SYLLABUS

DIPLOMA IN POLYMER TECHNOLOGY

(FULL TIME - SANDWICH)

M – SCHEME

2015 – 2016 onwards

COURSE CODE : 2074

DIRECTORATE OF TECHNICAL EDUCATION
GOVERNMENT OF TAMILNADU

SYLLABUS COMMITTEE

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PREFACE

Polymer technology is a branch of materials science that deals with the study of long chain molecules, which form an important part of modern technology. Materials that are typically classified as polymers are plastics, rubber, paints, sealants, foam, adhesives, etc. Today these materials are present in practically every facet of life and it has become impossible to live without them. Hence it is not exaggerated that to say we are living in “Polymer Age”.

The course in polymer technology provides an understanding of polymer materials, properties, manufacturing processes, analyses and applications. These enable students to gain a better understanding of key issues in the polymer industry. Industries that are totally dependent on polymer include the packaging, automotive, music, clothing, medical, information technology, aerospace, building and construction industries. As such, there are career opportunities in these major areas. Many companies that deal with the production and marketing of polymer commodities also offer employment to polymer technologists and engineers. The diploma holders play a vital role in the industries as such they are recruited for either supervisory level or as semi-technical personnel on the floor job. So framing of syllabus assumes a special significance for its importance and relevance to meet the technological advancements taking place around the globe and to cope up with the modernization-taking place in the field of polymer engineering.

This M-Scheme syllabus is designed and framed in tune with the international standard, under the light of new guidelines and policy prescribed by the Directorate of Technical Education on behalf of the Government of Tamilnadu.

Salient features of ‘M’ Scheme are: Removal of obsolete portions, Addition of topics covering of new technology like Green polymer chemistry, biomedical applications of polymers, waste management, Nano Technology, Composites Technology, Polymer Mould Engineering, Inclusion of Professional Ethics, Preparing the students to tackle emergency situations due to various disasters, Enhancement of Computer Skills, Soft Skills and Practical Skills.

A sound knowledge of fundamentals are included. The skill and knowledge expected from a Diploma holder to suit the needs of an industry are incorporated.

CONVENER
Syllabus revision committee – M Scheme
Thiru. N.Murugan, M.Tech.,
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DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY

(SEMESTER SYSTEM)

(Implemented from 2015- 2016)

M – SCHEME

R E G U L A T I O N S*

* *Applicable to the Diploma Courses other than Diploma in Hotel Management & Catering Technology and the Diploma Courses offered through MGR Film Institute, Chennai.*

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 Diploma in Engineering (sandwich) 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 4th and/or during 7th 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 diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*, the subjects of 3 year full time diploma courses being regrouped for academic convenience.

* Each Semester will have 15 weeks duration of study with 35 hrs. /Week for Regular Diploma Programme and 18hrs/ week (21 hrs. / Week I year) for Part-Time Diploma Programmes.

The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Courses viz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) have been revised and revised curriculum is applicable for the candidates admitted from 2015 – 2016 academic year onwards.

2. Condition 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, TamilNadu.

(Or)

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

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

Any other Examination recognized as equivalent to the above by the Board of Secondary Education, TamilNadu.

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 TamilNadu affiliated to the TamilNadu Higher Secondary Board with eligibility for university Courses of study or equivalent examination, & Should have studied the following subjects.

Sl. No	Courses	H.Sc Academic	H.Sc Vocational	
		Subjects Studied	Subjects Studied	
			Related subjects	Vocational subjects
1.	All the Regular and Sandwich Diploma Courses	Maths, Physics & Chemistry	Maths / Physics / Chemistry	Related Vocational Subjects Theory & Practical
2.	Diploma course in Modern Office Practice	English & Accountancy English & Elements of Economics English & Elements of Commerce	English & Accountancy, English & Elements of Economics, English & Management Principles & Techniques, English & Typewriting	Accountancy & Auditing, Banking, Business Management, Co-operative Management, International Trade, Marketing & Salesmanship, Insurance & Material Management, Office Secretaryship.

- For the diploma Courses related with Engineering/Technology, the related / equivalent subjects prescribed along with Practical 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.

- For admission to the Textile Technology, Leather Technology, Printing Technology, Chemical Technology and Modern Office Practice Diploma courses the candidates studied the related subjects will be given first preference.

- *Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Courses.*

4. Age Limit: No Age limit.

5. Medium of Instruction: English

6. 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, TamilNadu, 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 Period	Maximum Period
Full Time	3 Years	6 Years
Full Time(Lateral Entry)	2 Years	5 Years
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

7. 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. The curriculum outline is given in Annexure **- I**

8. Examinations:

Board 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 and 75 marks are allotted for Board Examination.

9. 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 **5 Marks**

(Award of marks for subject attendance to each subject theory/practical will as per 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 # **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Out of which the best one will be taken and the marks to be reduced to: 05 marks

The Test – III is to be the Model test covering all the five units and the marks so obtained will be reduced to : 05 marks

Total **10 marks**

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6th week	50	2 Hrs
Test II	Unit – III & IV	End of 12th week	50	2 Hrs
Test III	**Model Examination** - **Compulsory** Covering all the 5 Units. (Board Examination-question paper-pattern).	End of 15th week	75	3 Hrs

 # - From the Academic year 2015-2016 onwards.

Question Paper Pattern for the Periodical Test :(Test - I & Test- II)

With no choice:

PART A type questions:	4 Questions X 2 mark	… … 8 marks
PART B type questions:	4 Questions X 3 marks	… … 12 marks
PART C type questions:	3 Questions X 10 marks	… … 30 marks

	Total	50 marks
		----------

iii) Assignment **10 Marks**

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 10 marks

All Test Papers and assignment notebooks after getting the signature with date from the students must be kept in the safe custody in the Department for verification and audit. It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at 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 (Award of marks as same as Theory subjects)	:	**5 Marks**
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 board examinations.*
- The Record for every completed exercise should be submitted in the subsequent Practical classes and marks should be awarded for 20 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 and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)

- The students have to submit the duly signed bonafide record note book/file during the Practical Board Examinations.
- *All the marks awarded for assignment, Test and attendance should be entered in the Personal Log Book of the staff, who is handling the subject. This is applicable to both Theory and Practical subjects.*

10. Life and Employability Skill Practical:

The Life and Employability Skill Practical with more emphasis is being introduced in IV Semester for Circuit Branches and in V Semester for other branches of Engineering.
Much Stress is given to increase the employability of the students:

Internal assessment Mark **….. 25 Marks**

11. Project Work:

The students of all the Diploma Programmes **(except Diploma in Modern Office Practice)** 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, Tamilnadu. 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.**

a) Internal assessment mark for Project Work & Viva Voce:

Project Review I	…	**10 marks**
Project Review II	…	**10 marks**
Attendance	…	**05 marks** (award of marks same as theory subjects pattern)
Total	…	**25 marks**

Proper record to be maintained for the two Project Reviews, and It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Mark for Project Work & Viva Voce in Board Examination:

Viva Voce	…	**30 marks**
Marks for Report Preparation, Demo	…	**35 marks**
Total		**65 marks**

c) Written Test Mark (from 2 topics for 30 minutes duration): $

i) Environment Management	2 questions X 2 ½ marks	= **5 marks**
iI) Disaster Management	2 questions X 2 ½ marks	= **5 marks**
		10marks

$ - Selection of Questions should be from Question Bank, by the External Examiner.

No choice need be given to the candidates.

Project Work & Viva Voce in Board Examination	--	**65 Marks**
Written Test Mark (from 2 topics for 30 minutes duration)	--	**10 Marks**
TOTAL	--	**75 Marks**

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual during the Project Work & Viva Voce Board examination.

12. Scheme of Examinations:

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

13. Criteria for Pass:

1. 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 by AICTE 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 subject* out of the total prescribed maximum marks including both the internal assessment and the Board Examination marks put together, subject to the condition that he/she secures at least a minimum of *30 marks out of 75 marks in the Board's Theory examinations and a minimum of 35 marks out of 75 marks in the Board Practical Examinations.*

14. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2018 onwards (Joined in first year in 2015-2016) 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 3/ 3½/ 4 years (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 of marks in all the semesters put together and passes all the semesters except the I and II semesters in the first appearance itself and passes all the subjects within the stipulated period of study 3/ 3½/ 4 years (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 semesters put together and passes all the subjects within the stipulated period of study 3/ 3½ / 4 years (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 mentioned classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2018 /April 2019 onwards (both joined in First Year in 2015-2016)

15. Duration of a period in the Class Time Table:

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 as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

16. Seminar:

For seminar the total seminar 15 hours(15 weeks x 1hour) should be distributed equally to total theory subject per semester(i.e 15 hours divided by 3/4 subject). A topic from subject or current scenario is given to students. During the seminar hour students have to present the paper and submit seminar material to the respective staff member, who is handling the subject. It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

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ANNEXURE - I

CURRICULUM OUTLINE

THIRD SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
37531	Basic Organic Chemistry	5	-	-	5
37032	Mechanical Engineering*	5	-	-	5
37033	Electrical and Electronics Engineering*	5	-	-	5
37534	CAD Practice	-	-	4	4
37035	Electrical and Electronics Engineering Practical*	-	-	5	5
37036	Workshop Practice – II*	-	-	6	6
30001	Computer Applications Practical#	-	-	4	4
Seminar		1	-	-	1
TOTAL		16	-	19	35

FOURTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
37541	Polymer Science	5	-	-	5
37542	Polymeric Materials	5	-	-	5
37543	Chemical Engineering	5	-	-	5
37044	Engineering Drawing*	-	4	-	4
37545	Polymer Science Practical	-	-	5	5
37546	Polymer Preparation and Identification Practical	-	-	5	5
37547	Chemical Engineering Practical	-	-	5	5
Seminar		1	-	-	1
TOTAL		16	4	15	35

FIFTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
37551	Plastics Processing	5	-	-	5
37552	Rubber Processing and Product Manufacture	5	-	-	5
37053	Process Instrumentation and Control*	5	-	-	5
37571 37572	ELECTIVE I: 1. Polymer Composites 2. Tyre Technology	5	-	-	5
37055	Chemical Process Measurement and Control Practical*	-	-	5	5
37556	Polymer Processing Practical	-	-	5	5
30002	Life and Employability Skill Practical#	-	-	4	4
Seminar		1	-	-	1
TOTAL		21	-	14	35

SIXTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
37561	Plant Engineering and Management	5	-	-	5
37562	Polymer Testing	5	-	-	5
37581 37582	ELECTIVE II: 1. Polymer Mould Engineering 2. Packaging Technology	5	-	-	5
37564	Polymer Testing Practical	-	-	5	5
37565	Computer Aided Mould Design Practical	-	-	5	5
37566	Mould Making Practical	-	-	5	5
37567	Project Work	-	-	4	4
Seminar		1	-	-	1
TOTAL		16	-	19	35

SEVENTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical hours	Total Hours
37592	Industrial Training Report and Viva Voce	-	-	-	-

***Subject Common to Diploma in Chemical Engineering (M Scheme)**

ANNEXURE - II

SCHEME OF EXAMINATION

THIRD SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam. Marks	Total Mark		
37531	Basic Organic Chemistry	25	75	100	40	3
37032	Mechanical Engineering*	25	75	100	40	3
37033	Electrical and Electronics Engineering*	25	75	100	40	3
37534	CAD Practice	25	75	100	50	3
37035	Electrical and Electronics Engineering Practical*	25	75	100	50	3
37036	Workshop Practice – II*	25	75	100	50	3
30001	Computer Applications Practical#	25	75	100	50	3
TOTAL		175	525	700		

FOURTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam Marks	Total Mark		
37541	Polymer Science	25	75	100	40	3
37542	Polymeric Materials	25	75	100	40	3
37543	Chemical Engineering	25	75	100	40	3
37044	Engineering Drawing*	25	75	100	40	3
37545	Polymer Science Practical	25	75	100	50	3
37546	Polymer Preparation and Identification Practical	25	75	100	50	3
37547	Chemical Engineering Practical	25	75	100	50	3
TOTAL		175	525	700		

SCHEME OF EXAMINATION

FIFTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam. Marks	Total Mark		
37551	Plastics Processing	25	75	100	40	3
37552	Rubber Processing and Product Manufacture	25	75	100	40	3
37053	Process Instrumentation and Control*	25	75	100	40	3
37571 37572	ELECTIVE I: 1. Polymer Composites 2. Tyre Technology	25	75	100	40	3
37055	Chemical Process Measurement and Control Practical*	25	75	100	50	3
37556	Polymer Processing Practical	25	75	100	50	3
30002	Life and Employability Skill Practical#	25	75	100	50	3
		175	**525**	**700**		

SIXTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam Marks	Total Mark		
37561	Plant Engineering and Management	25	75	100	40	3
37562	Polymer Testing	25	75	100	40	3
37581 37582	ELECTIVE II: 1. Polymer Mould Engineering 2. Packaging Technology	25	75	100	40	3
37564	Polymer Testing Practical	25	75	100	50	3
37565	Computer Aided Mould Design Practical	25	75	100	50	3
37566	Mould Making Practical	25	75	100	50	3
37567	Project Work	25	75	100	50	3
TOTAL		**175**	**525**	**700**		

SEVENTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam Marks	Total Mark		
37592	Industrial Training Report and Viva Voce	25	75	100	50	3

GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION

CHENNAI –600025

Diploma Programme

POLYMER TECHNOLOGY

(FULL TIME-SANDWICH)

‘M’ Scheme Syllabus

(2015– 16 onwards)

Question paper pattern

Common for all theory subjects

PART A ***- (1 to 8) 5 Questions are to be answered out of 8 questions for 2 marks each.*****(Question No. 8 will be the compulsory question and *can be asked from any one of the units)(From each unit maximum of two 2 marks questions alone can be asked)***

PART B ***- (9 to 16)5 Questions are to be answered out of 8 questions for 3 marks each.*** **(Question No. 16 will be the compulsory question and *can be asked from any one of the units) (From each unit maximum of two 3 marks questions alone can be asked)***

PART C ***- (17 to 21) Five Questions will be in the Either OR Pattern. Students have to answer these five questions. Each question carries 10 marks. (Based on the discretion of the question setter, he/she can ask two five mark questions (with sub division A & sub division B) instead of one ten marks question if required)***

III SEMESTER

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

III SEMESTER

M - SCHEME

2015 – 2016 onwards

BASIC ORGANIC CHEMISTRY

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37531
Semester : III Semester
Subject Title : **BASIC ORGANIC CHEMISTRY**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours /Week	Hours /Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
BASIC ORGANIC CHEMISTRY	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME(Hrs)
I	CLASSIFICATION, NOMENCLATURE AND PURIFICATION OF ORGANIC COMPOUNDS	15
II	ISOMERISM AND TYPES OF ORGANIC REACTIONS	15
III	HYDROCARBONS AND ALCOHOLS	15
IV	CARBONYL COMPOUNDS AND AMINES	15
V	AROMATIC COMPOUNDS	15
	Total	**75**

RATIONALE:

Organic chemistry is that branch of chemistry that deals with the structure, properties, and reactions of compounds that contain carbon. 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 of living.

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 must be able to know about

- To learn about the IUPAC nomenclature of the organic compounds.
- To know about the different methods of purification of the organic compound.
- To understand the different types of isomerism. Free radical, initiators and inhibitors.
- To know about the different types of fission of a covalent bond.
- To learn about the reaction intermediates.

- To study about the different types of organic reactions.
- To know about the methods of preparation properties and uses of ethylene, acetylene methanol, ethanol, ethylene glycol, glycerol and diethyl ether.
- To study the different methods of preparation properties and uses of formaldehyde, acetaldehyde, acetone, acetic acid, acetyl chloride, methyl magnesium chloride and amines.
- To learn to distinguish between primary, secondary and tertiary amine from their chemical properties.
- To learn the Hoffmann method of separation of primary, Secondary and tertiary amines.
- To learn about the fractional distillation of coal tar and the various fractions.
- To study about the methods of preparation of properties and uses of Benzene, nitrobenzene, aniline, Benzene diazonium chloride, phenol, benzaldehyde and benzoic acid.

37531- BASIC ORGANIC CHEMISTRY

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**CLASSIFICATION, NOMENCLATURE AND PURIFICATION OF ORGANIC COMPOUNDS** Classification of organic compounds IUPAC nomenclature - Alkane, Alkene, Alkyne, alcohol (Monohydric, dihydric and trihydric), ether, aldehyde, ketone, carboxylic acid (mono and di), acid chloride, ester, cyanide, isocyanide and amine (primary, secondary and tertiary). Purification of organic compounds - Principles of crystallization, sublimation, simple distillation, fractional distillation and column chromatography.	**15 Hrs**
II	**ISOMERISM AND TYPES OF ORGANIC REACTIONS** Isomerism - structural isomerism - chain isomerism, position isomerism, functional isomerism, metamerism and tautomerism (Ketoenol tautomerism only). Stereoisomerism - optical isomerism (Lactic acid only)-Geometrical isomerism (Maleic acid and Fumaric acid). Types of organic reactions - I - Electrophile and nucleophile - Examples - Substitution reactions - Addition reaction - Addition in olefinic compounds - Markonikoff's Rule - Peroxide effect - Addition in Carbonyl compound (Addition of $NaHSO_3$ and HCN to carbonyl group only) Elimination reaction (Mechanism of E_2 and E_1 types are not included) - Isomerisation reaction - condensation reaction - Polymerisation - Addition Polymerisation (Ethylene and Styrene) by free radical mechanism only - Condensation polymerization (Terelene and Nylon-6,6)	**15 Hrs**

Unit	Name of the Topic	Hours
III	**HYDROCARBONS AND ALCOHOLS** General methods of preparation, properties and uses of ethylene, acetylene, Methanol (from water gas and by oxidation of CH_4). Ethanol (from ethylene, molasses and starch), Ethylene glycol (from ethylene and ethylene diamine), Glycerol (from fats and oils and from propylene)	**15 Hrs**
IV	**CARBONYL COMPOUNDS AND AMINES** General methods of preparation, properties and uses of Formaldehyde, Acetone, Acetic acid, and Amines (Primary secondary and tertiary amine). Separation of primary, secondary and tertiary amines by Hoffmann method - Difference between primary, Secondary and tertiary amines.	**15 Hrs**
V	**AROMATIC COMPOUNDS** Coal tar - Fractional distillation of coal tar - Different products and their uses - Commercial preparation of benzene from (i) coal tar and (ii) Petroleum - Properties of benzene. General methods of preparation properties and uses of Nitrobenzene, Aniline, Phenol, Benzaldehyde and Benzoic acid.	**15 Hrs**

Text Books:

1. B.S. Bahl and Arun Bahl - Text book of organic Chemistry
2. P.L. Soni and H.M. Chawla - Text book of organic Chemistry

Reference Books:

1. K.S. Tewari S.N. Mehrotra and N.K. Vishnoi - Text book of organic chemistry
2. B.K. Sharma, G.P. Pokhariyal and S.K.Sharma.- Organic Chemistry - Vol-I and II
3. S.P. Shukla and G.L. Trivedi - Modern Organic Chemistry
4. +1 and +2 Chemistry - Tamil Nadu Textbook Corporation.

