SYLLABUS

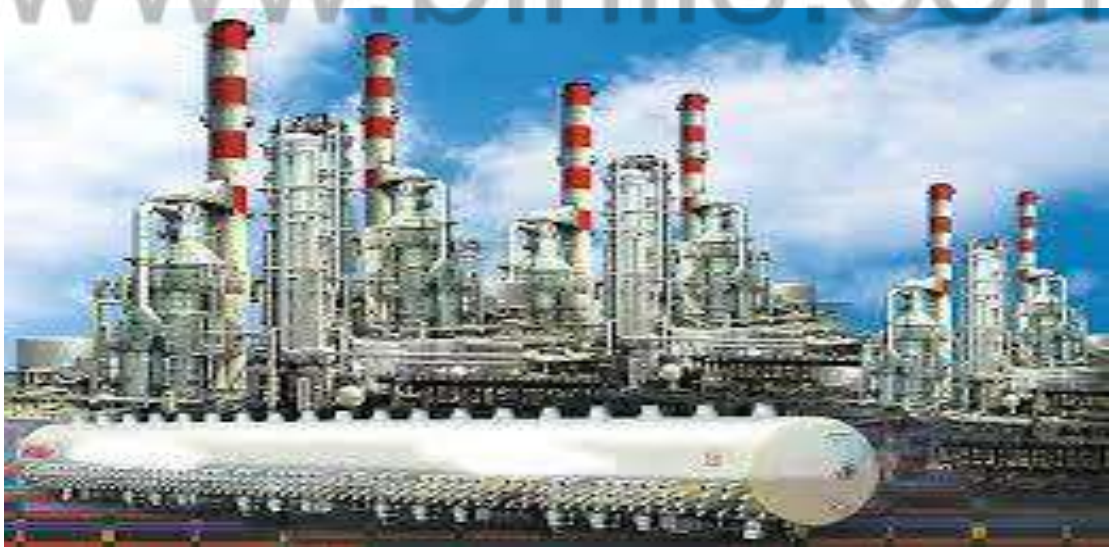
DIPLOMA IN PETROCHEMICAL ENGINEERING

FULLTIME

CourseCode:1075

M-SCHEME

2015–2016



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GOVERNMENT OF TAMILNADU

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SALIENT FEATURE OF 'M' SCHEME

Chemical engineering is the branch of engineering that deals with physical sciences and life sciences with the process of converting raw materials or chemicals into more useful or valuable forms. In addition, modern chemical engineers are also concerned with pioneering valuable new materials and related techniques – which are often essential to related fields such as nanotechnology and biomedical engineering.

Advancements in biochemical engineering found application in the pharmaceutical industry, and allowed for the mass production of various antibiotics, including penicillin and streptomycin.

The completion of the Human Genome Project is also seen as a major development, not only advancing chemical engineering but genetic engineering and genomics as well. Chemical engineering principles were send to produce DNA sequences in large quantities.

The diploma holders play a vital role n 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 and to cope up with the modernization-taking place in the field of 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 'M' Scheme are: Removal of obsolete portions, Addition of topics covering of new technology like Genetic Engineering, Nanotechnology, Fermentation Technology, Bio-technology, sugar technology, paper and pulp technology including, 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. R.ROOPKUMAR ISAAC DAVID, B.Tech(chemical)., M.E (energy).,
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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**
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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
37131	Petroleum Refining	5	-	-	5
37032	Mechanical Engineering*	5	-	-	5
37033	Electrical and Electronics Engineering*	5	-	-	5
37034	Mechanical Engineering Practical*	-	-	4	4
37035	Electrical and Electronics Engineering Practical*		-	5	5
37136	Distillate Testing Practical – I	-	-	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
37041	Mechanical Operations*	5	-	-	5
37042	Momentum Transfer*	5	-	-	5
37143	Basics Of Petrochemicals	5	-	-	5
37044	Engineering Drawing*	-	4		4
37045	Mechanical Operations Practical*	-	-	5	5
37046	Momentum Transfer Practical*	-	-	6	6
37047	Technical Analysis Practical*	-	-	4	4
Seminar		1	-	-	1
Total		16	4	15	35

