beck ProductDesign-Van Nostrand-Reinhold Co.(1970)
- 2. R.G.W.Pye- Injection moulddesign-4<sup>th</sup>Ed-Longmanscientific&Technical(2000)
- 3. R.H.Bebb PlasticMouldDesign-(Compression&Transfermould)
- 4. Rosato-BlowMouldDesign-HanserPublications(1972)
- 5. M.V.Joshi-ExtrusionDieDesign-MacmillanIndialtd(1992)

#### **REFERENCES:**

- 1. J.HarryDubois&WayingI.Prible-Plasticmouldengineeringhandbook(1982)
- 2. Laszlosors-PlasticMouldEngineering-Pergamonpress(1967)
- 3. RobertAMalloy-Plasticpartdesign for injectionMoulding-Hanser(1994)
- 4. Chereminishroff-.ProductDesignand Testing ofPolymeric Material-Hanser(1992)
- 5. Levy-PlasticsProductDesignHand Book-VannostrandreinholdCo.(1977)
- 6. DominickVRosatoand DonaldVRosato-Injection MouldingHandbook(1985)
- 7. Ralph.E.Wright-MouldedThermosets-HanserPublishers(1991)
- 8. Klausstoeckhert-Mouldmaking Handbook for Plastic Engineers -Hanser(1983)
- 9. Pauk.A.Tres-Designing Plasticpartsfor assembly-Hanser(1994)
- 10. WalterMichaeli ExtrusionDies-2<sup>nd</sup>Ed- Hanser(1992)

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

RY II:B. PACKAGING TECHNOLOG

#### **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	End Semester Examinatio n	Total	Duration
PACKAGING TECHNOLOGY	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
I	PACKAGING SCOPE AND MATERIALS	15
II	CONVERSION PROCESSES OF PACKAGES	15
	FLEXIBLE PACKAGING	15
IV	RIGID AND SEMIRIGID PACKAGING	14
V	TESTING OF PLASTICS PACKAGING	14
	Test & Model Exam	7
	80	
#### RATIONALE:

With the rapid expansion of Industries such as Paper, Sugar, Pharmaceutical, dyeing and food industries the demand for all these, technologists also increases. This specialized subject makes students aware about manufacturing process, quality control and packaging techniques.

#### **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able to:

- List out the functions of packaging
- Compare the advantages of plastics packaging over conventional packaging materials
- Select suitable material as per packaging requirement
- Analyse the packaging regulations and legislation.
- Choose a suitable processing method
- Measure the important properties like, barrier properties, migration properties, and compatibility properties.

# PACKAGING TECHNOLOGY

#### Contents:Theory

Unit	Nameofthe Topic	Hours
I	<ul> <li>PACKAGINGSCOPEANDMATERIALS</li> <li>Introduction to Plastics packaging - scope and functions of packaging - advantages of plastics packaging over conventional packaging materials</li> <li>Major forms of plastics materials used in packaging: LDPE, LLDPE, HDPE, PP, PS, PVC, Nylon, Polyesters, EVOH, PVDC and Poly Vinyl Alcohol - distribution hazards - special requirements of food and medical packaging- packaging regulations and legislation.</li> <li>Selection criteria of suitable polymeric packages for oils, fats and alliedproducts, soapsanddetergents, cosmetics, food, dairyproducts, bevera ges, medicines, chemicals, paints, householdandindustrialgoods.</li> </ul>	15 Hrs
11	<b>CONVERSIONPROCESSESOFPACKAGES</b> <b>Conversion processes:</b> Closures production by Injection moulding process - different types of closures: friction closures, snap fit closuresandthreadedclosures-Plasticsbottlesproductionbyblowmoulding- extrusion blow moulding - injection blow moulding - stretch blow moulding - moulds for plastics bottles - multi resin bottles -Plastics tubes manufacture by extrusion - rotational moulding - metalizing -decoration process- in mould labeling-barrier coatings.	15 Hrs