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DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

III SEMESTER

M - SCHEME

2015 – 2016 onwards

MECHANICAL ENGINEERING

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology (Full Time)**
Subject Code : 37032
Semester : III Semester
Subject Title : **MECHANICAL ENGINEERING**

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MECHANICAL ENGINEERING	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME (Hrs)
I	**STRENGTH OF MATERIALS**	**15**
II	**MECHANICAL SYSTEMS AND FRICTION**	**15**
III	**BASICS OF THERMODYNAMICS AND REFRIGERATION**	**15**
IV	**STEAM BOILERS, STEAM TURBINES AND I.C ENGINES**	**15**
V	**FUELS, NANOTECHANOLOGY AND ROBOTICS**	**15**
	Total	**75**

ROTIONALE

Chemical Engineering is intimately related with large areas of mechanical engineering. It is, therefore, essential for a chemical engineering to have basic knowledge of mechanical engineering.

OBJECTIVES

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

1.1 Various properties of materials which are commonly used in the Chemical and plastic industries.
2.1 Using the various metals according to the requirements.
3.1 Transmitting motion from one shaft to another shaft by using various methods like chain, gears and belt and drives.
4.1 Heat energy and generation of steam by using boilers.
4.2 Function of boilers, control devices, safety devices of boilers.
4.3 Explain the basics of systems and laws of thermodynamic and thermodynamic process.
4.4 Refrigeration system.
4.5 Familiarize boiler mounting and accessories.
4.6 Explain the components of I.C Engines.
5.1 Explain Various properties of fuels.
5.2 Define different forms of nano materials.
5.3 Explain the components of robot.

37032-MECHANICAL ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**STRENGTH OF MATERIALS** Mechanical properties of materials – Elasticity, Plasticity, Ductility, Malleability, Wear resistance, Toughness, Brittleness, Hardness, Fatigue and Creep. Simple stresses and strains- types of stress- tensile, Compressive and shear stress – Stress -Strain diagram – Hooke's law – Young's modulus – Lateral strain – Poisson's ratio – Volumetric Strain – Bulk modulus- Temperature stress and strains. Cylindrical shells – Definition – Thin and thick cylindrical shell –. Comparison	**15 Hrs**
II	**MECHANICAL SYSTEMS AND FRICTION** Machine elements – Fasteners – Permanent fasteners – Riveted joints – Welded joints – Temporary fasteners – Screws – Bolts and nuts – Couplings.Power transmission – Belt drives – Advantages and disadvantages Gear drivers – Types of gear – Advantage and limitations Chain drives – Advantages and limitations Friction – Types of friction – Angle of friction – Angle of repose.	**15 Hrs**
III	**BASICS OF THERMODYNAMICS AND REFRIGERATION** Pressure – Unit of pressure – Temperature – Absolute temperature – S.T.P and N.T.P – Heat - Specific heat capacity at constant volume(Cv) and at constant pressure (Cp) – Thermodynamic system - Types – Zeroth, first and second laws of thermodynamics. Refrigerators and heat pumps – Vapour compression refrigeration system -Vapour absorption refrigeration system- Comparison – Capacity of refrigeration unit–Co-efficient of performance – Refrigerants– Desirable properties – Common refrigerants – Ammonia – Sulphur -di -oxide – Carbon- di- oxide – Freon – Application of refrigeration.	**15 Hrs**
IV	**STEAM BOILERS, STEAM TURBINES AND I.C ENGINES** Steam boiler – Classification of boilers – Boiler mountings – Safety valve – lever and spring loaded safety valve – Water level Indicator– Pressure gauge– Feed check valve – Boiler accessories – Economizer – Air pre heater – Super heater-Steam turbines – Classification- Differences between impulse and Reaction turbines.Classification of IC engines – Components of IC engines – Cylinderblock – Cylinder head– Cylinder liners– Piston – Piston rings – connecting rod – Crank shaft– Cam shaft– Valves – Working principle of IC engines – Two stroke and four stroke engines – Carburetor – Fuel Injection pump – Lubrication of IC engines- Purposes and properties of lubricants.	**15 Hrs**

Unit	Name of the Topic	Hours
V	**FUELS, NANOTECHNOLOGY AND ROBOTICS** Fuels – Classification – Solid, liquid and gaseous fuels– Fuel properties – Calorific value of fuels – Octane number –Cetane number– Flash point- Fire point – Cloud point – Pour point – smoke point-Freezing point and Viscosity Index.Nanomaterials – Different forms of nanomaterials – Synthesis of nanomaterials-Techniques for synthesis of nanomaterials – Chemical vapour deposition. Robot– definition – Major components – Robot arm– End effector – Power source – Controller – Sensor – Actuator – Need for Robots – Sensors – Definition – Types – Applications.	**15 Hrs**

TEXT BOOKS

1. Theory of Mechanics by R.S.Khurmi and J.K.Gupta-EURASIA PUBLISHING HOUSE, 1986.
2. Mechanical Technology by R.S.Khurmi-S.Chand and Co., 1988.
3. O.P.Gupta," Elements of fuels,furnaces and Refractories" ,Pergaunon Press,Khanna Publishers,Delhi-1-1991.
4. J.D.Girchrist, "Fuels, Furnaces and refractories " Pergunon press, Oxford-1977.
5. Thermal Engineering by N.Rangasamy and E.Sundaramoorthy-Narayana Publications-2011.
6. Engineering Physics-II by Dr.P.Mani-Dhanam Publications-2010.
7. Robotics by P.Jaganathan-Lakshmi Publications-2010.

REFERENCE

1. Heat Power Engineering-II by N.Rangasamy and E.Sundaramoorthy-Narayana Publications-1989.
2. Applied Mechanics and Strength of Materials by R.S.Khurmi-NIRJA Constructions and Development Co.ltd,-1986.
3. Thermal Engineering – Volume- II-S.I Units by M.L.Matur and F.S.Methur and F.S.Mehta-Jain Brothers (New Delhi) - 1992.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

III SEMESTER

M - SCHEME

2015 – 2016 onwards

ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37033
Semester : III Semester
Subject Title : **ELECTRICAL AND ELECTRONICS ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours /Week	Hours /Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ELECTRICAL AND ELECTRONICS ENGINEERING	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME (Hrs)
I	**BASICS IN ELECTRIC CURRENT**	**15**
II	**A.C CIRCUITS**	**15**
III	**ELECTROSTATICS AND ELECTROMAGNETISM**	**15**
IV	**D.C MACHINES ,A.C MACHINES AND TRANSFORMERS**	**15**
V	**BASIC ELECTRONICS**	**15**
	Total	**75**

RATIONALE:

All industries including Chemical, Ceramic, Sugar, Petro chemical and Polymer Industries depends on Electric Machineries, Electronics Instrumentation and control for their day to day operations. Therefore, it sounds better if engineering professional of any faculty understands the basics of Electrical and Electronics Engineering. This subject is aimed at developing the required fundamentals.

OBJECTIVES:

On Completion of the units of syllabus contents the students must be able to understand

1.1. Fundamental concepts of electric current
1.2. Solve the simple net work analysis problems.
2.1. Basic concepts in A.C circuits
2.2. Express the current in various forms of mathematical representation
3.1. The electrostatic principle of materials
3.2. Basic concepts in electromagnetism
4.1.The construction, working principle and applications of simple DC Generator, DC Motor &Transformer
4.2.The construction, working principle and applications of various AC Machines used In Chemical Industries
5.1. Basic concept behind the electron devices such as Diodes.
5.2. Basics of Microprocessors and Transducer

37033-ELECTRICAL AND ELECTRONICS ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**BASICS IN ELECTRIC CURRENT** Electric potential – Resistance- Laws of Resistance – Effects of temperature on Resistance –Resistivity- Resistors- Linear &non-linear Resistors- Ohm's law- Resistance in series & parallel- Conductance-conductivity- Capacitance- capacitor- parallel, multiple and variable plate capacitors- capacitors in series & parallel - Kirchoff's law - Net work analysis by Kirchoff's law and Maxwell's methods- power, work & energy - simple problems in capacitor &Resistor.	**15 Hrs**
II	**A.C CIRCUITS** Generation of AC current- Terminology in AC currents such as Inductance, Impedance ,Reactance, cycle, Time period, Frequency, Amplitude ,phase &phase angle – AC circuits in series &parallel – power factor-Active &Reactive components of current- Basic concepts in R-L, R-C &R-L-C circuits. Vector representation of AC current- various methods of representation such as rectangular ,Trigonometrical, exponent &polar forms-complex Algebra application in series &parallel circuits-simple problems in calculation of Impedance, current, power &power angle	**15 Hrs**
III	**ELECTROSTATICS AND ELECTROMAGNETISM** Static electricity-permittivity –laws of electrostatics - Terminology in electrostatics such as electrostatic induction ,electric flux density, field intensity ,electrical potential , dielectric strength and potential gradient- potential at a point-potential & electric intensity due to a charged sphere- simple problems in electrical potential and field intensity . Electromagnetism- magnetic effects of electric current-Faraday's law of electromagnetic induction- Fleming's Right hand rule-Lenz's law – Statically induced and dynamically induced e.m.f-self inductance and mutually inductance- production of induced e.m.f and current-Magnetic Hysteresis .	**15 Hrs**
IV	**D.C MACHINES, A.C MACHINES AND TRANSFORMERS** D.C generator- principle, construction and working of D.C generator – armature windings- various losses in armature such as Iron losses ,copper loss ,magnetic loss and stray losses. D.C motor-Torque- variable speed motors – principle and characteristics of D.C motor- variable speed motors –A.C motor-Induction motor, squirrel gage motor and synchronous motor – principle, construction and operation of above mentioned A.C motors-Alternators- principle, construction and operation of Alternator.- Transformers- principle, construction and operation of Transformer – types of Transformer.	**15 Hrs**

Unit	Name of the Topic	Hours
V	**BASIC ELECTRONICS** Methods of producing electronic emission- Thermionic emission- cathodes-Vacuum tubes- Diode and Triode –operation and characteristics of Diode and Triode Gas filled Diodes -Oscillators- Gas filled valves- Gas filled Diodes- construction and characteristics of Gas filled Diodes . Semiconductors-P-type and N- type semiconductors-P-N junction Diode –Zener Diode- Transistor- P-N-P , N-P-N Transistor – Triode Transistor- Thyristor- configuration ,working and characteristics of Transistor. Microprocessor-(8085): Architecture- Pin details- Simple Programs (Addition and Subtraction) using Microprocessors - Applications of Microprocessors.	**15 Hrs**

TEXT BOOKS:

1. A Text Book on Electrical Technology by B.L.Theraja- S. Chand & Co
2. Electronic Devices by V.K.Metha- S. Chand & Co

REFERENCE BOOKS:

1. Electronic Instrumentation by H.S. Kalsi - McGraw Hill
2. Process Control Instrumentation Technology by Curtis D. Johnson- John Wiley& Sons, Inc
3. Introduction to Microprocessor by Aditya P. Mathur- Tata McGraw Hill.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

III SEMESTER

M - SCHEME

2015 – 2016 onwards

CAD PRACTICE

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37534
Semester : III Semester
Subject Title : **CAD PRACTICE**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CAD PRACTICE	4	60	25	75	100	3 Hrs

RATIONALE:

In Diploma level engineering education design skill development plays a vital role. These can be achieved by using drawing softwares. This is accomplished by sketching engineering related products in practical classes.

Objectives:

- In this practical subject, the students are required to learn the basic concepts of AutoCAD like screen interface, various commands and co-ordinate system used.
- This practical subject will also impart them requisite knowledge of creating 2D objects using various draw commands.
- The students will also learn to draw the isometric drawings and isometric projections.
- The students will also learn the 3D fundamentals and 2D to 3D conversions.

LIST OF EXPERIMENTS

(60 Hours)

Introduction - Applications - Advantages over manual drafting - Software requirements - windows desktop - AutoCAD screen interface - menus - toolbars - How to start AutoCAD - command groups - How to execute command- types of coordinate systems-absolute-relative-polar.

Creating objects (2D) – using draw commands - Line, Arc, Circle, Ellipse, Donut, Polygon, Point, Pline, sketch, Trace- creating 2D solid.

Creating Text – dtext, mtext, text style- Mline, Spline - Drawing with precision - Osnap options – 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 - 3D fundamentals - 2D to 3D conversion.

S.No.	Topics	Hrs
1.	Introduction	4
2.	Draw Group commands, Osnap options, Drafting setting and Function keys	2
3.	Commands Practice	2
4.	Edit and Modify Group commands, Pledit, Text edit	2
5.	Commands Practice	2
6.	View groups, Inquiry, Block commands	2
7.	Commands Practice	2
8.	Hatching, Layer, color and linetypes	2
9.	Commands Practice	2
10.	Creating Isometric Drawing	2
11.	Isometric Drawing Ex. Practice	2
12.	File commands, Plotting, External reference	2
13.	3D Fundamentals	4
14.	Drawing Ex. Practice (Simple polymer products drawings in 2D only)	15
15.	Simple Mould Drawings (in 2D only)	15

Note: Software lower than version AutoCAD 2007 should not be used.

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

S.No.	Name of Equipment / Instrument	No.	Material	No. / Quantity
1.	Computers with at least P IV Configuration	30	Auto CAD 2007 & above software	1

BOARD EXAMINATION EVALUATION

Practical Examination

Note: All the exercises should be given in the question paper and students are allowed to select by a lot.

ALLOCATION OF MARKS

➢ Basic commands	**10** Marks
➢ Drawing	**50** Marks
➢ Printout	**10** Marks
➢ Viva-Voice	**05** Marks
➢ Internal Assessment	**25** Marks
➢ Total	**100** Marks

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

III SEMESTER

M - SCHEME

2015 – 2016 onwards

ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name	:	**Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code	:	37035
Semester	:	III Semester
Subject Title	:	**ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours /Week	Hours /Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICAL	5	75	25	75	100	3 Hrs

RATIONALE:

All industries including Chemical, Petrochemical and Polymer Industries depends on Electric Machineries, Electronics Instrumentation and control for their day to day operations. Therefore, it sounds better if an engineering professional of any faculty have hands on experience in handling electrical machineries and instruments. This subject is aimed at giving hands on experience of handling electrical and electronic devices.

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 Board Examinations.

LIST OF EXPERIMENTS

ELECTRICAL ENGINEERING

1. Determination of Unknown Resistance by ohms law.
2. Energy measurement in a single phase circuit using Lamp load.
3. Power measurement in a single phase circuit.
4. Load test on a single phase transformer.
5. Load test on a single phase induction Motor.
6. Verification of Series and parallel circuit.
7. Study of DC and AC machine Starters

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ELECTRONICS ENGINEERING

1. Characteristics of Transistor.
2. Transistor Based Amplifier.
3. Zener Diode Voltage Regulator
4. Construction of Bridge Rectifier.
5. Characteristics of Photo Diode.
6. Measurement using CRO
7. Addition and Subtraction using Microprocessor.

LIST OF EQUIPMENTS:

- Rheostat of various range
- RPS (0-12v, 0-30v)
- Ammeters (MC and MI) of various ranges
- Voltmeters (MC and MI) of various ranges
- Wattmeter – 300v/5A-2.5A/UPF
- Energy meter – 300v/5A
- CRO & Function Generator
- Microprocessor kit
- Diode, Transistor, Logic Gate ICs, Photodiode and Thermistor -10nos each(Consumable)
- Resistors, Capacitors various ranges
- Breadboards and connecting wires
- Multi meter

Note: Any 6 Experiments from Electrical and 6 from Electronics can be completed.

BOARD EXAMINATION EVALUATION
Practical Examination

Note: All the exercises should be given in the question paper and students are allowed to select by a lot.

ALLOCATION OF MARKS

➢ Procedure	10 Marks
➢ Observation (including taking readings)	25 Marks
➢ Calculation	30 Marks
➢ Result	05 Marks
➢ Viva-Voice	05 Marks
➢ Total	75 Marks

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

III SEMESTER

M - SCHEME

2015 – 2016 onwards

WORKSHOP PRACTICE-II

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37036
Semester : III Semester
Subject Title : **WORKSHOP PRACTICE-II**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
WORKSHOP PRACTICE-II	6	90	25	75	100	3 Hrs

OBJECTIVES

- Identify the parts if a center lathe
- Identify the work holding devices
- Set the tools for various operations
- Operate the Lathe and Machine a Component using Lathe
- Identify the tools used in Plumbing
- Identify the tools and equipments used in welding

LATHE SHOP:

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

PLUMBING SHOP:

1. Pipe cutting and thread cutting practice
2. "Coupling" joint
3. "Elbow" joint
4. "Tee" Joint

WELDING SHOP:

1. Straight Line Beds
2. Butt Joint
3. Lap Joint
4. "T" Joint
5. Corner Joint

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

S.No.	Name of Equipment / Instrument	No.
1	Lathe	10
2	Plumbing	10
3	Welding	10

BOARD EXAMINATION EVALUATION

Practical Examination

Note: Arrangement should be made to conduct the examination inside the workshop for any one of the section.
All the exercises should be given in the question paper and students are allowed to select by a lot.

ALLOCATION OF MARKS

- Dimensions **30** Marks
- Turning **/** Plumbing **/** Welding **30** Marks
- Finishing **10** Marks
- Viva Voice **05** Marks

- Internal Assessment **25** Marks

- TOTAL **100** Marks

COMMON TO ALL BRANCHES

II YEAR

III SEMESTER

M - SCHEME

2015 – 2016 onwards

COMPUTER APPLICATIONS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU.

DIPLOMA IN COMPUTER ENGINEERING

M- SCHEME

(to be implemented for the student Admitted from the Year 2015-2016 on wards)

(Implemented from the academic year 2016-2017 onwards)

Course Name : For All Branches

Subject Code : 30001

Semester : III

Subject title : COMPUTER APPLICATIONS PRACTICAL

TEACHING & SCHEME OF EXAMINATION:

No. of weeks per Semester: 15 Weeks

Course	Instruction		Examination			
			Max.			Duration
	Hours/ week	Hours/ Semester	Internal Assessment	Board Examination	Total	
COMPUTER APPLICATIONS PRACTICAL	4Hrs	60 Hrs	25	75	100	3Hrs

RATIONALE:

The application of Computer knowledge is essential the students of all disciplines of Engineering in addition to their respective branch of study. The Computer Application Practical course facilitates the necessary knowledge and skills regarding creating, working and maintaining the documents and presentation of documents with audio visual effects ina computer and produces necessary skills in E- Learning and Chatting tools..