FIFTH SEMESTER

Subject Code	SUBJECT	Hours Per Week			
		Theory Hours	Tutorial/ Drawing	Practical Hours	Total Hours
37051	Heat Transfer*	5	-	-	5
37052	Chemical Process Calculation*	6	-	-	6
37053	Process Instrumentation And Control*	5	-	-	5
37171	**Elective- I** 1.Petrochemical Technology	4	-	-	4
37172	2.Natural Gas Engineering				
37055	Chemical Process Measurement And Control Practical*	-	-	**5**	5
37056	Heat Transfer 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
37161	Refinery Mass Transfer	6	-	-	6
37162	Processing of Chemicals	5	-	-	5
37181	Elective-II: 1.Energyresources and safety management	5	-	-	5
37182	2.Environmental engineering				
37064	Mass Transfer Practical*	-		6	6
37165	Distillate Testing Practical - II		-	4	4
37066	Chemical CAD and process Simulation Practical*	-	-	4	4
37167	Project work	-	-	4	4
	Seminar	1	-	-	1
	Total	19	-	16	35

*****Subject Common with Diploma in Chemical Engineering

Common to all Branches.

ANNEXURE – II
SCHEME OF THE EXAMINATION

THIRD SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Exam. Marks	Total Mark		
37131	Petroleum Refining	25	75	100	40	3
37032	Mechanical Engineering*****	25	75	100	40	3
37033	Electrical And Electronics Engineering*****	25	75	100	40	3
37034	Mechanical Engineering Practical*	25	75	100	50	3
37035	Electrical And Electronics Engineering Practical*	25	75	100	50	3
37136	Distillate Testing Practical – I	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 Assessment Marks	Board Exam Marks	Total Mark		
37041	Mechanical Operations*	25	75	100	40	3
37042	Momentum Transfer*	25	75	100	40	3
37143	Basics Of Petrochemicals	25	75	100	40	3
37044	Engineering Drawing*	25	75	100	40	3
37045	Mechanical Operations Practical*	25	75	100	50	3
37046	Momentum Transfer Practical*	25	75	100	50	3
37047	Technical Analysis Practical*	25	75	100	50	3
	TOTAL	**175**	**525**	**700**		

FIFTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment Marks	Board Exam. Marks	Total Mark		
37051	Heat Transfer*	25	75	100	40	3
37052	Chemical Process Calculations*	25	75	100	40	3
37053	Process Instrumentation And Control*	25	75	100	40	3
	Elective - I					
37171	1. Petrochemical Technology	25	75	100	40	3
37172	2. Natural Gas Engineering					
37055	Chemical Process Measurement And Control Practical*	25	75	100	50	3
37056	Heat Transfer Practical*	25	75	100	50	3
30002	Life And Employability Skill Practical#	25	75	100	50	3
	TOTAL	**175**	**525**	**700**		

SIXTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment Marks	Board Exam Marks	Total Mark		
37161	Refinery Mass Transfer	25	75	100	40	3
37162	Processing Of Chemicals	25	75	100	40	3
37181	**Elective - II** 1. Energy Resources And Safety Management	25	75	100	40	3
37182	2. Environmental Engineering					
37064	Mass Transfer Practical*	25	75	100	50	3
37165	Distillate Testing Practical- II	25	75	100	50	3
37066	Chemical CAD And Process Simulation Practical*	25	75	100	50	3
37167	Project Work	25	75	100	50	3
	TOTAL	**175**	**525**	**700**		