111	FLEXIBLEPACKAGING FlexiblePackaging: Extrusion film-cast film -cast sheet-blown film - multi layer film and sheet: coating, laminations and co-extrusion - stretchandshrinkwrap-pouches:pillowpouches,threesidesealpouches, four side seal pouches, stand up pouches, forming pouches -bulk and heavy duty bags - heat sealing: bar or thermal sealing, impulsesealing,bandsealing,hotwireorhotknifesealing,ultrasonicsealingan d friction sealing, radiant sealing, dielectric, magnetic and induction sealing-advantages offlexible packaging.	15 Hrs
IV	RIGIDANDSEMIRIGIDPACKAGING Rigid and semi rigid Packaging: Thermoformed packages- thermoforming moulds -form/fill/seal thermoforming operations - wrapforming-blisterpackaging-skinpackaging-mouldedpackages- Expanded polystyrene and other foam systems - Design of mouldedcushioningsystems- applicationsofexpandedpolystyreneinpackaging -Advantagesanddisadvantagesofmouldedfoams- Comparisonbetweenflexible packaging and rigid packaging.	14 Hrs
v	TESTINGOFPLASTICSPACKAGING Testing of plastic packages - barrier properties - oxygen permeability - carbondioxidepermeability-oxygenheadspace- watervapourtransmissionrate(WVTR)-migrationproperties- compatibilityproperty -printing-labeling-pigmenting-sterilization systems.	14 Hrs

# **TextBooks:**

1. E.M.Susan-Understanding Plasticpackaging technology-HanserPublishers(1995)

# **ReferenceBooks:**

- 1. A.S.Athalye-Plastics in packaging -Tata McGraw-HillCo.Ltd.,NewDelhi(1992)
- 2. R.L.Butzko- Plasticssheetforming-HanserPublishers(1995)
- 3. JohnD.Beadle-Plasticsforming-Ilifee,London(1982)
- 4. E.C.Bernhardt-Processingof ThermoplasticMaterials -.HanserPublishers(1995)

## N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

# (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: ELECTIVE THEORY II: C.POLYMER PRODUCT QUALITY CONTROL MANAGEMENT
Semester	: VI Semester
Subject Code	: 4974630 C
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

# **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 w					16 weeks		
	Inst	ructions	Examination				
Subject	Hours	Hours /	Marks				
			Internal	End	Total	Duration	
	/	Semester	Assassment	Semester			
	Week		Assessment	Examinatio			
				n			
POLYMER							
PRODUCT							
QUALITY	5 Hrs	80 Hrs	25	100*	100	3 Hrs	
CONTROL						01110	
MANAGEMENT							

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **Topics and Allocation of Hours**

Unit	Topics	Hours
I	INTRODUCTION	15
II	TQM PRINCIPLES	15
	TQM TOOLS AND TECHNIQUES I	15
IV	TQM TOOLS AND TECHNIQUES II	14
V	QUALITY SYSTEMS	14
	Test & Model Exam	7
	TOTAL	80

#### RATIONALE:

This subject will help the students to understand the techniques to be adopted to ensure the quality of the product and thereby the customer satisfaction. It also, enriches the students with the rejection analysis and prevention techniques. It aided the vital quality system and certification required to ensure the quality of the product.

### **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able to:

- Remember the basic principles behind quality
- Apply the techniques for defect analysis
- Analyse the cause and effect using TQM techniques
- Choose the quality system requirement as per the organization requirements

# POYMER PRODUCT QUALITY CONTROL MANAGEMENT

#### Content:Theory

Unit	Name of the Topic	Hours
I	<b>INTRODUCTION</b> Introduction - Need for quality - Evolution of quality - Definitions ofquality - Dimensions of product and service quality - Basic concepts ofTQM - TQM Framework - Contributions of Deming, Juran and Crosby -Barriers to TQM - Quality statements - Customer focus - Customerorientation,Customersatisfaction,Customercomplaints,Custom erretention -Costsofquality.	15 Hrs
II	TQMPRINCIPLESLeadership - Strategic quality planning, Quality Councils -Employeeinvolvement - Motivation, Teamwork, Quality circlesRecognition andReward, Performance appraisal - Continuous processimprovement -PDCA cycle,5S,8DKaizen- SupplierRating.	15 Hrs
111	<b>TQMTOOLS ANDTECHNIQUESI</b> The seven traditional tools of quality - New management quality tools - Sixsigma:Concepts,Methodology,applicationstomanufacturing,servicese ctor-Benchmarking-Reasontobenchmark,Benchmarkingprocess-FMEA - Stages,Types.	15 Hrs
IV	<b>TQMTOOLS ANDTECHNIQUESII</b> Quality circle - Quality function deployment (QFD) - Total productivemaintenance (TMP) - Concept - Performance measure - Businessprocess re-engineering (BPR) - principle, reengineering process,benefitsandlimitations.	14 Hrs
V	QUALITYSYSTEMS NeedforISO9000-QualitySystem-Elements,Implementationof Quality System, Documentation, Quality Auditing, ISO 14001 - PurposeofIATF16949- SignificanceofREACHCompliance	14 Hrs