OBJECTIVES:

On completion of the following exercises, the students will be able to

- Use the GUI operating systems
- Familiarize and customize the desktop
- Use the different facilities available in the word processor
- Prepare Power Point presentation with different formats
- Expose E-learning tools and chatting tools
- Analyze the datasheet
- Create and manipulate the database
- Create different types of charts
- Prepare PowerPoint presentation

- Understand Internet concepts and usage of e-mail

GUIDELINES:

- All the experiments given in the list of experiments should be completed and all the experiments should include for the end semester practical examination.
- The computer systems should be 1:1ratioforpracticalclasses

SYLLABUS
LAB EXERCISES
SECTION – A

GRAPHICAL OPEARTING SYSTEM

Introduction to GUI OS; Features and various versions of GUI OS & its use; Working with GUI OS; My Computer & Recycle bin ; Desktop, Icons and Explorer; Screen description & working styles of GUI OS; Dialog Boxes & Toolbars; Working with Files & Folders; simple operations like copy, delete, moving of files and folders from one drive to another, Shortcuts &Autostart; Accessories and Windows Settings using Control Panel- setting common devices using control panel, modem, printers, audio, network, fonts, creating users, internet settings, Start button & Program lists; Installing and Uninstalling new Hard ware & Software program on your computer - Copying in CD/DVD settings – Recording Audio files.

Exercises

1. a. Installing screen saver and change the monitor resolution by 1280X960
   b. Setting wall papers
   c. Creating, moving, deleting and renaming a folder
   d. Copy, paste and cut a folder/file
   e. Displaying the properties for a file or folder
2. a. Restoring files and folders from Recycle bin
   b. Creating short cuts for folder/file
   c. Finding a file or folder by name
   d. Selecting and moving two or more files/folders using mouse
   e. Sorting folders/files.

WORD PROCESSING

Introduction to Word Processing – Examples- Creation of new documents, opening document, insert a document into another document. Page setup, margins, gutters, font properties, Alignment, page breaks, header footer deleting, moving, replace, editing text in document. Saving a document, spell checker.

Printing a document. Creating a table, entering and editing, Text in tables. Changing format of table, height width of row or column. Editing, deleting Rows, columns in table. Borders, shading, Templates, wizards, drawing objects, mail merge.

Exercises

3. Create the following table and perform the operations given below

DAYS	1	2	3	4	5	6	7	8
MON	←TEST→		**A**: JPP		CA		RDBMS	TUT
			B:RDBMS					
TUE	CA	OOP	CN	RDBMS	**A**: RDBMS			
					B: JPP			
WED	CN	RDBMS	OOP	RDBMS	COMMUNICATIO N		CN	CA
THU	OOP	**A**: JPP			CA	RDBMS	CN	OOP
		B: RDBMS						
FRI	COMMUNICATI ON		**A**: RDBMS		OOP	CN	RDBMS	CA
			B: JPP					
SAT	OOPS	RDBMS	CN	CA	---------			

4. Create a standard covering letter and use mail merge to generate the customized letters for applying to a job in various organizations. Also, create a database and generate labels for the applying organizations.

5. Create a news letter of three pages with two columns text. The first page contains some formatting bullets and numbers. Set the document background colour and add 'confidential' as the watermark. Give the document a title which should be displayed in the header. The header/ footer of the first page should be different from other two pages. Also, add author name and date/ time in the header. The footer should have the page number.

SPREADSHEET

Introduction to Analysis Package – Examples - Concepts of Workbook & Worksheets; Using Wizards; Various Data Types; Using different features with Data, Cell and Texts; Inserting, Removing & Resizing of Columns & Rows; Working with Data & Ranges; Different Views of Worksheets; Column Freezing, Labels, Hiding, Splitting etc.; Using different features with Data and Text; Use of Formulas, Calculations & Functions; Cell Formatting including Borders & Shading; Working with Different Chart Types; Printing of Workbook & Worksheets with various options.

Exercises

6. Create a result sheet containing Candidate's Register No., Name, Marks for six subjects. Calculate the total and result. The result must be calculated as below and failed candidates should be turned to red.

   Result is Distinction if Total >= 70 %

   First Class if Total > = 60 % and < 70 %

   Second Class if Total >= 50 % and < 60 %

Pass if Total >= 35 % and < 50 %

Fail otherwise

Create a separate table based on class by using auto filter feature.

7. Create a table of records with columns as Name and Donation Amount. Donation amount should be formatted with two decimal places. There should be at least twenty records in the table. Create a conditional format to highlight the highest donation with blue color and lowest donation with red colour. The table should have a heading.

8. Create line and bar chart to highlight the sales of the company for three different periods for the following data.

SALES BAR CHART

Period	Product1	Product2	Product3	Total
JAN	35	40	50	125
FEB	46	56	40	142
MAR	70	50	40	160

SECTION – B

DATABASE

Introduction – Menus – Tool bar – Create – Edit – Save – Data types – Insert – Delete – Update – View – Sorting and filtering – Queries – Report – Page setup – Print.

Exercises

9. Create Database to maintain at least 10 addresses of your class mates with the following constraints

- Roll no. should be the primary key.
- Name should be not null

10. create a students table with the following fields: Sr.No, Reg. No, Name, Marks in 5 subjects. Calculate total and percentage of 10 students. Perform the following queries.

- To find the details of distinction student
- To find the details of first class students
- To find the details of second class students

11. Design a report for the above exercise to print the consolidated result sheet and mark card for the student.

PRESENTATION

Introduction - Opening new presentation, Parts of PowerPoint window – Opening -Saving and closing presentations - Features of PowerPoint, Background design, Word art, Clip art, Drawings,3D settings - Animations, Sound, Views, types of views - Inserting and deleting slides, arranging slides, slides show, rehearsal, setup show, custom show - Creating custom presentations, action setting, auto content wizard, working with auto content wizard

Exercises

12. Make a marketing presentation of any consumer product with at least 10 slides. Use different customized animation effects on pictures and clip art on any four of the ten slides.
13. Create a Presentation about our institution or any subject with different slide transition with sound effect.

INTERNET

Introduction – Getting acquainted with Internet Connection - Browsers – Website URL - Open a website – Net Browsing - Email: Creating E-mail id – Sending , receiving and deleting E-mail - Email with Attachments – CC and BCC - Chatting – Creating Group mail - Google docs – Search Engines – Searching topics .

Most Popular Social Networking Sites : History – Features – Services – Usage of Face book , Twitter and Linkdln.

Transferring data through wifi / bluetooth among different devices.

Introduction to cybercrime – Software Piracy – Viruses – Antivirus Software

Exercises

14. Create an e-mail id and perform the following
    - Write an e-mail inviting your friends to your Birthday Party.
    - Make your own signature and add it to the e-mail message.
    - Add a word attachment of the venue route
    - Send the e-mail to at least 5 of your friends.

15. Create a presentation on Google docs. Ask your friend to review it and comment onit. Use "Discussion" option for your discussions on the presentation.

Hardware and Software Requirements

Hardware Requirements:

- Computers – 36Nos
    - Intel Core i3 Processor
    - 500 GB Hard Disk, 2 MB RAM
    - 14" Monitor
- Projector – 1 Nos
- Laser Printer – 1 No
- Internet Connection – Minimum of 512 KB

Software Requirement

- Any GUI Operating System
- Open Source Software / MS- Office

1. SemesterEndExamination–75 Marks

Content	Max.Marks
Writing Procedure – One Question from Section A	15
Demonstration	15
Results with Printout	5
Writing Procedure – One Question from Section B	15
Demonstration	15
Results with Printout	5
Viva voce	5
Total	**75MARK**

IV SEMESTER

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

IV SEMESTER

M - SCHEME

2015 – 2016 onwards

POLYMER SCIENCE

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37541
Semester : IV Semester
Subject Title : **POLYMER SCIENCE**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
POLYMER SCIENCE	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME (hrs.)
I	**CHEMISTRY OF POLYMERISATION**	15
II	**COPOLYMERISATION AND POLYMERISATION TECHNIQUES**	15
III	**POLYMER MOLECULAR WEIGHTS & POLYMER SOLUTIONS**	15
IV	**STRUCTURE OF POLYMER, POLYMER CRYSTALLISATION & GLASS TRANSITION TEMPERATURE**	15
V	**POLYMER REACTIONS AND RHEOLOGY**	15
	Total	75

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 must be able to know about

- Monomer, Polymer and Polymerisation
- Free radical, initiators and inhibitors
- Ionic polymerization, co-ordination polymerization and Ziegler natta catalysts
- Salient feature of polymerisation reactions
- Copolymerisation and types of copolymers
- Surfactants - critical micelle concentration
- Significance of average moleculat weights,Molecular weight distribution in polymers
- Relationship between viscosity and molecular weight
- Process of polymer dissolution
- Chemical and geometrical structures of polymer molecules
- Theory of Polymer crystallization Significance of glass transition temperature
- Types of degradation and Applications of Rheological studies.

37541- POLYMER SCIENCE

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**CHEMISTRY OF POLYMERISATION** History of polymer - Classification of polymers - Functionality of compounds - Chemistry of polymerisation - Chain polymerisation - Free Radical polymerisation - Initiator - Chain transfer agents - Inhibitors - Ionic polymerisation - Cationic polymerisation - Anionic polymerisation - Living polymer _coordination polymerization - Ziegler-Natta catalysts - Step polymerisation - Polycondensation polymerisation - Polyaddition polymerisation - Ring opening polymerisation	**15 Hrs**
II	**COPOLYMERISATION AND POLYMERISATION TECHNIQUES** Copolymerisation - Free Radical copolymerisation – reactivity ratios and copolymerisation behaviour – ionic copolymerisation – copolycondensation -applications of co- polymers - polymerisation techniques - Bulk polymerisation - Solution polymerisation - Suspension polymerisation - Emulsion polymerisation - Surfactants - critical micelle concentration - Salient features of different polymerisation techniques.	**15 Hrs**
III	**POLYMER MOLECULAR WEIGHTS & POLYMER SOLUTIONS** Average molecular weight concept - Number average molecular weight - Weight average Molecular weight – Simple problems - Molecular weight and degree of polymerisation - Polydispersity and molecular weight distribution in polymers- Practical significance of polymer molecular weight. **Method of determination of molecular weight** i) Number average molecular weight: (Mn)- Gel permeation chromatography technique ii) Weight Average Molecular weight: (Mw)-Ultra centrifugation iii) Viscosity average molecular weight: (Mv) - Viscometry. **Polymer solutions:** The process of polymer dissolution - relationship between viscosity and molecular weight.	**15 Hrs**
IV	**STRUCTURE OF POLYMER, POLYMER CRYSTALLISATION & GLASS TRANSITION TEMPERATURE** Microstructure based on the chemical structure - Microstructure based on the geometrical structure - linear, branched and cross-linked polymers - random, alternating, block and graft copolymers - Stereo regular polymers –geometrical isomerism in polymer molecules - Polymer crystallisation - Degree of crystallinity - Theory of Polymer crystallisation – Factors affecting crystallisability -	**15 Hrs**

	spherulites - Effect of crystallinity on the properties of polymers - Glass transition temperature - factors influencing the glass transition temperature - Importance of glass transition temperature - Determination of glass transition temperature - Dilatometric method	
V	**POLYMER REACTIONS AND RHEOLOGY** Polymer degradation - Types of degradation: Thermal degradation, Mechanical degradation, Oxidative degradation and Hydrolytic degradation. Polymer reaction - Hydrolysis - Acidolysis - Aminolysis_ Hydrogenation - Cross Linking reactions (Vulcanisation and Cure reactions only). Introduction to rheology –Applications of Rheological studies - Measurements of Rheology-cone and plate viscometer	**15 Hrs**

Text Books:

1. V.R.Gowarikar, N.V.Viswanathan & Jayadev Sridhar - Polymer Science - New age international publishers - 1986.
2. Fred W.Billmeyer - Text Book of Polymer Science - Wiley Interscience - 1971.

Reference Books:

1. Anilkumar & S.K.Gupta -Fundamentals of Polymer Science - Tata McGraw Hill Pub. Co. 1978.
2. Odian.G - Principles of Polymerisation – McGraw-Hill, New York – 1970
3. Blackley & Halsted - Emulsion Polymerisations: Theory and Practice - McGraw-Hill, New York - 1975
4. Murugan N - Fundamentals of Polymer Science – Study Material
5. I.Herman S.Haufman and Joseph J.Falce - Introduction to Polymer Science and Technology - Wiley Inter Science Publications- 1977.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

IV SEMESTER

M - SCHEME

2015 – 2016 onwards

POLYMERIC MATERIALS

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37542
Semester : IV Semester
Subject Title : **POLYMERIC MATERIALS**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
POLYMERIC MATERIALS	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME(Hrs.)
I	**COMMODITY PLASTICS**	15
II	**ENGINEERING PLASTICS AND THERMOSETS**	15
III	**GENERAL PURPOSE RUBBERS**	15
IV	**SPECIAL PURPOSE AND HIGH PERFORMANCE RUBBERS**	15
V	**RUBBER COMPOUNDING MATERIALS & SPECIAL ADDITIVES**	15
	Total	75

RATIONALE:

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

OBJECTIVES:

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

- Classification of plastics
- Abbreviations used and their expansions.
- Preparation, properties and applications of various commodity plastics like
- PE, PP and Styrenic Plastics.
- Preparation, properties and applications of various commodity plastics like
- PVC, PVA and PMMA.
- Preparation, properties and applications of various engineering plastics like
- PTFE, Nylons and PC.

- Preparation, properties and applications of various engineering plastics like and Acetal
- Preparation properties and applications of various thermosetting plastics like PF, UF, MF, Epoxy and Silicones.
- The concept of plastics blend and alloys, their importance and industrial applications.
- The production, properties and applications of various high performance plastics like, PPO, PPS, PSU, PEEK, PAI, & PEI.
- 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
- Concepts of polymer blends their advantages and applications.
- Various compounding ingredients
- Specialty additives

37542- POLYMERIC MATERIALS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**COMMODITY PLASTICS** Plastics - Classifications - Abbreviations. Polyethylene - types - Manufacture of Low Density Polyethylene by high pressure process, Polypropylene - types – structure - production by Ziegler process - properties and applications. Polystyrene – structure - production by continuous bulk polymerisation process - Polyvinyl chloride – structure - manufacture of PVC - Types: soft and rigid PVC - properties and applications -Acrylic plastics: Polymethyl methacrylate (PMMA) - structure - production by Suspension polymerisation - properties and applications.	**15 Hrs**
II	**ENGINEERING PLASTICS AND THERMOSETS** Polyamides: Production, Properties and applications of Nylon-6 and Nylon-6,6 – Polycarbonate-PET. PBT -structure, production, properties and applications Fluoro plastics: PTFE – manufacture, properties and applications Acetal resins - structure, preparation, properties and applications Phenolic plastics - Novolaks - Resols – hardening - resin manufacture Amino plastics: Urea formaldehyde resins –- moulding powders - properties - applications .	**15 Hrs**

Unit	Name of the Topic	Hours
III	**GENERAL PURPOSE RUBBERS** **Natural Rubber:** Production of Ribbed smoked sheet, Pale crepe and, Brown crepe – Properties and Applications. **Reclaimed rubber:** Reclaiming processes - scrap rubber preparation - Digester process. **Ethylene Propylene rubber**-polymer structure-EPDM-manufacture-properties- application-vulcanization. **Styrene Butadiene Rubber**- raw materials- manufacture of emulsion SBR-solution SBR-– Properties and Applications **Poly Butadiene Rubber**-Raw materials-manufacture-properties applications.	**15 Hrs**
IV	**SPECIAL PURPOSE AND HIGH PERFORMANCE RUBBERS** **Butyl and Halo Butyl Rubbers:** Structure – manufacture - properties – vulcanization - applications of Butyl and Halo Butyl rubber **Nitrile rubber:** structure- manufacture - properties- vulcanization - applications **Neoprene:** structure- manufacture- properties- vulcanization – applications. **Ethylene vinyl acetate:** structure- manufacture- properties- applications. **Silicone rubbers:** structure- Manufacture -properties- vulcanization – applications. **Fluro-carbon elastomers:** Commercial types – properties- vulcanization – applications.	**15 Hrs**
V	**RUBBER COMPOUNDING MATERIALS & SPECIAL ADDITIVES** **Compounding Ingredients and their functions**: Vulcanizing agents-activators-accelerators: Types-antioxidants and antiozonants – retarders - softeners- plasticizers-pepticising 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:	**15 Hrs**

Text Books:

1. J.A. Brydson - Plastic Materials –7th Ed-Butterworths-Heinemann–London (1999)
2. D.C. Miles, J.H. Briston - Polymer Technology – Chemical Publishing Co.-New York (1972)
3. Robert V.Milby - Plastics Technology - McGraw Hill Book Co. - 1973.
4. Mauric Moton - Rubber Technology - Robert Krieger Publishing Co.- 1973.
5. I Franta, Elastomers and Rubber compounding materials –Elsevier -1989
6. 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.
4. A.S.Athalye-Plastics Materials Handbook Vol I & II-Multi-tech Publishers (2002)
5. Gachter / Muller - Plastics Additives (4th ed) – Hanser Publishers (1996).
6. W.C.Wake - Fillers for Plastics – Iliffe, London (1971)
7. H.V.Boenig - Polyolefins: Structure and Properties – Elsevier (1986)
8. W.S.Penn - P V C Technology –Applied science, London (1991)
9. Murugan N - Understanding Plastics materials – Study Material.
10. Geoffrey Pritchard - Plastics Additives – Chapmann & Hall (1998).
11. S.Schwartz & H.Goodman - Plastics Material and Processes - Van Nostrand Reinhold Co. - 1982.
12. J.Harry Dubois & Frederic W.John - Plastics - Van Nostrand Reinhold Co. - 1981.
13. W.S.Penn - P V C Technology – Applied Science, London – 1971.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

IV SEMESTER

M - SCHEME

2015 – 2016 onwards

CHEMICAL ENGINEERING

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37543
Semester : IV Semester
Subject Title : **CHEMICAL ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CHEMICAL ENGINEERING	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME (Hours)
I	**HYDROSTATICS AND FLUID MECHANICS**	15
II	**PUMPS AND HYDRAULIC APPLIANCES**	15
III	**HEAT TANSFER**	15
IV	**SIZE REDUCTION, SCREENING AND CONVEYING**	15
V	**MIXING, AGITATION, SETTLING AND SEDIMENTATION**	15
	Total	75

RATIONALE:

A Chemical Engineer during his/her professional career is primarily working 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 must be able to know about

- Properties of Fluids
- Laws of liquid pressure
- Newtonian and Non-Newtonian fluids
- Bernoullis Theorem
- Principle of flow meters
- Functions and Construction details of Valves
- Principle of centrifugal pumps and Reciprocating pumps
- Maintenance of pumps
- Major properties and types of hydraulic fluids
- Construction and operation of hydraulic press, hydraulic lift and Acccumulator
- Modes of Heat Transfer
- Construction of Heat Transfer Equipments
- Mechanism of Drying

- Classification of size reduction equipments
- Sieve Standards
- Actual screen and Ideal screen
- Types of Conveyors
- Purposes of Agitation
- Agitation Equipments and Mixing Equipments
- Construction of Dorr thickener