***Subject Common with DIPLOMA IN CHEMICAL ENGINEERING**

Common to all Branches

Board Examination - Question paper pattern

Common for all theory subjects unless it is specified

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)***

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

III SEMESTER

2015 – 2016 onwards

PETROLEUM REFINING

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37131

Semester : III SEMESTER

Subject Title : PETROLEUM REFINIG

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
PETROLEUM REFINING	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Origin, Composition Of Petroleum, And Sedimentary Environment	15
2.	Evaluation Of Properties	15
3.	Off-Shore Technology & Corrosion	15
4.	Fractionation Of Petroleum	15
5.	Treatment Techniques Of Lubes, Thermal And Catalytic Processes	15
6.	Origin, Composition Of Petroleum, And Sedimentary Environment	15
Total		75

Rationale:

The exponential growth of Engineering and Technology has benefited the mankind with extreme sophistication and comfort. The Petrochemical industry in India is poised for explosive growth in the coming years. Over all chemical engineers could make very important contributions for the improvement and maintenance of the quality of life. The various chapters of petroleum refining like origin, composition of petroleum, fractionation of petroleum, Off-Shore technology, Evaluation of Properties treatment techniques, thermal and catalytic processes etc, provide the outline and processes carried out in petroleum refinery.

Objectives:

At the end of the study of this subject the student will be able to know

- The occurrence and composition of petroleum.
- The Physical properties of Paraffin's, Naphthalene and Aromatics.
- Sources of petroleum availability.
- Exploration of Petroleum.
- Testing methods of Distillates, to meet the specification.
- Desalting and Dehydration of crude.
- Fractionation of Petroleum which includes two stage distillation with stabilizers.
- Treatment Process carried out in Refinery to m et out the specification for LPG and Gasoline.
- Blending to improve the quality and increase the quantity.
- Modern Improvements in off-shore drilling.
- Treatment process for kerosene, Lube oil & Wax.
- The important catalyst and process description of treatment processes.
- Cracking and its importance reforming process to increase the Octane number of distillates.

DETAILED SYLLABUS

UNIT	NAME OF TOPICS	Hours
I	**ORIGIN, COMPOSITION OF PETROLEUM, AND SEDIMENTARY ENVIRONMENT** Introduction, Occurrence of Petroleum by Biological method - Composition of Petroleum, Properties of -Paraffin's, Olefins, Naphthalene, Aromatics and Inorganic impurities -sulphur, nitrogen, chlorine- Source and reservoir rocks-Oil bearing rocks-Continental environment-Transitional environment-Marine environment- Refineries & its capacity in India.	**15 Hrs**

II	**EVALUATION OF PROPERTIES** Evaluation of Petroleum, U.O.P Characterization factor, Correlation Index - TBP Apparatus and its necessity in Refinery - Testing methods and its importance – ASTM Distillation, Reid vapor pressure, Oxidation stability, Smoke Point, Aniline Point - Carbon residue by Rams bottom method, Copper Corrosion test and Softening point Test - Refinery Products and its uses.	**15 Hrs**
III	**OFF-SHORE TECHNOLOGY& CORROSION** Seismic technology- Sniffer survey- Drilling technology- Off-shore rigs-Primary and secondary enhanced oil recovery techniques and methods-Major well complication and Remedies. Corrosion – definition - general effects - different types of corrosion -uniform corrosion - Galvanic corrosion - crevice corrosion - pitting corrosion - inter-granular corrosion - selective leaching corrosion – erosion corrosion - stress corrosion - galvanic series - Factors affecting corrosion Galvanic series. Corrosion control - cathodic protection - anodic protection - surface coatings- evaluation and proper selection of materials - Use of corrosion inhibitors.	**15 Hrs**
IV	**FRACTIONATION OF PETROLEUM** Dehydration and Desalting of crude by settling and electric Desalting method Two-state Distillation unit with stabilizer - Blending– Batch Blending, Line Blending, Gasoline Blending, Fuel oil Blending - Impurities, Mechanical Impurities, Chemical Impurities - Overhead Corrosion in Distillation unit. - Concept of flow diagram, Systematic representation and symbols used in relevant process equipment, Unit Operations, Unit Process, P & I diagram, Process Intensification - Flow diagram and Process description of Amine Treatment for LPG, Merox Treatment Process.	**15 Hrs**