# TEXTBOOK:

1 DaleH.Besterfiled, etat., TotalqualityManagement,PearsonEducationAsia,Third Edition,IndianReprint2006.

# **REFERENCES:**

- JamesR.EvansandWilliamM.Lindsay, TheManagementandControlofQuality, 8th Edition, FirstIndianEdition, CengageLearning, 2012.
- Suganthi.LandAnandSamuel, TotalQualityManagement,PrenticeHall(India)Pvt. Ltd.,2006.
- Janakiraman.BandGopal.R.K., TotalQualityManagement-TextandCases|, Prentice Hall (India)Pvt.Ltd.,2006.

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#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 - 2022 onwards)

Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

- Subject Code : 4974640
- Semester : VI Semester

: POLYMER TESTING PRACTICAL

# **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours Hours /		Marks			
Cubjeet	/ Week	Semester	Internal Assessment	End Semester Examinatio n	Total	Duration
POLYMER TESTING PRACTICAL	6 Hrs	96 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **RATIONALE:**

Subject Title

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

#### **Objectives:**

On completion of the experiments given in the syllabus the students will be able to:

- Identify the suitable testing machine, specimen, condition and standard
- Find outthemechanicalpropertiesofthepolymericmaterialasperthestandard
- Measuretheflammabilitypropertiesofthepolymericmaterialasperthestandard
- Determine the thermal properties of the polymeric material as per the standard
- Calculatetherheologicalpropertiesofthepolymericmaterialasperthestandard

- 1. Determination of Hardness
- 2. Determination of Tensile strength
- 3. Determination of Lapshear strength
- 4. Determination of Flexural strength
- 5. Determination of Rebound resilience
- 6. Determination of Impact strength
- 7. Determination of Abrasion resistance
- 8. Determination of Fatigue strength
- 9. Determination of Compression set
- 10. Determination of Meltflowindex
- 11. Determination of Heat distortion temperature
- 12. Determination of Flammability

# LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	UTMwithaccessoriesandfixtures	1
2.	Durometer(ShoreA&D)	1
3.	Reboundresiliencetester	1
4.	Impacttester(Izod&Charpy)	1
5.	Fallingdartimpacttester	1
6.	DinAbrader	1
7.	Fatiguetester	1
8.	Compressionsetapparatus	1
9	MFI Tester	1
10.	HDTTester	1
11.	Dialgauge	2
12.	Verniercaliper	2
13.	Hotairoven	1
14.	Stopwatch	2
15.	Screwgauge	2
16.	Binderclips	10

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: ELECTIVE PRACTICAL II: A.POLYMER MOULD ENGINEERING PRACTICAL
Semester	: VI Semester
Subject Code	: 4974650A
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

# **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours	Hours /		Marks		
Cubject	/ Semester Week	Internal Assessment	End Semester Examinatio n	Total	Duration	
POLYMER MOULD ENGINEERING PRACTICAL	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

#### **Objectives:**

On completion of the experiments given in the syllabus the students will be able to:

- Design and draw mould basic components and their assembly
- Design and draw two plates inglecavity and multicavity mould
- Design and drawt hree plate multicavity mould
- Design and draw compression mould
- Squaring of a metal plate on Milling and Grinding.
- Machining of mould components
- Making a cavity plate by Vertical milling
- Making Core plate by Milling and Grinding.

- 1. Drawing mould basic component Ejection grid assembly (top view and cut sectional view)
- 2. Design and draw single cavity two plate injection mould
- 3. Design and draw multi cavity two plate injection mould
- 4. Design and draw multi cavity three plate injection mould
- 5. Design and draw compression mould (any one type)
- 6. Squaring of a metal plate on Milling and Grinding.
- 7. Machining Guide pillar & amp; Guide bush
- 8. Drilling and counter boring holes for Guide pillar and Guide bush
- 9. Making a cavity plate by Vertical milling
- 10. Making Core plate by Milling and Grinding.

# LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	AutoCadSoftware(not less than 2007)	1
2.	System(aboveP3configuration)	30
3.	Lathe	1
4.	Milling Machine	1
5.	Surface Grinding Machine	1
6.	Drilling Machine	1

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: ELECTIVE PRACTICAL II: B.PACKAGING TECHNOLOGY PRACTICAL
Semester	: VI Semester
Subject Code	: 4974650B
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

# **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours	Hours / Semester	Marks			
	/ Week		Internal Assessment	End Semester Examinatio n	Total	Duration
PACKAGING TECHNOLOGY PRACTICAL	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

#### **RATIONALE:**

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

#### **Objectives:**

On completion of the experiments given in the syllabus the students will be able to:

- Identify the suitable testing machine, specimen, condition and standard
- Find out the mechanical properties of the packaging material as per the standard
- Measure the thermal properties of packaging material as per the standard
- Determine the optical properties of the packaging material as per the standard
- Calculate therheological properties of the packaging material as per the standard

- 1. Determination of Thickness and GSM
- 2. Determination of Tensile strength
- 3. Determination of Tear strength
- 4. Determination of Falling dartimpact strength
- 5. Determination of static and dynamic friction
- 6. Determination of transmittance
- 7. Determination of ESCR
- 8. Determination of Dimension stability
- 9. Determination of Meltflo windex
- 10. Determination of Heat stability

# LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	UTM with accessories and fixtures	1
2.	Elmendorfteartester	1
3.	Falling dartimpacttester	1
4.	Friction tester	1
5.	Opticaltesterfortransmittance	1
6.	MFI Tester	1
7.	ESCR apparatus with specimen holder	1
8.	Hotairoven	1
9	Dialgauge	1
10.	Electronic weighing balance	1
11.	Screw gauge	2

#### Reference:

1.Packaging Technology Labmanual

#### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

#### (Implemented from the Academic Year 2021 - 2022 onwards)

Semester	: VI Semester
Subject Code Semester	: 4974650B : VI Semester
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

C.POLYMER PRODUCT QUALITY CONTROL PRACTICAL

# **TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 16 weeks

	Instructions		Examination			
Subject	Hours Hours /		Marks			
	/ Week	Semester ek	Internal Assessment	End Semester Examinatio n	Total	Duration
PACKAGING TECHNOLOGY PRACTICAL	5 Hrs	80 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks **RATIONALE:** 

This practical session will help the students to have hands on experience in ensure the quality of the product and thereby the customer satisfaction. Also, the students will know to analyse the polymer product rejection through rejection analysis and prevention techniques.

#### **OBJECTIVES:**

On completion of the units of syllabus contents the students will be able to:

- Prepare DFMEA, PFMEA and Control plan for a new polymer rproduct
- Carryout Pareto analysis technique for controlling the rejection
- Apply why-why technique for analyzing the cause and effect factor
- Prepare Gantt chart for a newly proposed project

- 1. Preparation of DFMEA for development of new thermoplastic product
- 2. Preparation of PFMEA for development of new thermoplastic product
- 3. Preparation of DFMEA for development of new thermoset product
- 4. Preparation of PFMEA for development of new thermoset product
- 5. Pareto analysis for the rejection of any one thermoplastic product
- 6. Pareto analysis for the rejection of any one thermoset product
- 7. Why-Why analysis for the rejection of any one thermoplastic product
- 8. Why-Why analysis for the rejection of any one thermoset product
- 9. Preparation of Gantt chart for a new polymer product development
- 10. Preparation of control plan for a new polymer product development

# LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	Name of Equipment/Instrument	Quantity
1.	Drawing table	30

# TEXTBOOK:

1 DaleH.Besterfiled, etat., TotalqualityManagement,PearsonEducationAsia,Third Edition,IndianReprint2006.

# **REFERENCES:**

- 1. JamesR.EvansandWilliamM.Lindsay, TheManagementandControlofQuality, 8th Edition, FirstIndianEdition, CengageLearning, 2012.
- 2. Suganthi.LandAnandSamuel, TotalQualityManagement,PrenticeHall(India)Pvt. Ltd.,2006.
- 3. Janakiraman.BandGopal.R.K., TotalQualityManagement-TextandCases, Prentice Hall (India)Pvt.Ltd.,2006.