37543-CHEMICAL ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**HYDROSTATICS AND FLUID MECHANICS** Properties of fluids- density- specific weight- specific volume- specific gravity- surfacee Tension and capilarity -vapour pressure. Pressure- fluid pressure - Laws of liquid pressure - Pascals law of Transmissibility - Intensity of pressure - Atmospheric pressure - Gauge pressure - Absolute pressure. Flow of fluids- Laminar flow- Newtonian and Non-Newtonian fluids - viscosity - Kinematic viscosity - Turbulent flow- Reynolds experiment - Reynolds number - dimensionless number - continuity equation- Energy of fluid- Potential energy-kinetic energy- pressure energy- Bernoullis Theorum- Pump work in Bernoullis theorem - Principle of Venturi meter and orifice meter - difference between venturi and orifice meter - principle of protometer. Valves - rotary valve - needle valve - gate valve - globe valve - check valves - functions - construction details.	**15Hrs**
II	**PUMPS AND HYDRAULIC APPLIANCES** Reciprocating pump - sigle acting reciprocating pump - double acting reciprocating pump - Principle of centrifugal pump - parts of pump - working of a centrifugal pump - priming of centrifugal pump - principle of gear pumps - maintenance of pumps. Major properties and types of hydraulic fluids the construction the construction and operation of hydraulic press and hydraulic lift - The construction and operation of weight loaded, piston and bladder type accumulators; the advantages and disadvantages of each type - Construction of single acting intensifier.	**15Hrs**
III	**HEAT TANSFER** Conduction - fouriers law - thermal conductivity - conduction through plane wall, convection - natural convection - forced convection - radiation - Kirchoff's law - black body - stefan boltzmaun law - emisivity - grey body - heat transfer equipments- heat exchangers – 1-2 , 2-4 heat exchangers construction details - thermal insulation. Drying - tray driers - drum driers.	**15Hrs**

Unit	Name of the Topic	Hours
IV	**SIZE REDUCTION, SCREENING AND CONVEYING** Principles - applications - size reduction machines - crushers - jaw crusher - angle of nip - - roll crushers - angle of nip - grinders - ball mills - critical speed - operating speed - ultrafine grinders - hammer mill - fluid energy mill. Screeing - sieve standards - - motions of screens - actual screen and ideal screen. Conveying types - belt conveyor - bucket elevator - screw conveyor - pneumatic conveyor.	**15Hrs**
V	**MIXING, AGITATION, SETTLING AND SEDIMENTATION** Purposes of agitation - Agitation of liquids - equipments - propellers - paddles - turbines - flow patterns in agitated vessels - Vortex and Swirling prevention. Mixing of pastes - change can mixers - kneaders - two arm kneader - banbury mill - Mixers for dry powders- ribbon blenders - tumbling mixers. Settling – stokes law - batch settling - hindered settling and free settling - equipment - Dorr thickner.	**15Hrs**

Text Books:

1. W.L.Mc Cabe & 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 - Hydraulics and Hydraulic appliances.

Reference Books:

1. Robert H.Perry - Perry's Chemical Engg. Hand Book - McGraw Hill Book Co.
2. A.S.Foust Etal - Principles of Unit Operations - Wiley International Edition.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

IV SEMESTER

M - SCHEME

2015 – 2016 onwards

ENGINEERING DRAWING

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37044
Semester : IV Semester
Subject Title : **ENGINEERING DRAWING**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Week / Hours	Semester / Hours	Marks			Duration
ENGINEERING DRAWING	4	60	Internal Assessment	Board Examination	Total	
			25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME (Hrs)
I	MACHINE ELEMENTS AND SECTIONAL VIEWS	22
II	ASSEMBLY DRAWING	22
III	FREE HAND DRAWING	8
	REVISION AND TEST	8
	TOTAL	60

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 machine parts. Therefore this subject is essentially required. Drawing is said to be the language of engineers and technicians. Reading and inter prating 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

1.0 Need and Importance of Sectional Views in Machine Drawing.
1.1 To show the inner parts clearly as possible.
1.2 To identify the types of threads, bolts, nuts, keys, rivets and joints in machine elements.
1.3 To know different terms used in connection with screw threads and drawing external metric threads.
1.4 To know how to draw fasteners like bolt, nut and its assembly.
1.5 To know how to draw different types of keys in shaft and hub assembly.
1.6 To illustrate with neat sketch how two parts can be joined by rivets in different forms.
2.0 To know various parts, how they are assembled and how do they work.
2.1 Have an idea about the Functional requirements of individual parts and their location.
2.2 Understand the purpose, principle of operation and filed of application of the given

machine part.

2.3 To prepare Assembly Drawing from final finished part drawings (or) pictorial drawing.

3.0 To make free hand sketches of some important Chemical Engineering Equipments.

3.1 To have better understanding about their function and applications.

3.2 It is used for preparing detailed drawing of the required parts.

DETAILED SYLLABUS

UNIT - 1 SECTIONAL VIEWS AND MACHINE ELEMENTS		**22 Hours**
SECTIONAL VIEWS (THEORY ONLY)	:	Need for sectioning - cutting plane - Section lines - Section of adjacent components - Types of Sections - Full Section - Half Section - Removed Section - Revolved Section - Partial Section - Off set Section - Sectioning of thin and large areas - Convention of Sectioning - Material Convention.
THREADS	:	Nomenclature of Thread - Types of Threads - V.Thread - Square Thread - Right hand and Left hand thread - Internal Threads - External Threads - Single start thread - Multiple thread Draw Single Start External Metric V and Square threads.
BOLT AND NUT	:	Hexagonal and Square Nut - Bolt and Nut assembly.
KEYS	:	Sunk Key - Rectangles Key - Square Key - Gib Headed Key - Woodruff Key And Feather Key. Saddle Key - Flat And Hollow Saddle Key Round Key
RIVETED JOINTS	:	Single riveted Lap Joint - Double riveted Lap Joint (chain and Zig - Zag) - Single riveted Butt Joint (Single Strap and Double Strap).
UNIT - 2 ASSEMBLY DRAWING (ONLY TWO VIEWS)		**22 Hours**
Drawing Elevation and Plan (or) Elevation and End View of a component from the given part drawing or pictorial drawing.	:	Bushed Bearing for Horizontal Shaft Sleeve and Cotter Joint Flanged Coupling (Plain type) Cast Iron Flanged Pipe Joint Horizontal stuffing Box.
UNIT - 3 FREE HAND DRAWING		**8 Hours**
HEAT EXCHANGES	:	Shell and Tube (1 - 1 Pass)
EVAPORATOR	:	Standard Vertical Type
DISTILLATION COLUMN	:	Multi Stage Tray tower
ABSORPTION COLUMN	:	Counter Current Packed Tower
VALVE	:	Globe Valve - Gate Valve - Check Valve

TEXT BOOKS

1. Engineering Drawing by **P.K.Kapur and P.K.Sapra** - Tata McGraw - Hill Publishing Company Limited, New Delhi - 1990.

2. A Text Book of Machine Drawing by **P.S.Gill** - Kataria & Son Publishing House, New Delhi - 2010.

3. A Text Book of Machine Drawing by **N.D.Bhatt & V.M.Panchal -** Charotor Publishing, Anand - 2011.

REFERENCE BOOKS

1. Perry's Chemical Engineer's Hand Book by Robert H.Perry - McGraw - Hill Book Co-New York - 1994.

2. Unit Operations of Chemical Engineering by Warren L.McCabe, Julian C.Smith, and Peter Harriott - McGraw - Hill Higher Education - International Edition - 2001.

Model Question Paper - I

Marks: 75 Time: 3 Hrs.

(Sketch 'K' to Accompany)

(N.B. (i) Answer any two Questions from Part - A.
(ii) Part - B and Part - C are Compulsory.
(iii) Only First Angle Projection is to be followed.
(iv) Any missing dimensions can be assumed suitably)

PART - A

2 X 10 = 20

I. Draw elevation and plan of a hexagonal headed bolt with hexagonal nut and washer for 24 mm dia bolt.

II. Draw the following orthographic views of a Single riveted Single Strap Butt Joint suitable to join two plates, each 10 mm thick.

1. Sectional front view
2. Plan

III. Explain the following with neat sketches :-

1. Feather Key
2. Woodruff Key

PART - B

1 X 40 = 40

IV. The detailed drawings of a Horizontal Stuffing Box are given in sketch 'K' Assemble the parts and draw.

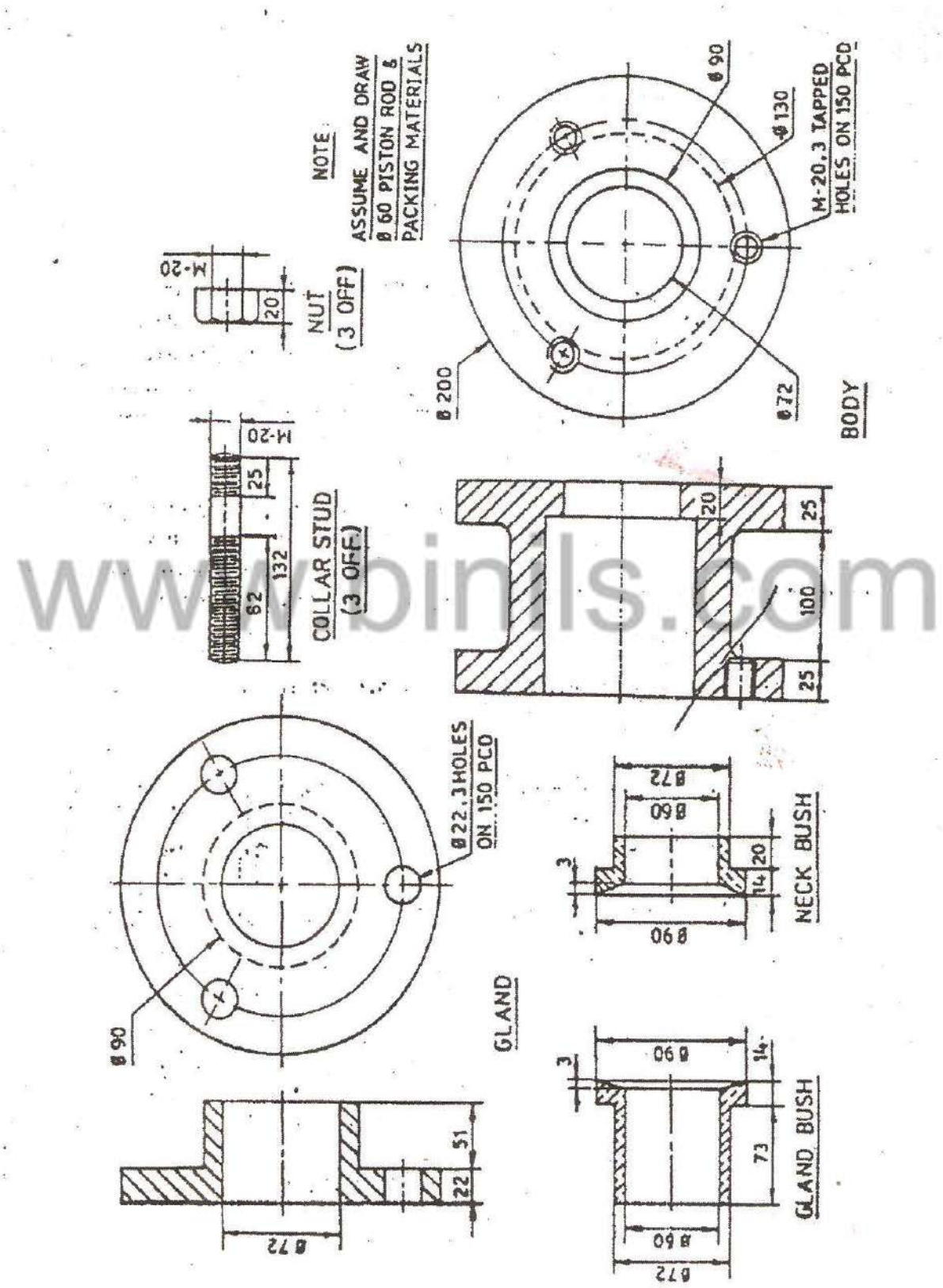
1. Bottom Half Sectional elevation (30)
2. Left end view (10)

PART - C

1 X 15 = 15

V. Draw a Free hand sketch of a Standard Vertical type Evaporator.

SKETCH 'K' TO ACCOMPANY MODEL QUESTION PAPER 1



DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

IV SEMESTER

M - SCHEME

2015 – 2016 onwards

POLYMER SCIENCE

PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37545
Semester : IV Semester
Subject Title : **POLYMER SCIENCE PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
POLYMER SCIENCE PRACTICAL	5	75	25	75	100	3 Hrs

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.

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 student while admitted a batch of 30 student during Board Examinations.

LIST OF EXPERIMENTS

Determination of the following properties: -

1. Specific gravity
2. Density
3. Swelling characteristics
4. Ash content.
5. Melting point
6. gel time
7. K-value of Polymer Resins
8. Viscosity/average molecular weight of polymers
9. Shrinkage of polymers
10. Moisture content
11. Volatile content of polymers.

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

S.No.	Name of Equipment / Instrument	No.
1.	Specific gravity balance	1
2.	Electronic weighing balance	1
3.	Burette	5
4.	Melting point apparatus	1
5.	Viscometer	1
6.	Vernier Caliper	1
7.	Oven	1
8.	Round bottom flask	5

1. Experimental Polymer science by V.R.Gowrikar et.al.,
2. Polymer science Lab Manual by CIPET

BOARD EXAMINATION EVALUATION
Practical Examination

Note: All the exercises should be given in the question paper and students are allowed to select by a lot.

ALLOCATION OF MARKS:

- Procedure 10 Marks
- Observation (including taking readings) 25 Marks
- Calculation 30 Marks
- Result 05 Marks
- Viva-Voice 05 Marks

- Total 75 Marks

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

IV SEMESTER

M - SCHEME

2015 – 2016 onwards

POLYMER PREPARATION AND IDENTIFICATION PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37546
Semester : IV Seme
Subject Title : **POLYMER PREPARATION AND IDENTIFICATION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
POLYMER PREPARATION AND IDENTIFICATION PRACTICAL	5	75	25	75	100	3 Hrs

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 polymer preparation 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 Board Examinations.

LIST OF EXPERIMENTS:

1. Pre Phenol formaldehyde
2. Preparation of Urea formaldehyde
3. Preparation of Melamine Phenol formaldehyde
4. Preparation of Unsaturated polyester resin
5. Preparation of Poly methyl metacrylate
6. Preparation of Nylon 6,6
7. Preparation of Ethylene vinyl acetate
8. Preparation of PVC Plastosol
9. Simple methods of identification of Plastics
10. Simple methods of identification of Rubbers

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

S.No.	Name of Equipment / Instrument	No.
1.	Polymer preparation and identification bench with burner facility	1
2.	Electronic weighing balance	1

BOARD EXAMINATION EVALUATION
Practical Examination

Note: All the exercises should be given in the question paper and students are allowed to select by a lot.

ALLOCATION OF MARKS:

- Procedure 10 Marks
- Observation 25 Marks
- Polymer yield 30 Marks
- Result 05 Marks
- Viva-Voice 05 Marks
- Total 75 Marks

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

II YEAR

IV SEMESTER

M - SCHEME

2015 – 2016 onwards

CHEMICAL ENGINEERING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37547
Semester : IV Semester
Subject Title : **CHEMICAL ENGINEERING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CHEMICAL ENGINEERING PRACTICAL	5	75	25	75	100	3 Hrs

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.

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 Board Examinations.

LIST OF EXPERIMENTS

1. Determination of Pipe friction
2. Study and operation on Orifice meter
3. Study and operation on Venturi meter
4. Study and operation on Rotameter
5. Study and operation on Centrifugal pump
6. Study and operation on Jaw crusher
7. Study and operation on Roller crusher
8. Study and operation on Ball mill
9. Experiment on Batch settling
10. Study and operation on Industrial mixer
11. Study and operation on Drier

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

S.No.	Name of Equipment / Instrument	No.
1.	Orifice meter	1
2.	Venturi meter	1
3.	Rotameter	1
4.	Centrifugal pump	1
5.	Jaw crusher	1
6.	Roller crusher	1
7.	Ball mill	1
8.	Batch settling equipment	1
9.	Industrial mixer	1
10.	Drier	1

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

BOARD EXAMINATION EVALUATION
Practical Examination

Note: All the exercises should be given in the question paper and students are allowed to select by a lot.

ALLOCATION OF MARKS:

- Procedure 10 Marks
- Observation (including taking readings) 25 Marks
- Calculation 30 Marks
- Result 05 Marks
- Viva-Voice 05 Marks

- Total 75 Marks

V SEMESTER

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

V SEMESTER

M - SCHEME

2015 – 2016 onwards

PLASTICS PROCESSING

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37551
Semester : V Semester
Subject Title : **PLASTICS PROCESSING**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
PLASTICS PROCESSING	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	Time (Hours)
I	**COMPRESSION, TRANSFER MOULDING & EXTRUSION**	15
II	**INJECTION MOULDING**	15
III	**BLOW MOULDING & THERMOFORMING**	15
IV	**ROTATIONAL MOULDING, CALENDERING & FOAMS**	15
V	**FINISHING, DECORATION & JOINING OF PLASTICS**	15
	Total	75

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 must be able to know about

- Compression moulding process and moulding cycle
- Principle of transfer moulding process and types of transfer moulding process
- Comparison of compression moulding process versus transfer moulding process.
- Principle of extrusion
- Applications of extruder process like tubular blow film extrusion, monolayer, multilayer, sheet extrusion, wire and cable covering and co-extrusion.
- Principles of injection moulding process
- Specification of injection moulding machine
- Knowledge of injection moulding for thermosets and RIM
- Principles of blow moulding process and the importance of parison programming

- ❖ Advantages and limitations of blow moulding process
- ❖ Principle of thermoforming and its advantages and limitations
- ❖ Process and materials involved in Rotational moulding process.
- ❖ Principles of calendering
- ❖ The concept of processing parameters, machine specifications and processing cycle of all the above processes.
- Different problems encountered during processing and rectifying the same to get good products in all the above processes.
- Knowledge about the secondary operations done on plastics products.