V	**TREATMENT TECHNIQUES OF LUBES, THERMAL AND CATALYTICAL PROCESSES** Flow diagram and Process description of: Hydrodesulphurization Process, Hydro fining Process - Phenol Extraction of Lubes, Furfural Extraction of lubes – Catalytic Reforming- Flow diagram and Process description of: Vis breaking, Dubs Two coil Cracking Process- Fluid Catalytic Cracking, Hydro cracking- Coking definition, Delayed coking operation, Decoking.	**15 Hrs**

Text Books:

1. B.K. BhaskaraRao "Modern Petroleum Refining Process" 4th Edition,OXFORD & IBH Publishing Co. Pvt. Ltd.,
2. Dr. B.K. BhaskaraRao "A Text on Petro Chemicals" 1st Edition, Khanna Publishers.
3. Bhagan Sahay "Petroleum Exploration and Exploitation Practices" Allied Publishers Ltd., Chennai, 1994.
4. Richard Dawe, "Modern Petroleum Technology", Vol.l, Upstream,6th Edition, John and Wiley Sons Ltd,2000.

Reference Books:

1. W.L Nelson "Petroleum Refinery Engineering", 4th Edition, McGraw Hill.
2. G.D.Hobson and W.Rohl Modern Petroleum Technology, Applied Science.
3. Howard B.Bradley, "Petroleum Engineering Handbook", Society of Petroleum Engineers, 1987.
4. Shay B., "Well site Geological Techniques for Petroleum Exploration "Allied Publishers Ltd., 1991

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

III SEMESTER

2015 – 2016 onwards

MECHANICAL ENGINEERING

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37032

Semester : III Semester

Subject Title : MECHANICAL ENGINEERING*

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		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:

Sl.No.	Topic	Time (Hrs)
1.	Strength Of Materials	15
2.	Mechanical Systems And Friction	15
3.	Basics Of Thermodynamics And Refrigeration	15
4.	Steam Boilers, Steam Turbines And I.C Engines	15
5.	Fuels, Nanotechnology And Robotics	15
6.	Test & Revision	-
Total		75

Rationale:

Chemical Engineering is intimately related with large areas of Mechanical engineering. Therefore, it is essential for a Chemical engineer must 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.
1.2.Using the various metals according to the requirements.
2.1.Transmitting motion from one shaft to another shaft by using various methods like Chain, gears, belt and drives.
2.2.About various types of joints.
3.1.Explain the basics of systems and laws of thermodynamic and thermodynamic Process.
3.2.Refrigeration system.
4.1.Heat energy and generation of steam by using boilers.
4.2.Boiler mounting accessories, control devices, safety devices of boilers.
4.3.The components of I.C Engines .
5.1.The various properties of fuels.
5.2.The different forms of Nanomaterials.
5.3.The Components of Robot.

DETAILED SYLLABUS

UNIT	NAME OF TOPICS	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(C_v) and at constant pressure (C_p) – Thermodynamic system - Types – Zeroth, first and second laws of thermodynamics. Refrigerators and heat pumps – Vapor compression refrigeration system -Vapor absorption refrigeration system- Comparison – Capacity of refrigeration unit–Co-efficient of performance – Refrigerants– Desirable properties – C on 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 – Cylinder block – 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**

FUELS, NANOTECHNOLOGY AND ROBOTICS

V	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 vapor deposition. Robot– definition – Major components – Robot arm– End effectors – 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 .Khurmi-S.Chand and Co., 1988.
3. O.P.Gupta," Elements of fue s,fur ces and Refractories" ,Pergaunon Press,Khanna Publishers,Del -1-1991
4. J.D.Girchrist, Furnaces nd refra tor es " Pergunon press, Oxford-1977.
5. Thermal Engin ering 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 Books:

1. Heat Power Engineering-II by N.Rangasamy and E.Sundaramoorthy-Narayana Publication 1989.
2. Applied Mecha cs d 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 PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

III SEMESTER

2015 – 2016 onwards

ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETRCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

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

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Basics In Electric Current	15
2.	A.C Circuits	15
3.	Electrostatics And Electromagnetism	15
4.	D.C Machines ,A.C Machines And Transformers	15
5.	Basic Electronics	15
6.	Test & Revision	-
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 &Transform.
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 transducers.