### N - 20 SCHEME

## DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

## (Implemented from the Academic Year 2021 - 2022 onwards)

- Subject Code : 4974660
- Semester : VI Semester

#### Subject Title

#### : PROJECT WORK AND INTERNSHIP TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

	Inst	ructions		Examinatio	n	
Subject	Hours	Hours /	Marks			
	Semester	Internal	End Semester	Total	Duration	
	Week		Assessment	Examinatio		
				n		
PROJECT WORK						
AND INTERNSHIP	6 Hrs	96 Hrs	25	100*	100	3 Hrs

\* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

# **OBJECTIVES:**

- To develop the creative talents in the students.
- The project work should involve less cost, easy manufacturing technique and suitable to thereal life situations.
- The project work should be useful to the mankind.
- To give the students a taste of real life problem solving and thus simulate industrial environment within the polytechnic.
- To develop those abilities that cannot be developed by normal class

roomsituationssuchasgroupwork, sharing responsibility, initiate, creativity etc.

#### a) Internal assessment mark for Project Work & Internship:

Total	 25 marks
	theorysubjectpattern)
Attendance	 05marks(Awardofmarks sameas
ProjectReviewII	 10 marks
ProjectReviewI	 10 marks

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the

inspection team at the time of inspection/verification.

Total	100*marks			
InternshipReport	20marks			
VivaVoce	30marks			
Report	25marks			
Demonstration/Presentation	25marks			
<ul> <li>b) Allocation of Marks for Project Work and Internship in Autonomous Examinations:</li> </ul>				

\*Examination will be conducted for 100 marks and will be converted to 75marks.

# c) Internship Report:

The internship training for a period of two weeks shall be undergone byevery candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry/ Government or Private certified agencies which are in social sector /Govt.Skill Centres /Institutions /Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work and Internship Autonomous examination.

#### Note: -

- The selection of Project work should be carried out in V semester itself.
- The Project committee's approval should be obtained prior to the executing ofproject.
- The students should maintain a logbook of the work carried out by them.



### N - 20 SCHEME

#### DIPLOMA IN POLYMER TECHNOLOGY (FULL TIME-SANDWICH)

## (Implemented from the Academic Year 2021 - 2022 onwards)

Subject Title	: INDUSTRIAL TRAINING AND VIVA VOCE
Semester	: VII Semester
Subject Code	: 4974710
Course Name	: 2074: DIPLOMA IN POLYMER TECHNOLOGY

# TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 1						16 weeks
	Instructions		Examination			
Subject	Hours	Hours /	Marks			
	,	Compoter	Internal	End	Total	Duration
	/	Semester	Assessment	Semester		
	Week			Examinatio		
				n		
INDUSTRIAL						
TRAINING AND		_				
	-	-	50	150*	200	3 Hrs
VIVA VOCE						

#### 1. Introduction

The main objective of the sandwich Diploma Course is to mould a well rounded technician acclimated with industrial environment while being a student in the institution.

The Sandwich Diploma Course study is pursued by students, in 7 semesters of 31/2 years duration, the subjects of 3 years- Full Time Diploma Course being regrouped for academic convenience.

The Apprenticeship (Amendment) Act 1973 is followed in regulating the Industrial training procedure for Sandwich Course.

- Industrial training-VII Semester
- Duration: June to October

# 2. ATTENDANCECERTIFICATION

Every month students have to get their attendance certified by industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the sectional mark.

# 3. Training Reports

The students have to prepare two types of reports:

• Weekly report in the formot diary to be submitted to the concerned staff incharge of the institution. This will be reviewed while awarding sectional marks.

• Comprehensive report attheend of each spell which will be used for Board

# 3.1 IndustrialTrainingDiary

Students are required to maintain the record of day -to- day work done. Such record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars(Presence, Absence,Leave,Holidays etc.). The concern Industrial supervisor is to check periodically these progress reports.

# 3.2 Comprehensive Training Report

In additions to the diary, students are required to submit a comprehensive report on training with details of the organization where the training was undergone after attestation by the supervisors. The comprehensive report should be incorporating study of plant / product /process / construction along with intensive in-depth study on any one of the topics such as processes, methods, tolling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be incorporated with the consent of the Organization.