37551- PLASTICS PROCESSING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**COMPRESSION, TRANSFER MOULDING & EXTRUSION** Introduction to compression moulding process - types of compression press - moulding cycle - bulk factor - effect of preheating and performing - trouble shooting. Basic principle of transfer moulding process - types of transfer moulding process - pot and plunger types - moulding cycle - limitations of transfer moulding process - comparison of compression moulding process versus transfer moulding process. Basic principle of extrusion - barrel - screw nomenclature - types - L/D ratio - compression ratio - screen pack - breaker plate - types of extruder - single screw extruder - multi screw extruder - sizing unit - winding and cutting unit - applications of extruder process- tubular blow film extrusion - monolayer - multilayer - sheet extrusion - wire and cable covering - troubleshooting.	**15 Hrs**
II	**INJECTION MOULDING** Basic principles of injection moulding process - single stage - 2 stage screw machines - plunger type machine - reciprocating screw type machine - injection unit - barrel - types of barrel - nozzles - nozzle shut off valve - (any one) - heating system - band heaters etc., - clamping unit - clamp types - toggle system - hydraulic system - day light - clamping pressure - tie bar injection moulding process and control - screw control, clamping pressure control - process parameters - temperature, pressure - Injection rate - hold on time - specification of injection moulding machine - trouble-shooting - elementary knowledge of injection moulding for thermosets - elementary knowledge of RIM.	**15 Hrs**

III	**BLOW MOULDING & THERMOFORMING** Basic priciples of blow moulding process - production of parison - parison programming - extrusion blow moulding process - injection blow moulding process - injection stretch blow moulding process - advantages and limitations of blow moulding process - troubleshooting. Basic principle of thermoforming - clamping of sheets - heating sources - radiant - contact heating - mould and mould materials - female, male and matched mould - draw ratio of sheet - thermoforming techniques - vacuum forming - plug assist forming - drape forming - bubble or blister forming - snap back forming - advantages and limitations of thermoforming - troubleshooting.	**15 Hrs**
IV	**ROTATIONAL MOULDING, CALENDERING & FOAMS** Basic principle of rotational moulding process - Types of rotational moulding - Batch type machine process - Carousel type machine process - Straight line machine process - Applications of rotational moulding - Advantage and trouble shooting. Basic principles of calendering process- types of calenders - manufacturing of PVC calendered sheets - sheets thickness control arrangements - gauge control – nip roller cambering - contour grinding - roll bending - crowing effect - cross axis. Introduction to plastic foaming process - Structural foam moulding – Low pressure and high pressure moulding - Expandable polystyrene foam - Rigid PU foam - Flexible PU foam - Applications.	**15 Hrs**
V	**FINISHING, DECORATION & JOINING OF PLASTICS** Introduction - Finishing of plastics - Filling, grinding, buffing, drilling, turning, slitting - Preparation for decorating - Printing - Silk screen printing - Pad printing - Rotogravure printing and flexographic printing - Hot stamping - Foil inlay moulding - Vacuum metalizing - Electroplating – Adhesive bonding - Advantage of adhesive bonding - Welding of plastics - Ultrasonic welding - Application - Vibration welding - Heat sealing - Thermal heat sealing - Dielectric sealing - Ancillary equipments - Drier - Types of Dryers, Tray Dryer, Rotatory dryer and Oven dryers, Hopper dryer, Dehumidifying dryer - Hopper loader – Vacuum hopper loader - Granulator - Mould temperature controller – Chilling plant – Colour blender - Magnetic grills	**15 Hrs**

Text Books:

1. D.H.Marton, Jones - Polymer Processing – Chapman and Hall (1989)
2. Irvin Rubin - Injection Moulding: Theory and Practice – Wiely, (1972).

Reference Books:

1. E.C.Bernhardt – Processing of Thermoplastics Materials – Reinhold, New York.
2. J.S.Walker & E.R.Martin - Injection Moulding of Plastics–Butterworths, London.
3. Bown,J - Injection Moulding of Plastics Components – McGraw-Hill (1979).
4. Holmes–Walker,W.A – Polymer Conversion, Applied Science Publishers- (1975)
5. John D. Beadle – Plastics Forming – Macmillan, London (1981)
6. Fisher, E.G - Blow Moulding of Plastics – Iliffe, London (1991)
7. Elden,R.A. and Swann,A.D - Calendering of Plastics – Iliffe, London (1991)
8. James E.S., Margolis - Decorative of Plastics – Hanser Publishers (1986)
9. Gleann L Beall – Rotational Moulding – Hanser Publishers (1998)

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

V SEMESTER

M - SCHEME

2015 – 2016 onwards

RUBBER PROCESSING AND PRODUCT MANUFACTURE

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37552
Semester : V Semester
Subject Title : **RUBBER PROCESSING AND PRODUCT MANUFACTURE**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
RUBBER PROCESSING AND PRODUCT MANUFACTURE	5	75	Internal Assessment	Board Examination	Total	
			25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME(Hrs)
I	**TYRES AND TUBES**	15
II	**COATED FABRICS, BELTS AND CABLES**	15
III	**HOSE AND FOOT WEAR**	15
IV	**MOLDED PRODUCTS AND METAL BONDED COMPONENTS**	15
V	**LATEX PRODUCTS AND ADHESIVES**	15
	Total	75

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 the same to get good products.
This subject enables the students to apply the understanding of various rubber processing techniques used in rubber industries

OBJECTIVES:

On Completion of the units of syllabus contents the students must be able to understand the following:

- Specification of a tyre.
- Function of a tyre, abbreviation used in tyre specification.
- Tubed and Tubeless tyres.
- Components, Formulations and manufacture of pneumatic tyres
- Manufacturing and applications of coated fabrics
- Components, formulation, building and vulcanization of Conveyor belts and Transmission

- Components, formulations and manufacturing of cables.
- Formulation of compounds for hose and different types of hoses.
- Component and vulcanization of different foot wears.
- Formulations and manufacture of different moulded products like, Diaphragms, oil seals, Bellows, O-rings, play balls etc.,
- Preparation of Rubber to metal bonded components.
- Preparation of latex dispersion and emulsion.
- Formulation, compounding, manufacturing of various latex products.
- Manufacture of latex foam.
- Formulation, compounding and manufacturing of latex pillows, mattresses and automotive seats.
- Formulation of NR adhesives and pressure sensitive adhesives.

37552-RUBBER PROCESSING AND PRODUCT MANUFACTURE

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**TYRES AND TUBES** **Tyres**: Definition, Types:– Specification of a tyre, Function of a tyre, abbreviation used in tyre 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-matic curing, autoclave curing - after treatment. **Solid Tyres:** Formulation (high hardness, low build up), manufacturing, application- **Tubes:** Automotive and Bi-cycle tubes - formulations - manufacture.	**15 Hrs**
II	**COATED FABRICS, BELTS AND CABLES** **Coated fabrics:** Formulations – manufacturing of coated fabrics – applications of coated fabrics. **Belts**: Types: Conveyor belting, Transmission belting, Conveyor belting – components, formulation, building, vulcanization - Transmission belting: manufacturing, vulcanization. V-belts: types - components, formulations, manufacture, vulcanization. **Cables:** Types: Components, Insulation, jackets – their formulations – manufacturing of cables.	**15 Hrs**

Unit	Name of the Topic	Hours
III	**HOSE AND FOOT WEAR** **Hose:** Components: tube, reinforcement, cover - formulation of compounds for hose – types – long length moulded hose, machine made, hand made and circular woven (BRIDED) hoses - Radiator hose- oil hose -Petrol hose **Rubber footwear**: component of a foot wear - hot air vulcanized-compression moulded, direct moulding process for shoe bottoming; micro cellular rubber soled foot wear, solid rubber soled foot wear, injection molded sole and heel units, safety foot wear, conductive of antistatic footwear.	**15 Hrs**
IV	**MOLDED PRODUCTS AND METAL BONDED COMPONENTS** **Moulded Products:** Formulations and manufacture of Diaphragms, oil seals, Bellows, O-rings, play balls: Tennis - formulation, manufacturing - hard rubber: formulation, manufacture, properties and applications. **Rubber to metal bonded components**: Bonding methods - Metal cleaning-surface preparation Compounds preparation for bonding, application of bonding medium, molding - Rubber rollers: formulation for general purpose, textile roll, paper mill roll and hard rubber roll – curing, applications of rubber rolls.	**15 Hrs**
V	**LATEX PRODUCTS AND ADHESIVES** **Latex products:** Preparation of latex dispersion and emulsion **Dipped goods:** formulation, compounding, manufacturing of Toy balloons, gloves (industrial and surgical) and contraceptives – Threads-formulations compounding-outline of the manufacturing methods **Latex foam:** – Formulation, compounding Manufacture of latex foam and pillows, mattresses and automotive seats.- Talalay process and Dunlop process **Adhesives:** Formulation of NR adhesives, latex adhesives, tyre cord adhesives,	**15 Hrs**

Text Books:

1. Rubber Tech., and Manufacture by C.M.Blow-Plastic and Rubber Institute Butter Worths- 1982
2. Plastics Materials and Product Testing Vol.I & II CIPET, Chennai
3. Rubber Engineering - Indian Rubber Institute - Tata McGraw Hill Publishing Co. Ltd. - New Delhi – 1998

Reference Books:

1. Plastics by JJ.Harry Dubois and Frederick W.John -Van Nostrand Reinhold Co.
2. Plastics Technology by Robert V.Milby -McGraw Hill Book Co.-1973
3. Technology of Rubber Products by G.P.Mayurya-S.B.P.Publication
4. Complete Manufacturing Details and Know-how on Tyres Tubes Hoses and Belts by R.S.Gupta - SIRI Publications.
5. Hand Book of Rubber and Rubber Goods Industries by K.E.Dhingra - SIRI Publications.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

V SEMESTER

M - SCHEME

2015 – 2016 onwards

PROCESS INSTRUMENTATION AND CONTROL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name	:	**Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code	:	37053
Semester	:	V Semester
Subject Title	:	**PROCESS INSTRUMENTATION AND CONTROL**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
PROCESS INSTRUMENTATION AND CONTROL	5	75	Internal Assessment	Board Examination	Total	
			25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	Time (Hours)
I	**BASIC CONCEPTS OF MEASUREMENT ANDMEASUREMENT OF TEMPERATURE**	**15**
II	**MEASUREMENT OF PRESSURE**	**15**
III	**MEASUREMENT OF FLOW, LIQUID LEVEL AND HUMIDITY.**	**15**
IV	**PROCESS CONTROL**	**15**
V	**COMPUTERIZED PROCESS CONTROL**	**15**
	Total	**75**

RATIONALE:

This subject gives the knowledge of various instruments used to measure various processes parameters. This course will impart knowledge on working principle, construction, repair, and use of these instruments

This course will make the students knowledgeable in various types of measuring instruments used in chemical process industries.

The diploma holder in chemical engineering has to deal with all kinds of equipment's in the chemical industry. This subject provides him/her thorough knowledge of uses, types and constructional details of heat transfer, mass transfer equipment's along with pumps, blowers, compressors, crushers and screens.

OBJECTIVE:

1.1 To understand the application of various Industrial instruments & control
1.2 System to measure the process variables
1.3 To know the necessity of studying Instrumentation
1.4 To list out various Temperature measuring Instruments
2.1 To list out various pressure measuring Instruments
2.2 To understand the working of various temperature measuring Instruments
2.3 To understand the working of various pressure measuring Instruments

3.1 To list out various Flow measuring Instruments
3.2 To list out various Liquid level measuring Instruments
3.3 To measure the Flow rate using different flow measuring Instruments
3.4 To handle various level measuring Instruments
3.5 To understand the operation of different Humidity measuring Instruments
4.1 To understand the significance of automatic control system.
4.2 To distinguish the various modes of control actions
4.3 To understand the principle of various controllers
5.1 To understand about transmission of both analog and digital signals
5.2 To understand the concept about Distributed Controlled System and its applications.

37053-PROCESS INSTRUMENTATION AND CONTROL

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**BASIC CONCEPT OF MEASUREMENT, MEASUREMENT OF TEMPERATURE AND PRESSURE** Purpose of Instrumentation – Measurement and its aim- Functional elements of Instruments – Static and Dynamic characteristics of Instruments - Signaling and Recording Instruments – Circular and Strip chart- Instrumentation diagram. Temperature measuring Instruments- Methods of temperature measurement- Liquid filled thermometer- Gas filled Thermometer- Bimetallic Thermometer- Electrical Resistance Thermometer - Thermocouples – Thermistor – Radiation Pyrometer- optical pyrometer- Temperature Transmitter.	**15 Hrs**
II	**MEASUREMENT OF PRESSURE** Pressure- Units of Pressure- Different types of pressure- Methods of pressure measurement. Bourdon gauge - Bellow and Diaphragm pressure sensors. Vacuum measurement - Pirani gauge - Ionization gauge. Electrical pressure Transducers - Strain gauge pressure Transducers – Potentiometric pressure Transducers- Differential pressure Transmitter- Piezoelectric Pressure Transducer- Linear Variable Differential Transformer (LVDT).	**15 Hrs**
III	**MEASUREMENT OF FLOW ,LIQUID LEVEL AND HUMIDITY** Flow measurement: Introduction- Methods of flow measurement- Orifice meter–venturimeter- Rotameter- Pitot tube- Weirs and Flumes- Electromagnetic Flowmeter- Turbine flow meter- Nutating Disc type. Liquid level measurement: Introduction- Methods of level measurement- Sight glass- Float-tape level indicator- Air purge system- Capactive and Conductivity type level sensor- Radiation level detector- Bin and Diaphragm type.Humidity measurement: Hair Hygrometer – sling Psychrometer	**15 Hrs**

Unit	Name of the Topic	Hours
IV	**PROCESS CONTROL** Automatic control system –significance –Terminology used in control system: controlled variable, manipulated variable, set point, etc,.- General process control system: open loop system ,closed loop system ,Feed back control system, Feed forward control system and Ratio control system (Principles and Purposes only)-Block diagram-elements of process dynamics –static and dynamic behavior of process-process lag-dead time-process degree of freedom.- concept of using Transfer function in process control. Automatic controllers: controllers- classification; based on control action such as P,I,PI,PD,PID – based on actuating medium such as Pneumatic, Hydraulic and Electronic(concept and application only in Pneumatic system) –Actuators-Pneumatic Relays- Final control element: control valves, variable speed drives and variable electric power actuator. Control application in (a)liquid level system (b) Heat Exchanger-control of temperature and flow rate. (c) Batch Reactor- control of temperature and pressure.	**15 Hrs**
V	**COMPUTERIZED PROCESS CONTROL** Modes of signal- Transmission of Analog signal-electronic and pneumatic methods- Transmission of Digital signal - Data logging and transmission using computer-conversion of analog signal into digital vice-versa. Process control computers: Analog computer system, Digital computer system-Features of both types- application of Distributed Controlled System(DCS) in unit operation ,unit process and plant	**15 Hrs**

TEXT BOOKS:

1. Industrial Instrumentation by Donald Eckman , Allied Publishers, 1982
2. Industrial Instrumentation and control by S.K Singh , Twelfth edition, Tata McGraw Hill Publishing Company Ltd ., New Delhi.
3. Automatic Process Controlby Donald P.Eckman, Sixth edition, Wiley Eastern Limited.,
4. Computer Control of Processes by M.chidambaram, Narosa Publishing House.

REFERENCE BOOKS:

1. Perry's Chemical Engineering Hand book, Seventh edition, Robert H. Perry, McGraw Hill Book Company, Singapore – 1997
2. Process Modeling, Simulation and control for Chemical EngineersbyLuyben, McGrawHillKogakasha Ltd.
3. Chemical process control by George Stephanopoulos, PHI learning pvt Ltd.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

V SEMESTER

M - SCHEME

2015 – 2016 onwards

POLYMER COMPOSITES

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37571
Semester : V Semester
Subject Title : **POLYMER COMPOSITES**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
POLYMER COMPOSITES	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	Time (Hours)
I	**RESIN AND REINFORCEMENT MATERIALS**	15
II	**DESIGN AND FABRICATION OF MOULDS**	15
III	**PROCESSING METHODS**	15
IV	**POST PROCESSING METHODS**	15
V	**APPLICATIONS OF COMPOSITES**	15
	Total	75

RATIONALE:

This course helps the students to understand the various processing methods involved in the preparation of fiber reinforced plastics. Resins, reinforcing materials and other additives used in FRP manufacture and also basic design concept and fabrication of moulds.

Objectives:

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

- Basic concept of fiber reinforced plastics
- History and development of fiber reinforced plastics.
- Properties of composites and comparison of FRP and metals.
- Resins, reinforcing materials and other additives used in FRP manufacture.
- Basic design concept and fabrication of moulds.
- Various processing methods of FRP like Hand lay up, Spray up, Vacuum bag,etc.,
- Post processing methods like Cutting, Trimming, Machining, Joining, etc.,
- Moulding defects and their remedies.
- Applications of FRP like Household , Building and Construction etc.,

37571- POLYMER COMPOSITES
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**RESIN AND REINFORCEMENT MATERIALS** 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, unsaturated polyester resin, epoxy resins, PP and ABS – Reinforcing materials used, glass fiber, carbon fiber, asbestos, nylon and aramid – Miscellaneous additives used, catalyst, accelerator, fillers, pigments and mould release agents – Their functions in moulding	**15 Hrs**
II	**DESIGN AND FABRICATION OF MOULDS** Basic design concept and fabrication of moulds for fiber reinforced plastics – Selection of mould materials – Type of moulds used – Cost economics – Fabrication of moulds –Preparation of prepregs – SMC – DMC compounds – Their properties.	**15 Hrs**
III	**PROCESSING METHODS** 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.	**15 Hrs**
IV	**POST PROCESSING METHODS** 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.	**15 Hrs**
V	**APPLICATIONS OF FRP** Applications of FRP – Household applications: Cladding and Decorative Sheeting – Building and Construction applications - Land transportation applications: Cars, Commercial vehicles, Containers and other applications – Rail transport applications: Coach structure, tank wagons – Marine applications: Boat hulls, Ship lifeboats, Open rowing boats, fast motor boats, slow motor boat and larger sail boat hulls - Air craft applications – Aero space applications: Radomes, Di-electric panels, Ducting and Secondary structures – Electrical applications – Agricultural applications – Industrial applications: Chemical plant.	**15 Hrs**

TEXT BOOKS:

L.Holloway - Composite materials – Elsevier, Amsterdam, 1966

REFERENCES:

1. Brian Parkyn – Glass Reinforced Plastics – Ilifee, 1970.
2. Gibbs & Cox – Marine Design Manual for FRP- McGraw Hill Book Co. – 1960.
3. P.Ghosh – Fiber science and technology – Tata McGraw Hill, New Delhi, 2004
4. Geoffery Pritchard – Reinforced Plastics Durability – Wood head Publilshing – 2000.
5. R.H.Sonneborn - Fiberglass Reinforced Plastics – Reinhold, New York, 1954

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

V SEMESTER

M - SCHEME

2015 – 2016 onwards

TYRE TECHNOLOGY

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37572
Semester : V Semester
Subject Title : **TYRE TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
TYRE TECHNOLOGY	5	75	Internal Assessment	Board Examination	Total	
			25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPIC	Time (Hours)
I	**TYRE COMPONENTS AND ITS FUNCTIONS**	15
II	**TYRE REINFORCEMENT AND TYRE PERFORMANCE**	15
III	**TYRE MANUFACTURING**	15
IV	**TYRE BUILDING**	15
V	**TYRE TESTING**	15
	Total	75

RATIONALE:

The subject aims at providing students the knowledge of various types of tyres and their manufacturing technique. The knowledge of Tyre reinforcement materials – Tyre mould design , curing and post curing methods and measurement of tyre properties will also be imparted.