DETAILED SYLLABUS

UNIT	NAME OF TOPICS	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 - Kirchhoff's law - Net work analysis by Kirchhoff'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 o electromagnetic induction- Fleming's Right hand rule-Lenz's w –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	**15 Hrs**

	operation of Alternator.- Transformers- principle, construction and operation of Transformer – types of Transformer.	
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. Fundamentals of Electrical Engineering and Electronics , B.L.Theraja, Cheand& Co Ltd., New Delhi-2 .
2. Electronic Devices by V.K.Metha- S. Chand & Co Ltd,. New Delhi-2

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 PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

III SEMESTER

2015 – 2016 onwards

MECHANICAL ENGINEERING PRACTICAL*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37034

Semester : III Semester

Subject Title : MECHANICAL ENGINEERING PRACTICAL*

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MECHANICAL ENGINEERING PRACTICAL	4	60	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, which are used to identify the strength of material, quality of fuel etc. These will help to handle various materials in process industries for a chemical engineer.

Guidelines:

- All the experiments given in the list of experiments should completed and given for the end semester practical examination.
- In order to develop best skills in handing 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 30student during Board Examinations.

LIST OF THE EXPERIMENTS

1. Viscosity Determination using REDWOOD Viscometer
2. Viscosity Determination using SAYBOLT Viscometer
3. Tensile Stress Testing of plastic Materials
4. Refrigeration Test Rig – COP Determination
5. Hardness Test (mild steel or plastic material)
6. Determination of Flash and Fire point of the given oils by open cup method
7. Determination of Flash and Fire point of the given oils by closed cup method
8. Determination of(a) Cloud point and(b) Pour point
9. Compressor testrig.
10. Analysis of coal (a) Proximate analysis and (b) Ultimate analysis

LIST OF THE EQUIPMENTS

1. Red wood viscometer
2. Say bolt viscometer
3. Tensile testing machine
4. Refrigeration kit for C.O.P determination
5. Hardness testing machine
6. Closed cup apparatus of the flash and fire point
7. Open cup apparatus of the flash and fire point
8. Cloud point and pour point
9. Compressor testrig
10. Porcelain Crucible and Electrical Furnace

ALLOCATION OF MARKS

Contents	Maximum Marks
Procedure	15
Observation	20
Calculation	20
Result	10
Viva-Voce	10
Total	75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

III SEMESTER

2015 – 2016 onwards

ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICALENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

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	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ELECTICAL AND ELECTRONICS ENGINEERING PRACTICAL*	5	75	25	75		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 twelve 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. Verification of Series and parallel circuit.

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)
- A meters (C and MI) of various ranges
- Voltmeters (MC and MI) f various ranges
- Wattmeter – 300v 5A-2.5A PF
- Energy meter – 300v A
- CRO and 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

ALLOCATION OF MARKS

Contents	Maximum Marks
Procedure	15
Observation	20
Calculation	20
Result	10
Viva-Voce	10
Total	75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

III SEMESTER

2015 – 2016 onwards

DISTILLATE TESTING PRACTICAL - I

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING

M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37136

Semester : III SEMESTER

Subject Title : DISTILLATE TEST NG PRACTICAL - I

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	arks			Duration
DISTILLATE TESTING PRACTICAL - I	5	75	Internal Assessment	Board Examination	Total	
			25	75	100	3 Hrs

Rationale:

In Diploma level engine ering education skill development plays a keyhole. The skill development can be achieved by hands on experience in handling various instruments, apparatus and equipment in focus of improving new trends in petroleum Refinery. This is accomplished by doing engineering related experiments in practical classes in various laboratories.

Objectives:

After completion of this laboratory, the students will be able

- To know the water quality standards.
- To know the basic properties of petroleum fractions.
- To identify the problems during the process.
- To prevent the distillation column from corrosion.
- To know the importance of aniline point for aromatics.

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 readings 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 admitting a batch of 30 students during Board Examinations.

LIST OF EXPERIMENTS

1. Determination of pH by using pH meter
2. Determination of aromatics using aniline point
3. A.S.T.M Distillation of Petroleum Products
4. Smoke point of Petroleum Products
5. Drop point of grease
6. Determinations of sediments and water by centrifuge
7. Determination of acidity f Petroleum Products
8. Melting point
9. Softening point
10. Coking tendency of oil

LIST OF EQUIPMENTS

1. pH meter
2. Aniline point apparatus
3. A.S.T.M Distillation apparatus.
4. Smoke point apparatus
5. Drop point apparatus
6. Centrifuge apparatus
7. Acidity determination apparatus
8. Melting point apparatus
9. Ring & ball apparatus
10. Muffle furnace

ALLOCATION OF MARKS

Contents	Maximum Marks
Procedure	15
Observation	20
Calculation	20
Result	10
Viva-Voce	10
Total	75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

III SEMESTER

2015 – 2016 onwards

COMPUTER APPLICATIONS PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU.

M- SCHEME

(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

<table>
<tr><th>DAYS</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr>
<tr><td>MON</td><td colspan="2">←TEST→</td><td colspan="2">A: JPP
B:RDBMS</td><td>CA</td><td>RDBMS</td><td>TUT</td></tr>
<tr><td>TUE</td><td>CA</td><td>OOP</td><td>CN</td><td>RDBMS</td><td colspan="3">A: RDBMS
B: JPP</td></tr>
<tr><td>WED</td><td>CN</td><td>RDBMS</td><td>OOP</td><td>RDBMS</td><td colspan="2">COMMUNICATION</td><td>CN</td><td>CA</td></tr>
<tr><td>THU</td><td>OOP</td><td colspan="3">A: JPP
B: RDBMS</td><td>CA</td><td>RDBMS</td><td>CN</td><td>OOP</td></tr>
<tr><td>FRI</td><td colspan="2">COMMUNICATION</td><td colspan="2">A: RDBMS
B: JPP</td><td>OOP</td><td>CN</td><td>RDBMS</td><td>CA</td></tr>
<tr><td>SAT</td><td>OOPS</td><td>RDBMS</td><td>CN</td><td>CA</td><td colspan="4">---------</td></tr>
</table>

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**

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

IV SEMESTER

2015 – 2016 onwards

MECHANICAL OPERATIONS*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING

M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37041

Semester : IV SEMESTER

Subject Title : MECHANICAL OPERATIONS*

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MECHANICAL OPERATIONS*	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Size Reduction And Conveying	17
2.	Separation Of Solid–Solid And Solid–Gas System	16
3.	Separation Of Solid – Liquid System	17
4.	Special Separation Methods	11
5.	Mixing And Agitation	14
6.	Test & Revision	-
Total		75

Rationale:

It gives the student the knowledge of various mechanical operations and their significance in chemical industries. With this information student can control the operation of equipment in order to separate solid-solid, solid-liquid & gas-solid systems.

Objectives:

On completion of the following exercise, the student must be able

1.1.To know the principles of various size Reduction machines
1.2.To define the different Laws of size Reduction
1.3.To understand the operation of various types of conveyors
2.1.To analyze the solid particles in the set of sieves
2.2.To understand the working of various Industrial screens.
2.3.To know the principles of gas- soli separation
3.1.To understand the principles of settling
3.2.To distinguish between filtration &settling
3.3.To describe the working of various Filtration equipments
4.1.To discuss various special methods of separation
4.2.To know the application of various separators
5.1.To distinguish between Mixing & Agitation
5.2.To list out various types of Impellor
5.3.To design the mixing tank
5.4.To understand the principles of various industrial mixer