Objectives:

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

- Introduction and development of tyres.
- Tyre sizing and Marking on the tyres.
- Different types of tyres and different components of tyres
- Manufacturing techniques of various tyres.
- Tyre reinforcement materials.
- Tyre mould design and methods of building green tyres
- Tyre curing methods, post cure inflation, quality control tests,
- Measurement of tyre properties, dimension
- Tyre construction analysis,
- Rolling resistance and non uniformity dimensional variations
- Type balance, mileage, evaluations, tyre flaws and separations, X-ray holography.BIS standards for tyres.

37572- TYRE TECHNOLOGY

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**TYRE COMPONENTS AND ITS FUNCTIONS** Introduction and development of tyres. Tyre sizing and Marking on the tyres. Different types of tyres - bias, bias belted radial, tube type and tubeless tyres. Different components of a tyre, its geometry, basic functions. Functions of a pneumatic tyre .	**15 Hrs**
II	**TYRE REINFORCEMENT AND TYRE PERFORMANCE** Cord- rubber composites and its properties and failure mechanism of cord reinforced rubber. 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 friction and sliding. Tyre stresses and deformation, tyre noise, mechanism of noise generation, effect of tread pattern, vehicle speed etc.	**15 Hrs**
III	**TYRE MANUFACTURING** Manufacturing techniques of various tyres like two wheeler and car tyres, truck tyres, OTR,. formulations for various rubber components. Tyre reinforcement materials (Textile, steel, glass etc.). Criteria of selection, different styles and construction, textile treatment.	**15 Hrs**
IV	**TYRE BUILDING** Tyre mould design, green tyre design principles, methods of building green tyres for bias, bias belted, radial and tube-less tyres, green tyre treatments. Tyre curing methods, post cure inflation, qualitycontrol tests,	**15 Hrs**
V	**TYRE TESTING** Measurement of tyre properties, dimension, Tyre construction analysis, Endurance test wheel and plunger tests, traction, noise measurements. cornering coefficient aligning torque coefficient, load sensitivity and load transfer sensitivity, Rolling resistance, non uniformity dimensional variations, concentricity and ply steer. Type balance, mileage, evaluations, tyre flaws and separations, X-ray holography.BIS standards for tyres.	**15 Hrs**

TEXT BOOKS:

1. Samuel K. Clark, “Mechanics of pneumatic Tires”, National Bureau of standards, Monograph, US Govt. printing office, 1971.
2. Tom French, “Tyre Technology”, Adam Hilger, New York, 1989

REFERENCES:

1. F.J. Kovac, “Tire Technology”, 4th edition, Good year Tire and Rubber Company, Akron, 1978.
2. E. Robecchi, L.Amiki, “Mechanics of Tire”, 2 Vols, Pirelli, Milano, 1970.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

V SEMESTER

M - SCHEME

2015 – 2016 onwards

CHEMICAL PROCESS MEASUREMENT AND CONTROL PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37055
Semester : V Semester
Subject Title : **CHEMICAL PROCESS MEASUREMENT AND CONTROL PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CHEMICAL PROCESS MEASUREMENT AND CONTROL PRACTICAL	5	75	25	75	100	3 Hrs

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.

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 Board Examinations.

LIST OF EXPERIMENTS:

1. Characteristics of different temperature sensors like Thermocouple module, RTD and Thermistor module.
2. Measurement of Pressure using Strain Gauge type Transducer
3. Measurement of Pressure using Bourdon Pressure Transducer
4. To study the linearity of P/I and I/P converter.
5. Level measurement by using Air purge method and Differential Pressure (DP) Transmitter.
6. Study of valve flow coefficients and inherent characteristics of Linear, Equal% and Quick opening.
7. Study of ON- OFF controller using Temperature controller Trainer kit by monitoring the process in SCADA mode.
8. Study of P,PI and PID controller using Liquid Level controller Trainer kit by monitoring the process in SCADA mode.

9. Study of P, PI and PID controller using Pressure controller Trainer kit by monitoring the process in SCADA mode.
10. Study of multidrop communication system for temperature, pressure and Level control Trainer kit (ON-OFF and PID Controller) in SCADA mode.

LIST OF EQUIPMENTS:

1. Temperature sensors like Thermocouple, RTD and Thermistor.
2. Strain Gauge type Pressure Transducer.
3. Bourdon Pressure Transducer.
4. P/I and I/P converter.
5. Differential Pressure Transmitter.
6. Pneumatic control valve (Linear, Equal % and Quick opening) set up.
7. Temperature control Trainer Kit with SCADA.
8. Liquid Level control Trainer Kit with SCADA.
9. Pressure Control Trainer Kit with SCADA.
8. Multidrop communication system.

BOARD EXAMINATION EVALUATION
Practical Examination

Note: All the exercises should be given in the question paper and students are allowed to select by a lot.

ALLOCATION OF MARKS:

❖ Procedure	10 Marks
❖ Observation	25 Marks
❖ Calculation	30 Marks
❖ Result	05 Marks
❖ Viva-Voice	05 Marks
❖ Total	75 Marks

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

V SEMESTER

M - SCHEME

2015 – 2016 onwards

POLYMER PROCESSING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37556
Semester : VI Semester
Subject Title : **POLYMER PROCESSING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
POLYMER PROCESSING PRACTICAL	5	75	25	75	100	3 Hrs

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:

- This practical subject will impart the students the requisite practical knowledge in plastics processing.
- The students will acquire the practical skills to operate various polymer processing machines like
    1. Injection moulding
    2. Extrusion
    3. Vaccum forming
    4. Rotational moulding
    5. Two roll mill
    6. Calendering
    7. Compression and Transfer moulding

LIST OF EXPERIMENTS

Operation of the following processing machines: -

1. Hand Injection Molding Machine
2. Hand Blow Molding Machine
3. Semiautomatic Injection molding Machine
4. Compression Molding Machines
5. Extruder
6. Semi Automatic Blow Molding Machine
7. Two roll mill.
8. Thermoforming machine
9. Waste Scrap Grinder
10. Making FRP by hand lay up technique

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

S.No.	Name of Equipment / Instrument	No.
1.	Hand Injection Molding Machine	1
2.	Hand Blow Molding Machine	1
3.	Semiautomatic Injection molding	1
4.	Compression Molding Machines	1
5.	Extruder	1
6.	Semi Automatic Blow Molding Machine	1
7.	Vacuum Forming Machine	1
8.	Scrap grinder	1
9.	Two Roll Mill	1
10.	Hydraulic Press	1

1. Processing Lab Manual by CIPET
2. Polymer Processing Lab Manual by D.H.Morton Jones

BOARD EXAMINATION EVALUATION
Practical Examination

Note: All the exercises should be given in the question paper and students are allowed to select by a lot.

ALLOCATION OF MARKS

- Procedure 10 Marks
- Observation 25 Marks
- Calculation 30 Marks
- Result 05 Marks
- Viva-Voice 05 Marks

- Total 75 Marks

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN ENGINEERING/TECHNOLOGY

III YEAR

V SEMESTER

M - SCHEME

2015 – 2016 onwards

LIFE AND EMPLOYABILITY SKILL PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING – SYLLABUS – M Scheme

(Being implemented from the Academic Year 2016-2017 onwards)

Course Name : **All Branches of Diploma in Engineering and Technology and Special Programmes**

Subject Code : **30002**

Semester : **IV /V**

Subject Title : **LIFE AND EMPLOYABILITY SKILLS PRACTICAL**

Teaching and Scheme of Examination: **No. of Weeks per Semester: 15 Weeks**

Subject	Instruction		Examination			
			Marks			
	Hours/ Week	Hours/ Semester	Internal assessment	Board Examination	Total	Duration
Life and Employability Skills	4 Hours	60 Hours	25	75	100	3 Hours

Topics and Allocation of Hours:

Sl. No.	Section	No. of Hours
1	**Part – A** Communication	**30**

2	**Part – B** Entrepreneurship, Project Preparation, Productivity, Occupational Safety, Health, Hazard, Quality Tools& Labour Welfare	**20**
3	**Part – C** Environment, Global Warming, Pollution	**10**
TOTAL		**60**

RATIONALE

Against the backdrop of the needs of the Industries, as wells as based on fulfilling the expectations of the Industries, the Diploma Level students have to be trained directly and indirectly in toning up their competency levels. Proficiency in Communication only, equips them with confidence and capacity to cope with the employment. Hence, there is a necessity to focus on these in the curriculum. At the end of the Course, the student is better equipped to express himself in oral and written communication effectively.

SPECIFIC INSTRUCTIONAL OBJECTIVES

1. Emphasize and Enhance Speaking Skills

2. Increase Ability to Express Views & Opinions

3. Develop and Enhance Employability Skills

4. Induce Entrepreneurship and Plan for the Future

5. Expose & Induce Life Skills for Effective Managerial Ability

LIFE AND EMPLOYABILITY SKILLS PRACTICAL

SYLLABUS

Unit	Topics	Activity	Hours
I	**Communication, Listening, Training, Facing Interviews, Behavioural Skills**	-- instant sentence making – say expressions/phrases-- self- introduction/another higher official in company – describe/explain product – frame questions based on patterns – make sentences based on patterns	**30**
II	**Entrepreneurship, Project Preparation, Marketing Analysis, Support & Procurement**	-- prepare an outline of a project to obtain loan from bank in becoming an entrepreneur – prepare a resume	**10**
III	**Productivity – comparison with developed countries, Quality Tools, Circles, Consciousness, Management, House Keeping**	-- search in the website -- prepare a presentation – discuss & interact	**05**
IV	**Occupational Safety, Health Hazard, Accident & Safety, First-Aid,Labour Welfare Legislation, Welfare Acts**	-- search in the website -- prepare a presentation – discuss & interact	**05**

V	**Environment, Global Warming, Pollution**	-- taking down notes / hints – answering questions -- fill in blanks the exact words heard	**10**

LEARNING STRUCTURE **100 Marks**

-- Focus more on Speaking & Listening Skills
-- Attention less on Reading & Writing Skills
-- Apply the skills in fulfilling the Objectives on Focused Topics

a) Listening **25 Marks**

1. Deductive Reasoning Skills (taking down notes/hints) **10**
2. Cognitive Skills (answering questions) **10**
3. Retention Skills (filling in blanks with exact words heard) **05**

b) Speaking Extempore/ Prepared **30 Marks**

1. Personality/Psychological Skills (instant sentence making) **05**
2. Pleasing & Amiable Skills (say in phrases/expressions) **05**
3. Assertive Skills (introducing oneself/others) **05**
4. Expressive Skills (describe/explain things) **05**
5. Fluency/Compatibility Skills (dialogue) **05**
6. Leadership/Team Spirit Skills (group discussion) **05**

c) Writing & Reading **20 Marks**

1. Creative & Reasoning Skills (frame questions on patterns) **05**
2. Creative & Composing Skills (make sentences on patterns) **05**
3. Attitude & Aim Skills (prepare resume) **05**
4. Entrepreneurship Skills (prepare outline of a project) **05**

d) Continuous Assessment (Internal Marks) **25 Marks**

(search,read, write down, speak, listen, interact & discuss)

1. Cognitive Skills (Google search on focused topics)
2. Presentation Skills& Interactive Skills (after listening, discuss)

Note down and present in the Record Note on any 5 topics **10 Marks**
Other activities recorded in the Record note **10 Marks**
Attendance **05 Marks**

INTERNAL MARKS **25 MARKS**

EXTERNAL MARKS AT END EXAMINATION **75 MARKS**

MODEL QUESTION

Time: 3 Hours **Maximum Marks: 75**

A. LISTENING **25 Marks**

1. Listen to the content and take down notes/hints 10
2. Listen to the content and answer the following questions. 10
3. Listen to the content and fill in the blanks the exact words heard. 05

B. SPEAKING **30 Marks**

1. Say in a sentence instantly on hearing the word(5 words, one after another). 05
2. Say any five expressions commonly used in communication. 05
3. Imagine, a consultant has come to your department.
   Introduce him to your subordinates. 05
4. Explain/describe the product you are about to launch in the market. 05
5. Speak with your immediate boss about the progress you have made. 05
6. Discuss within the group on the topic of focus in the syllabus. 05

C. WRITING & READING **20 Marks**

1. Frame new questions from the pattern given by changing sets of words with your own. 05

a.	When	do	you	return?
b.	How	is	his performance?	
c.	Where	has	the manager	gone?
d.	What	is	the progress	today?
e.	Why	are	the machines	not functioning?

2. Make sentences from the pattern given by changing sets of words with your own. 05

a.	The workers	are	on strike		
b.	The labourers	are paid	well	in this factory	
c.	There	is	a rest room	for the workers	

d.	These	are	the new products	launched	by our company
e.	Almost everyone	come	to the company	on motorbikes	

3. Prepare a resume for the post of Department Manager. 05

4. Prepare an outline of a project to obtain a loan. (Provide headings and subheadings) 05

I. Guidelines for setting the question paper:

A. LISTENING :

ONLY TOPICS related to
POLLUTION /
ENVIRONMENT /
GLOBAL WARMING are to be taken.
These topics are common for all the three types of evaluation.

B. SPEAKING :

1. WORDS of common usage
2. Fragments – expression of politeness, courtesy, cordiality
3. Introduce yourself as an engineer with designation or
   Introduce the official visiting your company/department

4. Describe/Explain the product/machine/department
5. Dialogue must be with someone in the place of work.
6. Group of six/eight
   Discuss the focused topic prescribed in syllabus

C. WRITING & READING:

1. Provide five different structures.
   Students are to substitute at least one with some other word/words
2. Provide five different structures.
   Students are to substitute at least one with some other word/words
3. Provide some post related to industries.
4. Outline of the project (skeleton/structure)
   Only the various headings and subheadings
   Content is not needed

II. Guidelines for recording the material on the Focused Topics in the Record note.

Write in the record note, **on any five topics**, from the list of topics given below. **10 Marks**
(5 topics x 10 marks = 50 marks. Thus, the **Average of 5 topics is 10 Marks)**

1. Productivity in Industries – Comparison with developed countries
2. Quality Tools, Quality Circles and Quality Consciousness
3. Effective Management
4. House Keeping in Industries
5. Occupational Safety and Hazard
6. Occupational Accident and First Aid
7. Labour Welfare Legislations
8. Labour Welfare Acts and Rights
9. Entrepreneurship
10. Marketing Analysis, Support and Procurement

LABORATORY REQUIREMENT:

1. An echo-free room
2. Necessary furniture and comfortable chairs
3. A minimum of two Computers with internet access
4.A minimum of two different English dailies
5. A minimum of Three Mikes with and without cords
6. Colour Television (minimum size – 29")
7. DVD/VCD Player with Home Theatre speakers
8. Smart board
9. Projector

Suggested Reading:

1. Production and Operations Management by S.N. Chary, TMH
2. Essentials of Management by Koontz &Weihrich, TMH
3. Modern Production / Operations Management by E.S. Buffa and R.K. Sarin, John Wiley & Sons
4. Production Systems: Planning, Analysis and Control by J.L.Riggs, 3rd ed., Wiley.
5. Productions and Operations Management by A.Muhlemann, J.Oakland and K.Lockyer, Macmillan
6. Operations Research - An Introduction by H.A.Taha, Prentice Hall of India
7. Operations Research by J.K.Sharma, Macmillan
8. Business Correspondence & Report Writing by R.C. Sharma and K.Mohan, TMH
9. How to prepare for Group Discussion & Interview (With Audio Cassette) by Prasad, TMH
10. Spoken English – A self-learning guide to conversation practice (with Cassette)
11. Introduction to Environmental Engineering by Mackenzie, L. Davis and A. David, Cornwell, McgrawHill, 3rd Ed.
12. Environmental Engineering by Peary, Rowe and Tchobanoglous, McgrawHill
13. Total Quality Management – An Introductory Text by Paul James, Prentice Hall
14. Quality Control and Applications by Housen&Ghose
15. Industrial Engineering Management by O.P. Khanna

VI SEMESTER

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

VI SEMESTER

M - SCHEME

2015 – 2016 onwards

PLANT ENGINEERING AND MANAGEMENT

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37561
Semester : VI Semester
Subject Title : **PLANT ENGINEERING AND MANAGEMENT**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
PLANT ENGINEERING AND MANAGEMENT	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPIC	Time (Hours)
I	**PRINCIPLES OF MANAGEMENT**	15
II	**ORGANISATION AND QUALITY CONTROL**	15
III	**MARKETING FUCNTIONS-INDUSTRIAL RELATIONS AND SAFETY**	15
IV	**ENVIRONMENTAL MANAGEMENT**	15
V	**DISASTER MANAGEMENT**	15
	Total	75

RATIONALE:

In this subject the basic concepts on the various principles of management about scientific management, entrepreneurship, different types of organanisation are 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 following :

- To understand the different types of ownership in industry
- To understand the scientific management
- To organise the different activities of the plant
- To develop the traits required for entrepreneur

- To select the plant location and product
- To acquire better knowledge about decision making and communication
- To understand the important factors of production planning control
- To carryout suitable effective methods for inventory control
- To maintain good quality control
- To understand the various quality certification schemes
- To understand the different marketing techniques
- To promote the products with effective methods
- To select the suitable advertising techniques
- To understand the different factory acts for employee welfare
- To appraise the safety performance
- To understand the importance of pollution control
- 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 various preventive measures and warning systems
- To estimate the arrangements required in industry to avoid disaster
- To understand the insurance claim and rehabilitation methods

37561 - PLANT ENGINEERING AND MANAGEMENT

DETAILED SYLLABUS

Unit	Name of the Topic	Hours
I	**UNIT I: PRINCIPLES OF MANAGEMENT** Role of industry –Types of ownership-Proprietorship, partnership-Private limited –Public limited –Industrial co-operatives –Scientific management –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 –Site selection –Principles of plant layout –Factors influencing plant location. Plant maintenance – importance – Break down maintenance, preventive maintenance and scheduled maintenance.	**15 Hrs**
II	**UNIT II: ORGANISATION AND QUALITY CONTROL** Leadership in organization –Decision making –Communication –Motivation –Group dynamics –Production planning and control –Need for planning –Routing –Scheduling –Despatching –PERT –CPM –Inventory control –ABC analysis of safety stock –EOQ method –Purchasing procedures –Records –Bin cards - Quality control –Basic concepts –Definition –Terminology –Presentation of data –Indian standards on quality control technique –Quality certification schemes –ISO 9000 etc.	**15 Hrs**

III	**UNIT III MARKETING FUNCTIONS, INDUSTRIAL RELATIONS AND SAFETY** Marketing –Definition –Information –Functions –Pricing policy –Pricing techniques - Sales –Definition –Personal selling –Promotion mix – 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 act 1948 –Child labour act Process safety –Hazard analysis –Risk analysis –Common causes of accidents –Safety training –Electrical hazard –Fire hazard –Explosion hazard –First aid.	**15 Hrs**
IV	**UNIT IV: ENVIRONMENTAL MANAGEMENT** Introduction – Environmental Ethics – Assessment of Socio Economic Impact – Environmental Audit – Mitigation of adverse impact on 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 – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management. Noise pollution management – Effects of noise on people – Noise control method**s.**	**15 Hrs**
V	**UNIT V: DISASTER MANAGEMENT** Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Man made Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life. Disaster Mitigation measures – Causes for major disasters – Risk Identification – Hazard Zones – Selection of sites for Industries and residential buildings – Minimum distances from Sea – Orientation of Buildings – Stability of Structures – Fire escapes in buildings - Cyclone shelters – Warning systems. Disaster Management – Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings –	**15 Hrs**

	Mobilization of Emergency Services - Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbours / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.	