DETAILED SYLLABUS

UNIT	NAME OF TOPICS	Hours
I	**SIZE REDUCTION AND CONVEYING** Importance of size Reduction - Methods of size Reduction - Energy and Power Requirement in size Reduction – Crushing efficiency - Grinding Aids and Dispersing agents - Laws of crushing: Rittinger's law, kick's law & Bond law - Work Index – Grindability Index- Methods of determination of Grindability Index - Reduction Ratio - Size Reduction machines - classification - Blake Jaw Crusher - Smooth and Toothed Roller Crushers - Ball Mill – Fluid energy Mill-principle. Operation and application of above mentioned Size Reduction machines – Methods of crushing: Open circuit , closed circuit , free crushing and Choke crushing - Simple problems in laws of crushing , Ball mill and Roller crusher.	**17 Hrs**

	Particulate solid - Characteristics of particulate solid particle - Regular and Irregular particles - particle size - particle shape - Average particle size -specific surface area - Mixed particle size . Conveying of solids - Types of conveyors - principle , operation and application of Belt conveyor, Screw conveyor , Bucket elevator and Pneumatic conveyor - conveyor drives and accessories.	
II	**SEPARATION OF SOLID – SOLID AND SOLID – GAS SYSTEM** Sieving - Tyler Standard sieves - sieve shaker - Differential and cumulative sieve analysis - Screening - Capacity and efficiency of screens - Industrial screens - Grizzly , Revolving screen, shaking screen , vibrating screen , Reciprocating screen and Gyratory screen. Gas – Solid separation – principle, operation and application of settling chamber, Impingement separator , cyclone separator , Bag filter and Electro static precipitator	**16 Hrs**
III	**SEPARATION OF SOLID– LIQUID SYSTEM** Motion of sol i d particle through liquid - mechanism of particle motio n - Drag coefficient – equation for Drag coefficient of spherical particle- Settling velocity - Free settling and Hindered settling - Different regions in settling- Flocc ulation- Batch sedimentation test - Kynch Theory - Gravity Thickener – simple problems in settling. Filtration – filter medium – Filter Aids - Constant pressure and constant volume filtration – Filter cake resistance and filter med um resistance -factors controlling them – Washing of filter cake - Types of Filtration equipments- construction , operation and application of Filter press, Leaf filter & Rotary drum Filter.	**17 Hrs**
IV	**SPECIAL SEPARATION METHODS** Classification – Dorr classifier – Helical classifier – Elutriation - Jigging - Tabling – Dense media separation - Magnetic separation – Electrostatic separation - Dielectric separation - Froth flotation – Spiral concentration – principle, operation and application of above equipments.	**11Hrs**

V	**MIXING AND AGITATION** Differences between Mixing and Agitation - purposes of Agitation - Agitation vessel - Impellers – Propellers , Paddles and Turbines - their operational characteristics and application - Flow pattern in agitated vessel – Swirling , Vortex formation and their prevention - Power consumption - power number - Mixing ex for paste and granular solids - simple problem power calculation and Mixing Index. Industrial Mixers - Change - can Mixer ,Double arm kneader , Banbury Mixer, Ribbon blender, Tumbling Mixer and Internal screw Mixer. .	**14 Hrs**

Text Books:

1. Unit operations of chemical Engineering by W.L.Mc cabe & J.C.Smith - Seventh Edition McGraw Hill Book Co. –Singapore- 2001.
2. Introduction to Chemical Engineering by W.L. Badger & J.T. Banchero - Tata McGraw Hill Publishing Co. Ltd., New Delhi – 1997.