Text book:

1. O.P.Khanna Industrial engineering and management, Dhanpat rai & sons.
2. C.S.Rao - Environmental Engineering and Pollution control, Wiely

Reference Books:

1. Industrial Management by Dalilal & Mansur Ali
2. Hand Book of "Industrial Safety and Health, Trade and Technical Press Ltd., Modern, U.K. 1980.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

VI SEMESTER

M - SCHEME

2015 – 2016 onwards

POLYMER TESTING

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**

Subject Code : 37562

Semester : VI Semester

Subject Title : **POLYMER TESTING**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
POLYMER TESTING	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPIC	Time (Hours)
I	**IDENTIFICATION OF POLYMER**	15
II	**TEST SPECIMEN PREPARATION AND TESTING OF MECHANICAL PROPERTIES OF POLYMER**	15
III	**THERMAL AND OPTICAL PROPERTIES OF POLYMER**	15
IV	**ELECTRICAL AND WEATHERING PROPERTIES OF POLYMER**	15
V	**TESTING OF POLYMER END PRODUCTS**	15
	Total	75

RATIONALE:

In this subject the basic methods by plastics and rubbers identification are detailed to make the students to be knowledgeable in various methods of identification. This subject also covers different properties of polymers namely mechanical properties, thermal properties, optical properties, Electrical properties and chemical properties also the methods by which these properties can be determined.

In this subject different test can be performed to products like pipes, containers, foams, hoses, belts and laminates.

This subject will definitely help the students to operate various testing equipments.

OBJECTIVES:

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

- Identification of plastics by Simple physical preliminary tests and by detection of elements present in the plastics.
- Confirmation of plastics by chemical analysis.
- Significance and method of determination Analytical tests like Specific gravity, Density, Water absorption, Moisture analysis, Melting point and Solubility.
- Specifications, standards and their importance.
- Principle, test procedure, standards used, significance and the factors affecting the various mechanical properties of plastics like Short-term mechanical properties, Long-term mechanical properties and Mechanical properties of surfaces.

- Principle, test procedure, standards used, significance and the factors affecting the various thermal properties and flammability tests.
- Principle, test procedure, standards used, significance and the factors affecting the Optical properties of plastics.
- Electrical properties, weathering properties, Chemical properties their Principle, test procedure, standards used, significance and the factors affecting the tests.
- Significance of product testing.
- Product Testing methods and their importance of Pipe testing, plastic packages, Laminates / Multilayer films, Blow moulded containers and cellular materials.

37562 – POLYMER TESTING
DETAILED SYLLABUS

Unit	Name of the Topic	Hours
I	**UNIT I: IDENTIFICATION OF POLYMER** Identification of Polymer - Simple physical preliminary tests like visual examination, heating and softening behavior, floatation test, cutting with knife, scratching with nail, bending, tearing and dropping sound test. Burning tests - Nature of flame, odour, speed of burning, smoke and other characteristics - Detection of elements by Copper wire test (Beilstein test) and Sodium fusion extract test – Confirmation of Polymer by chemical analysis. **Analytical tests:** Specific gravity - Density - Water absorption - Moisture analysis - Melting point - Solubility test - Significance and method of determination. latex test; Dry rubber content-Total solids-Coagulum content-Total alkalinity-KOH number	**15 Hrs**
II	**UNIT II: TEST SPECIMEN PREPARATION AND TESTING OF PHISICO-MECHANICAL PROPERITES OF POLYMER** Importance of testing - Specifications - Test specimen preparation of Polymer - Equipments used for preparation - Standards (Brief idea only) - Conditioning procedure. **Mechanical Properties:** **Short-term mechanical properties**: 1. Tensile strength - Stress curve - Equipment and procedure –Factors affecting Tensile strength. 2. Impact strength (Izod, Charpy) 3. Shear strength - compressive strength and flexural strength - Test methods and procedure. **Long-term mechanical properties**: 1. Creep and Set - Equipment and procedure - Factors affecting the property. 2.Fatigue and stress relaxation - Types of fatigue tests - Factors affecting the property. **Mechanical properties of surfaces**: Measurement of Hardness (Durometer (Shore A & D), IRHD and Rockwell only) - Factors affecting Hardness. 2. Abrasion –Taber abrasion - equipment and procedure.	**15 Hrs**

Unit	Name of the Topic	Hours
III	**UNIT III: THERMAL, RHEOLOGICAL AND OPTICAL PROPERTIES OF POLYMER** **Thermal properties**: Thermal conductivity - Measurement of Thermal conductivity - Co efficient of thermal expansion - -Heat distortion Temperature (HDT) - Vicat Softening Point (VSP) -) - Significance and method of determination - Determination of Glass transition temperature(DSC & TMA only). **Rheological Properties:** Melt Flow Index (MFI Rheological properties of polymeric materials-determination of viscosity - Rotational viscometer(ODR & MDR principle only)- Mooney viscometer **Flammability tests**: - Oxygen Index Test - Critical Oxygen Index -Method of determination of critical Oxygen Index (COI) value only **Optical properties**: Refractive index- birefringence - Light Transmittance - Haze – Gloss - Definitions and method of determination.	**15 Hrs**
IV	**UNIT IV: ELECTRICAL & WEATHERING PROPERITES OF POLYMER (16 hours)** **Electrical properties**: Introduction - Requirements of an insulator - Di-electric strength - Measurement of Di-electric strength - Factors affecting Di-electric strength. Di-electric constant and dissipation factor - Measurement of Di-electric constant-Arc resistance - Measurement of Arc resistance – Tracking-Resistivity - Volume resistivity and Surface resistivity. **Weathering properties**: Accelerated weathering test - Outdoor weathering test - Significance and measurement. **Chemical properties**: Immersion test - Stain resistance test - Solvent stress cracking resistance - Environmental Stress Cracking Resistance (ESCR) - Significance and method of determination.	**15 Hrs**
V	**UNIT V: TESTING OF POLYMER PRODUCTS** Testing of plastic products - Significance of product testing. Pipe testing - PVC and HDPE Pipes Classification - Test methods. Plastic packages -Rigid - Semi rigid and Flexible packages - General test methods. Laminates / Multilayer films - Parameters for acceptance. Testing of Blow moulded containers. Testing of cellular materials - Rigid foam test methods and flexible foam test methods. Testing of Rubber Hose, Belts and tubes.- non-destructive test (introduction only)	**15 Hrs**

Text Books:

1. R.P.Brown.- Polymer testing
2. Vishu shah - Handbook of Plastic Testing Technology – Wiley Inter-science Publications - 1998
3. J.Haslam and H.A.Willis - Identification and Analysis of Polymer – ILIFFE, London – 1972.

Reference Books:

1. G.Gordon Cameron - Ellis Hand Book of Analysis of Synthetic Polymers- Honwood Ltd., - 1977
2. Maurice Morton - Rubber Technology - Robert E.Krieger Pub.Co.1973.
3. A.S. Athalye–Identification and testing of plastics - Multitech publishers - 1992.
4. How to identify plastics - CIPET Publication- 2003.
5. Paul Kluckow-Rubber and Plastics Testing – Chapman & Hall, London – 1963.
6. Murugan.N - Basics of Testing of Plastics – Study Material.
7. L.E.Nielsen -Mechanical properties of Plastics – Reinhold, New York – 1962.
8. J.H.Collins -Testing and Analysis of Plastics – Plastics Institute – 1955.
9. R. P. Brown - Handbook of plastic testing methods - 1971
10. K.J.Saunders-Identification of Platics & Rubbers–Chapman & Hall – 1966.
11. M.E.Baird - Electrical Properties of polymeric materials – Plastics and Rubber Institute, London – 1973.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

VI SEMESTER

M - SCHEME

2015 – 2016 onwards

POLYMER MOULD ENGINEERING

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37581
Semester : VI Semester
Subject Title : **POLYMER MOULD ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
POLYMER MOULD ENGINEERING	5	75	Internal Assessment	Board Examination	Total	
			25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME (Hrs)
I	**MOULD MATERIALS & MOULD DESIGN FOR PART REQUIREMENT**	15
II	**MOULD DESIGN FUNDAMENTALS, FEED, EJECTION & COOLING SYSTEM**	15
III	**INJECTION MOULD DESIGN**	15
IV	**COMPRESSION AND TRANSFER MOULD DESIGN**	15
V	**BLOW MOULD & EXTRUSION DIE DESIGN**	15
	Total	75

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 must be able to know about

- ❖ Mould materials their properties and applications
- ❖ Design of moulds and product to meet processing requirements.
- ❖ Important product design concepts like of ribs, bosses and undercuts etc.,
- ❖ Types of threads and its significance.
- Functions of inserts and their importance.
- Basic terminology and mould construction.
- Parting line construction.
- Design of gate system.
- Design of Ejection system.
- Hot runner mould.

- Compression and Transfer Mould Design their types, advantages, limitations and applications.
- Blow mould materials and constructions.
- Extrusion Die materials and construction.
- Designing of pipe, blown film and sheet dies.

37581 – POLYMER MOULD ENGINEERING
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**UNIT-I: MOULD MATERIALS & MOULD DESIGN FOR PART REQUIREMENT** Introduction of mould materials - Elementary idea about Pre hardened mould materials and standard mould base. Introduction to product design - Design to meet processing requirements - Positioning of gates, runners, venting, weld lines - Design of ribs and bosses - Rim - Gussets - Radii - Fillets - Parting line. Warpage - Wall thickness – Draft. Undercuts - Internal, external - Inserts - Functions of inserts - Effect of inserts on mould strength -	**15 Hrs**
II	**UNIT-II: MOULD DESIGN FUNDAMENTALS, FEED, EJECTION & COOLING SYSTEM** Basic terminology and mould construction - Cavity and core (integer, insert) - Bolster - Sprue bush - Register ring - Guide pillar - Guide bush - Parting line construction - Stepped parting line - Irregular parting surface - Local stepped and profile parting line. Feed system - sprue - runners - runner cross section - Balancing of runner. Types of gating system - Winkle gate - Diaphragm gate - Sprue gate - Edge gate - Fan gate - Ring gate - Submarine gate - Pin point gate - Tab gate - Selection of gate and application - Types of ejection - Pin, stepped pin, "D" pin, blade, sleeve, stripper, air, double ejection - Sprue pullers - Sprue bush. Cavity cooling techniques - Core cooling techniques - Bolster cooling techniques - Sprue cooling - Ejection cooling.	**15 Hrs**

III	**UNIT III: INJECTION MOULD DESIGN** Types of injection moulds - General arrangement of 2 plate, 3 plate mould - Single, multi impression moulds - Single daylight, multi daylight moulds - Split mould - Actuation techniques - Cam actuation, finger cam, dog leg - Actuation of side core and side cavity - Empirical formula for determination of number of cavities - Elementary cost estimating procedure for mould. Hot runner mould - Elementary knowledge about hot runner mould.	**15 Hrs**
IV	**UNIT IV: COMPRESSION AND TRANSFER MOULD DESIGN** Compression mould types - flash, semi-positive, positive moulds – Advantages, limitations and applications. Empirical formula for calculation of: Bulk factor, weight of moulding, no. of cavity required, shrinkage - Mould heating - Types of heaters. Transfer moulds - Pot type moulds, Plunger type moulds. Simple calculation for: Size of transfer pot, transfer plunger, sprue dimension, transfer chamber, clamp pressure, transfer pressure	**15 Hrs**
V	**BLOW MOULD & EXTRUSION DIE DESIGN** Die and mandrel design - Die head - Side feed - Spider or axial flow head - Accumulator head - - Parison programming - Parting line - Pinch off design - Neck pinch off - Base pinch off - Flash pockets - Venting and mould surface finish - Cooling. Extrusion Die geometry - Designing of pipe die - Production line - Torpedo, mandrel, land - length, approach section - Inline type - offset type - Design of blown film - Side feed die, bottom feed die - Design of sheet die - Production line - Coat hanger type - Design of profile die (one type only) - Elementary idea about monofilament die.	**15 Hrs**

TEXT BOOKS:

1. Ronald D. Beck - Product Design - Van Nostrand-Reinhold Co. (1970)
2. R.G.W.Pye - Injection mould design -4th Ed- Longman scientific & Technical (2000)
3. R.H.Bebb - Plastic Mould Design - (Compression & Transfer mould)
4. Rosato - Blow Mould Design – Hanser Publications (1972)
5. M.V. Joshi - Extrusion Die Design –Macmillan India ltd (1992)

REFERENCES:

1. J. Harry Dubois &Waying I. Prible - Plastic mould engineering hand book (1982)
2. Laszlosors – Plastic Mould Engineering – Pergamon press (1967)
3. Robert A Malloy – Plastic part design for injection Moulding – Hanser (1994)
4. Chereminishroff -.Product Design and Testing of Polymeric Material – Hanser (1992)
5. Levy - Plastics Product Design Hand Book – Van nostrand reinhold Co. (1977)
6. Dominick V Rosato and Donald V Rosato - Injection Moulding Handbook (1985)
7. Ralph.E.Wright – Moulded Thermosets – Hanser Publishers (1991)
8. Klaus stoeckhert – Mould making Handbook for Plastic Engineers – Hanser (1983)
9. Pauk.A.Tres – Designing Plastic parts for assembly – Hanser (1994)
10. Walter Michaeli – Extrusion Dies - 2nd Ed- Hanser (1992)

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

VI SEMESTER

M - SCHEME

2015 – 2016 onwards

PACKAGING TECHNOLOGY

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37582
Semester : VI Semester
Subject Title : **PACKAGING TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
PACKAGING TECHNOLOGY	5	75	Internal Assessment	Board Examination	Total	
			25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME (Hrs)
I	**PACKAGING SCOPE AND MATERIALS**	15
II	**CONVERSION PROCESSES OF PACKAGES**	15
III	**FLEXIBLE PACKAGING**	15
IV	**RIGID AND SEMI RIGID PACKAGING**	15
V	**TESTING OF PLASTICS PACKAGING**	15
	Total	75

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

- ❖ Scope and functions of packaging
- ❖ Advantages of plastics packaging over conventional packaging materials
- ❖ Major forms of plastics materials used in packaging.
- ❖ Packaging regulations and legislation.
- ❖ Selection criteria of polymeric packages
- Conversion processes like
    1. Compression and Transfer moulding
    2. Injection moulding
    3. Blow moulding and extrusion
    4. Rotational moulding and thermoforming etc.,
- Comparison between the rigid packaging, semi rigid packaging and flexible packaging.
- Design of moulded cushioning systems.
- Applications of expanded polystyrene in packaging.
- Advantages and disadvantages of moulded foams.
- Testing of important properties like, barrier properties, migration properties, and compatibility properties.
- Printing, labeling, pigmenting and sterilization systems of plastics packages.

37582-PACKAGING TECHNOLOGY
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**UNIT I: PACKAGING SCOPE AND MATERIALS** Introduction to Plastics packaging – scope and functions of packaging – advantages of plastics packaging over conventional packaging materials – 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. Selection criteria of suitable polymeric packages for oils, fats and allied products, soaps and detergents, cosmetics, food, dairy products, beverages, medicines, chemicals, paints, household and industrial goods.	**15 Hrs**
II	**UNIT II: CONVERSION PROCESSES OF PACKAGES** **Conversion processes:** Closures production by Injection moulding process – different types of closures: friction closures, snap fit closures and threaded closures – Plastics bottles production by blow moulding – 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**
III	**UNIT III: FLEXIBLE PACKAGING** **Flexible Packaging:** Extrusion film – cast film – cast sheet – blown film – multi layer film and sheet: coating, laminations and coextrusion – stretch and shrink wrap – pouches: pillow pouches, three side seal pouches, four side seal pouches, stand up pouches, forming pouches – bulk and heavy duty bags – heat sealing: bar or thermal sealing, impulse sealing, band sealing, hot wire or hot knife sealing, ultrasonic sealing and friction sealing, radiant sealing, dielectric, magnetic and induction sealing – advantages of flexible packaging .	**15 Hrs**

Unit	Name of the Topic	Hours
IV	**UNIT IV: RIGID AND SEMI RIGID PACKAGING** **Rigid and semi rigid Packaging:** Thermoformed packages – thermoforming moulds –form/fill/seal thermoforming operations – wrap forming – blister packaging –skin packaging - moulded packages – Expanded polystyrene and other foam systems – Design of moulded cushioning systems – applications of expanded polystyrene in packaging - Advantages and disadvantages of moulded foams – Comparison between flexible packaging and rigid packaging.	**15 Hrs**
V	**UNIT V: TESTING OF PLASTICS PACKAGING** Testing of plastic packages – barrier properties – oxygen permeability – carbon dioxide permeability – oxygen head space – water vapour transmission rate (WVTR) - migration properties – compatibility property – printing – labeling – pigmenting – sterilization systems.	**15 Hrs**

Text Books:

1. E.M.Susan-Understanding Plastic packaging technology–Hanser Publishers(1995)

Reference Books:

1. A.S.Athalye -Plastics in packaging – Tata McGraw-Hill Co. Ltd.,New Delhi (1992)
2. R.L.Butzko - Plastics sheet forming – Hanser Publishers (1995)
3. John D. Beadle - Plastics forming – Ilifee, London (1982)
4. E.C.Bernhardt - Processing of Thermoplastic Materials –. Hanser Publishers (1995)

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

VI SEMESTER

M - SCHEME

2015 – 2016 onwards

POLYMER TESTING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37564
Semester : VI Semester
Subject Title : **POLYMER TESTING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
POLYMER TESTING PRACTICAL	5	75	25	75	100	3 Hrs

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.

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 Board Examinations.

Objectives:

- In this practical subject, the students are required to learn the basics of analytical tests and their determination and significance.
- This practical subject will also make the students to identify any polymers given to them by using simple tests.
- This subject will also make the students to understand the principle, test procedure, standards used, significance and the factors affecting the various properties of polymers like mechanical, optical, thermal, electrical etc.,
- The students will also be well versed in polymer products testing procedure and their importance.

LIST OF EXPERIMENTS

I. Testing of polymers (Rubber & Plastics) for the following properties:

1. Determination of Tensile strength
2. Determination of Hardness
3. Determination of Flex cracking and cut growth
4. Determination of Abrasion resistance
5. Determination of Rebound resilience
6. Determination of Compression set
7. Determination of Impact strength
8. Determination of Melt flow index
9. Determination of Heat distortion temperature test

II. Testing of Latex:

1. Determination of Dry rubber content
2. Determination of Total solids
3. Determination of Coagulum content
4. Determination of Total alkalinity
5. Determination of KOH number

III. Identification of Rubber and Plastics by simple chemical methods.

V.Studies on Rheometer –

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

S.No.	Name of Equipment / Instrument	No.
1.	Electronic Weighing Balance	1
2.	Muffle Furnace	1
3.	Melting point Apparatus	1
4.	U T M	1
5.	Hardness testing machine	1
6.	DIN abrader	1
7.	Melt Flow Index Tester	1
8.	HDT Tester	1
9.	Compression/Tension set apparatus	1
10.	ESCR Apparatus	1
11.	Rebound resilience tester	1
12.	Vernier Caliper	1

1.Plastics Testing Lab Manual by Vishu shah
2. Identification and testing of plastics by CIPET
3.Testing of Plastics by ASTM

BOARD EXAMINATION EVALUATION
Practical Examination

Note: All the exercises should be given in the question paper and students are allowed to select by a lot.

ALLOCATION OF MARKS

❖ Procedure	10 Marks
❖ Observation	25 Marks
❖ Calculation	30 Marks
❖ Result	05 Marks
❖ Viva-Voice	05 Marks
❖ Total	75 Marks

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

VI SEMESTER

M - SCHEME

2015 – 2016 onwards

COMPUTER AIDED MOULD DESIGN PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37565
Semester : VI Semester
Subject Title : **COMPUTER AIDED MOULD DESIGN PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
COMPUTER AIDED MOULD DESIGN PRACTICAL	5	75	25	75	100	3 Hrs

RATIONALE:

These modern techniques have largely supplanted the classical design analyses, which are used to produce polymer products. This is accomplished by doing design Engineering experiments in practical classes using computers.

OBJECTIVES:

After completion of this laboratory, the students will be able

- Design two-plate single cavity injection mould.
- Design two-plate multi cavity injection mould with ejection system.
- Design three plate / under feed mould.
- Design spilt mould with actuation system.
- Design mould with side core.

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 Board Examinations.

LIST OF EXPERIMENTS:

1. Drawing mould basic component -Guide pillar,
2. Drawing mould basic component.- Guide bush
3. Drawing mould basic component - Sprue Bush

4. Drawing mould basic component - Register Ring and Ejection assembly
5. Hand injection mould for given product.
6. Design of two-plate single cavity injection mould.
7. Design of two-plate multi cavity injection mould with ejection system.
8. Design of three plate / under feed mould.
9. Design of spilt mould with actuation system.
10. Design of mould for the given product

LIST OF EQUIPMENTS:

LISTOFEQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR A BATCH OF30 STUDENTS):

S.No.	Name of Equipment / Instrument	No.	Material	No./Quantity
1.	Computers with at least PIV Configuration	30	AutoCAD 2007 &abovesoftware	1

BOARD EXAMINATION EVALUATION
Practical Examination

Note: All the exercises should be given in the question paper and students are allowed to select by a lot.

ALLOCATION OF MARKS

- Procedure 10 Marks
- Design concept 25 Marks
- Drawing 30 Marks
- Result 05 Marks
- Viva-Voice 05 Marks

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- Total 75 Marks

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DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

VI SEMESTER

M - SCHEME

2015 – 2016 onwards

MOULD MAKING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN POLYMER TECHNOLOGY (Sandwich)**
Subject Code : 37566
Semester : VI Semester
Subject Title : **MOULD MAKING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours /Week	Hours /Semester	Marks			Duration
MOULD MAKING PRACTICAL	5	75	Internal Assessment	Board Examination	Total	
			25	75	100	3 Hrs

OBJECTIVES:

- In this practical subject, the students are required to learn the basic
- Of Squaring of a metal plate on Milling and Grinding.
- Machining Guide pillar
- Machining Guide bush
- Drilling and counter boring holes for Guide pillar and Guide bush.
- Making a cavity and Cavity insert by Vertical milling
- Making Core and Core insert by Turning, Milling and Grinding.
- The students will also learn assembly of moulds.

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 Board Examinations.

LIST OF EXPERIMENTS:

MOULD MAKING:

1. Squaring of a metal plate on Milling and Grinding.
2. Machining Guide pillar
3. Machining Guide bush
4. Drilling and counter boring holes for Guide pillar and Guide bush, .
5. Making a cavity and Cavity insert by Vertical milling
6. Making Core and Core insert by Turning, Milling and Grinding.
7. Assembly of moulds
8. Heat treatment by using Muffle Furnace
9. Hardness testing by Rockwell Hardness testers
10. Checking the flatness with dial indicator using surface plate and accessories.

ALLOCATION OF MARKS

❖ Procedure	10 Marks
❖ Observation	25 Marks
❖ Mould making	30 Marks
❖ Result	05 Marks
❖ Viva-Voice	05 Marks
❖ Total	75 Marks

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY

FULL TIME - (SANDWICH)

III YEAR

VI SEMESTER

M - SCHEME

2015 – 2016 onwards

PROJECT WORK

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology (Full Time)**
Subject Code : 37567
Semester : VI Semester
Subject Title : **PROJECT WORK**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
PROJECT WORK	4	60	Internal Assessment	Board Examination	Total	
			25	75	100	3 Hrs

OBJECTIVES:

- To develop the creative talents in the students.
- The project work should involve less cost, easy manufacturing technique and suitable to the real 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 room situations such as group work, sharing responsibility, initiate, creativity etc

.

Internal Assessment	**Marks**
Project Review I (8th Week)	10
Project Review II (14th Week)	10
Attendance	5
Total	25

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 of project.
- Periodical assessment should be carried out from V semester.
- The students' batch size should not exceed 6 Nos.
- The students should maintain a logbook of the work carried out by them.
- The internal assessment marks will be given based on the work carried out by the students as per the logbook.

EVALUATION FOR BOARD EXAMINATION:

Details of Mark allocation	Max Marks
Marks for Report Preparation, Demo, Viva-voce	65
Marks for answers of 4 questions which is to be set by the external examiner from the given question bank consisting of questions in the following two topics Disaster Management and Environmental Management. Out of four questions two questions to appear from each of the above topics i.e. 2 questions x 2 topics = 4 questions 4 questions x 2 ½ marks = 10 Marks	10
Total	**75**

DETAILED SYLLABUS

ENVIRONMENTAL & DISASTER MANAGEMENT

1. ENVIRONMENTAL MANAGEMENT

Introduction – Environmental Ethics – Assessment of Socio Economic Impact – Environmental Audit – Mitigation of adverse impact on 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 – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management.

Noise pollution management – Effects of noise on people – Noise control methods.

2. DISASTER MANAGEMENT

Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Man made Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life..

Disaster Mitigation measures – Causes for major disasters – Risk Identification – Hazard Zones – Selection of sites for Industries and residential buildings – Minimum distances from Sea – Orientation of Buildings – Stability of Structures – Fire escapes in buildings -

Cyclone shelters – Warning systems.

Disaster Management – Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services - Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbors / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

LIST OF QUESTIONS

1. ENVIRONMENTRAL MANAGEMENT

1. What is the responsibility of an Engineer-in-charge of an Industry with respect to Public Health?
2. Define Environmental Ethic.
3. How Industries play their role in polluting the environment?
4. What is the necessity of pollution control? What are all the different organizations you know, which deal with pollution control?
5. List out the different types of pollutions caused by a Chemical / Textile / Leather / Automobile / Cement factory.
6. What is meant by Hazardous waste?
7. Define Industrial waste management.
8. Differentiate between garbage, rubbish, refuse and trash based on their composition and source.
9. Explain briefly how the quantity of solid waste generated in an industry could be reduced.
10. What are the objectives of treatments of solid wastes before disposal?
11. What are the different methods of disposal of solid wastes?
12. Explain how the principle of recycling could be applied in the process of waste minimization.
13. Define the term ‘Environmental Waste Audit’.
14. List and discuss the factors pertinent to the selection of landfill site.
15. Explain the purpose of daily cover in a sanitary landfill and state the minimum desirable depth of daily cover.
16. Describe any two methods of converting waste into energy.
17. What actions, a local body such as a municipality could take when the agency appointed for collecting and disposing the solid wastes fails to do the work continuously for number of days?
18. Write a note on Characteristics of hazardous waste.
19. What is the difference between municipal and industrial effluent ?
20. List few of the undesirable parameters / pollutants anticipated in the effluents from oil refinery industry / thermal power plants / textile industries / woolen mills / dye

industries / electroplating industries / cement plants / leather industries (any two may be asked)

21. Explain briefly the process of Equalization and Neutralization of waste water of varying characteristics discharged from an Industry.
22. Explain briefly the Physical treatments “Sedimentation” and “Floatation” processes in the waste water treatment.
23. Explain briefly when and how chemical / biological treatments are given to the waste water.
24. List the four common advanced waste water treatment processes and the pollutants they remove.
25. Describe refractory organics and the method used to remove them from the effluent.
26. Explain biological nitrification and de-nitrification.
27. Describe the basic approaches to land treatment of Industrial Effluent.
28. Describe the locations for the ultimate disposal of sludge and the treatment steps needed prior to ultimate disposal.
29. List any five Industries, which act as the major sources for Hazardous Air Pollutants.
30. List out the names of any three hazardous air pollutants and their effects on human health.
31. Explain the influence of moisture, temperature and sunlight on the severity of air pollution effects on materials.
32. Differentiate between acute and chronic health effects from Air pollution.
33. Define the term Acid rain and explain how it occurs.
34. Discuss briefly the causes for global warming and its consequences
35. Suggest suitable Air pollution control devices for a few pollutants and sources.
36. Explain how evaporative emissions and exhaust emissions are commonly controlled.
37. What are the harmful elements present in the automobile smokes? How their presence could be controlled?
38. What is the Advantage of Ozone layer in the atmosphere? State few reasons for its destruction.
39. Explain the mechanism by which hearing damage occurs.
40. List any five effects of noise other than hearing damage.
41. Explain why impulsive noise is more dangerous than steady state noise.
42. Explain briefly the Source – Path – Receiver concept of Noise control.
43. Where silencers or mufflers are used ? Explain how they reduce the noise.
44. Describe two techniques to protect the receiver from hearing loss when design / redress for noise control fail.
45. What are the problems faced by the people residing along the side of a railway track and near to an Airport? What provisions could be made in their houses to reduce the problem?

2. DISASTER MANAGEMENT

1. What is meant by Disaster Management? What are the different stages of Disaster management?
2. Differentiate Natural Disasters and Man made Disasters with examples.
3. Describe the necessity of Risk identification and Assessment Surveys while planning a project.
4. What is Disasters recovery and what does it mean to an Industry?
5. What are the factors to be considered while planning the rebuilding works after a major disaster due to flood / cyclone / earthquake? (Any one may be asked)
6. List out the public emergency services available in the state, which could be approached for help during a natural disaster.
7. Specify the role played by an Engineer in the process of Disaster management.
8. What is the cause for Earthquakes? How they are measured? Which parts of India are more vulnerable for frequent earthquakes?
9. What was the cause for the Tsunami 2004 which inflicted heavy loss to life and property along the coast of Tamilnadu ? Specify its epicenter and magnitude.
10. Specify the Earthquake Hazard Zones in which the following towns of Tamilnadu lie: (a) Chennai (b) Nagapattinam (c) Coimbatore (d) Madurai (e) Salem.
11. Which parts of India are experiencing frequent natural calamities such as (a) heavy rain fall (b) huge losses due to floods (c) severe cyclones
12. Define basic wind speed. What will be the peak wind speed in (a) Very high damage risk zone – A, (b) High damage risk zone, (c) Low damage risk zone.
13. Specify the minimum distance from the Sea shore and minimum height above the mean sea level, desirable for the location of buildings.
14. Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.
15. Explain how the shape and orientation of buildings could reduce the damages due to cyclones.
16. What is a cyclone shelter ? When and where it is provided ? What are its requirements ?
17. What Precautionary measures have to be taken by the authorities before opening a dam for discharging the excess water into a canal/river ?
18. What are the causes for fire accidents ? Specify the remedial measures to be taken in buildings to avoid fire accidents.
19. What is a fire escape in multistoried buildings ? What are its requirements ?
20. How the imamates of a multistory building are to be evacuted in the event of a fire/Chemical spill/Toxic Air Situation/ Terrorist attack, (any one may be asked).
21. Describe different fire fighting arrangements to be provided in an Industry.
22. Explain the necessity of disaster warning systems in Industries.
23. Explain how rescue operations have to be carried out in the case of collapse of buildings due to earthquake / blast / Cyclone / flood.

24. What are the necessary steps to be taken to avoid dangerous epidemics after a flood disaster?
25. What relief works that have to be carried out to save the lives of workers when the factory area is suddenly affected by a dangerous gas leak / sudden flooding ?
26. What are the difficulties faced by an Industry when there is a sudden power failure? How such a situation could be managed?
27. What are the difficulties faced by the Management when there is a group clash between the workers? How such a situation could be managed?
28. What will be the problems faced by the management of an Industry when a worker dies because of the failure of a mechanical device due to poor maintenance? How to manage such a situation ?
29. What precautionary measures have to be taken to avoid accidents to labourers in the Industry in a workshop / during handling of dangerous Chemicals / during construction of buildings / during the building maintenance works.
30. Explain the necessity of medical care facilities in an Industry / Project site.
31. Explain the necessity of proper training to the employees of Industries dealing with hazardous products, to act during disasters.
32. What type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?
33. What is meant by Emergency Plan Rehearsal? What are the advantages of such Rehearsals?
34. What action you will take when your employees could not reach the factory site because of continuous strike by Public Transport workers?
35. What immediate actions you will initiate when the quarters of your factory workers are suddenly flooded due to the breach in a nearly lake / dam, during heavy rain?
36. What steps you will take to avoid a break down when the workers union of your Industry have given a strike notice?
37. List out few possible crisis in an organization caused by its workers? What could be the part of the middle level officials in managing such crisis?
38. What types of warning systems are available to alert the people in the case of predicted disasters, such as floods, cyclone etc.
39. Explain the necessity of Team work in the crisis management in an Industry / Local body.
40. What factors are to be considered while fixing compensation to the workers in the case of severe accidents causing disability / death to them?
41. Explain the legal / financial problems the management has to face if safely measures taken by them are found to be in adequate.
42. Describe the importance of insurance to men and machinery of an Industry dealing with dangerous jobs.
43. What precautions have to be taken while storing explosives in a match/ fire crackers factory?

44. What are the arrangements required for emergency rescue works in the case of Atomic Power Plants?
45. Why residential quarters are not constructed nearer to Atomic Power Plants?

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VII SEMESTER

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN POLYMER TECHNOLOGY
FULL TIME - (SANDWICH)

VII SEMESTER

M - SCHEME

2015 – 2016 onwards

INDUSTRIAL TRAINING REPORT AND VIVA VOCE

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **Diploma in Polymer Technology FULL TIME - (SANDWICH)**
Subject Code : 37592
Semester : VI Semester
Subject Title : **INDUSTRIAL TRAINING REPORT AND VIVA-VOCE**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per semester: 15 weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
INDUSTRIAL TRAINING REPORT AND VIVA-VOCE	-	-	25	75	100	3 Hrs

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. ATTENDANCE CERTIFICATION

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 form of diary to be submitted to the concerned staff in charge of the institution. This will be reviewed while awarding sectional marks.

- Comprehensive report at the end of each spell which will be used for Board Examination.

3.1 Industrial Training Diary

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 completed in the last week of industrial training. Any data, drawings etc. should be incorporated with the consent of the Organization.

4. Scheme of Evaluation

4.1 Sessional Marks

First review (during 3rd month)	:	10marks
Second review (during 5th month)	:	10marks
Attendance	:	5 marks
(Awarded same as in Theory)		
Total	**:**	**25 marks**

4.2 BOARD EXAMINATIOM MARKS

Presentation about Industrial Training	:	20marks
Comprehensive Training Report	:	30marks
Viva- voce	:	25marks
Total	**:**	**75 marks**

EQUIVALENT SUBJECTS IN MSCHEME FOR L SCHEME

L SCHEME				M SCHEME		
S.No	Course Code	Course Name/Subject	Term	Equivalent Course code	Equivalent Subject	Term
1	27031	Organic Chemistry	III	**37531**	**Basic Organic Chemistry**	III
2	27032	Mechanical Engineering	III	**37032**	**Mechanical Engineering**	III
3	27033	Electrical and Electronics Engineering	III	**37033**	**Electrical and Electronics Engineering**	III
4	27534	Auto CAD Practice	III	**37534**	**CAD Practice**	III
5	27035	Electrical and Electronics Engineering Practical	III	**37035**	Electrical and Electronics Engineering Practical	III
6	27036	Workshop Practice II	III	**37036**	**Workshop Practice – II**	III
7	20001	Computer Applications Practical	III	**30001**	**Computer Applications Practical**	III
8	27541	Polymer Science	IV	**37541**	**Polymer Science**	IV
9	27542	Polymeric Materials	IV	**37542**	**Polymeric Materials**	IV
10	27543	Chemical Engineering	IV	**37543**	**Chemical Engineering**	IV
11	27044	Engineering Drawing	IV	**37044**	**Engineering Drawing**	IV
12	27545	Polymer Science Practical	IV	**37545**	**Polymer Science Practical**	IV
13	27546	Polymer Preparation and Identification Practical	IV	**37546**	**Polymer Preparation and Identification Practical**	IV
14	27547	Chemical Engineering Practical	IV	**37547**	**Chemical Engineering Practical**	IV
15	27551	Plastics Processing Technology	V	**37551**	**Plastics Processing**	V

16	27552	Rubber Processing and Product Manufacture	V	**37552**	**Rubber Processing and Product Manufacture**	V
17	27053	Process Instrumentation and Control	V	**37053**	**Process Instrumentation and Control**	V
18	27571	ELECTIVE I 1. Polymer Composites	V	**37571**	**ELECTIVE I 1. Polymer Composites**	V
19	27572	ELECTIVE I 2. Bio-Polymeric Materials	V	**37572**	**ELECTIVE I 2. No equivalent**	V
20	27055	Chemical Process Measurement and Control practical	V	**37055**	**Chemical Process Measurement and Control practical**	V
21	27556	Polymer Processing Practical	V	**37556**	**Polymer Processing Practical**	V
22	20002	Communication and Life Skill Practical	V	**30002**	**Life and Employability Skill Practical#**	V
23	27561	Plant Engineering and Management	VI	**37561**	**Plant Engineering and Management**	VI
24	27562	Polymer Testing	VI	**37562**	**Polymer Testing**	VI
25	27581	ELECTIVE II: 1. Polymer Mould Engineering	VI	**37581**	**ELECTIVE II: 1. Polymer Mould Engineering**	VI
26	27582	ELECTIVE II: 2. Packaging Technology	VI	**37582**	**ELECTIVE II: 2. Packaging Technology**	VI
27	27564	Polymer Testing Practical	VI	**37564**	**Polymer Testing Practical**	VI
28	27565	Computer Aided Mould Design Practical	VI	**37565**	**Computer Aided Mould Design Practical**	VI
29	27566	Mould Making Practical	VI	**37566**	**Mould Making Practical**	VI
30	27567	Project Work	VI	**37567**	**Project Work**	VI
31	27592	Industrial Training Report and Viva Voce	VII	**37592**	**Industrial Training Report and Viva Voce**	VII