Reference Books:

1. Perry's Chemical Engineering Hand Book by Robert H. Perry & D.W .Green- Seventh Edition .- McGraw Hill Book co., - Singapore -1997.
2. Principles of Unit operations by A.S. Foust et al -Wiley International Edition- 1966.
3. Chemical Engineering – Vol. 1 & II by J. M . Coulson & Richardson - Sixth Edition, Butterworth – New Delhi- 2.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

IV SEMESTER

2015 – 2016 onwards

MOMENTUM TRANSFER*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37042

Semester : IV SEMESTER

Subject Title : MOMENTUM TRANSFER*

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MOMENTUM TRANSFER	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Fluid Statics	15
2.	Fundamentals Of Fluid Dynamics	17
3.	Flow Of Incompressible Fluids In Pipes	17
4.	Transportation Of Liquids	13
5.	Transportation Of Gases, Piping's And Valves	13
6.	Test & Revision	-
Total		75

Rationale:

Fluids Mechanics is a science subject and helps in solving problems in field of Aeronautical, Electronics, Electrical, Mechanical and Metallurgical Engineering subjects. The subject deals with basic concepts and principles in hydrodynamics, hydrokinetics and hydrostatics and their applications in solving fluid flow problems.

The knowledge of fluid flow is very essential because all chemical plants have fluid flow. The examples are flow of stream and gases in pipes, flow of liquid in pipes and open Channels etc. This subject aims at the basic concepts of fluid flow, measurement Techniques involved for the same and equipments used for the transportation of fluids. With this background, students will be able to quantitatively find out material and power Requirement for a process.

Objectives:

After completion of the entire syllabus, mentioned above the students are able to know the information about the following:

1.1 Importance of Fluid Mechanics.

1.2 Basic principles and properties of fluids.

1.3 Manometers.

2.1 Behavior of fluids, Newtonian and non- Newtonian fluids.

2.2 Reynolds number and its use.

2.3 Continuity equation and its application Bernoulli's equation and its application in fluid flow.

3.1 Boundary layer concept.

3.2 Flow of fluids through circular pipes in steady state.

3.3 Haugen – Poiseullie's equation, Friction factor chart.

4.1 Different types of pumps used for transportation of liquids.

4.2 Their method of construction and working principles, their specific fields of application.

4.3 Performance characteristics of centrifugal and reciprocating pumps Terminologies.

5.1 Blowers and compressors and their types.

5.2 Their method of construction and working principles.

5.3 Method of generating vacuum .

5.4 Different types of valves and their specific applications.

DETAILED SYLLABUS

UNIT	NAME OF TOPICS	Hours
I	**FLUID STATICS** Definition :Fluid statics and Fluid Dynamics.-Nature of fluid- Classification of Fluids: Ideal Fluid , Compressible , Incompressible Fluids, Newtonian and Non-Newtonian Fluids.- Transport Properties of Fluids :density, pressure, viscosity, consistency and fluidity. Fluid Statics: Pressure concepts –Types of pressure - Pressure head-compressibility factor- Hydrostatic Equilibrium- Manometers : Simple U-tube manometer – Inverted U tube manometer- inclined tube manometer – Differential U– tube manometer- Derivation of equation and uses.- Simple problems in manometers.	**15 Hrs.**
II	**FUNDAMENTALS OF FLUID DYNAMICS** Fluid flow phenomena: steady flow, unsteady flow , potential flow, frictional fl fully developed flow, laminar flow, turbulent flow and transition flow -Shear stress and velocity gradient- profile of velocity and velocity gradient- Momentum flux - Reynolds number -Reynolds experiment and its significance .Turbulence: wall Turbulence and free Turbulence –intensity and scale of turbulence –Terminology in fluid flow: stream line , stream tube, Average velocity, Mass velocity, skin friction and Form friction. Principle of conservation of mass, energy and momentum-. Basic equations of fluid flow: Continuity equation- Bernoulli's equation for potential flow, fluid friction, effect of solid boundaries and pump work(exclusion of derivation) - limitations of Bernoulli's equation. Energies of fluids: Potential energy, pressure energy and kinetic energy - (Statement only) and its application - Simple problems in Reynolds number and Continuity equation.	17 Hrs.

III	**FLOW OF INCOMPRESSIBLE FLUIDS IN PIPES** Concept of boundary layer- Boundary layer formation in straight tubes.-laminar and turbulent flow in boundary layer-transition length- boundary layer separation- Relation between skin friction and wall shear- Fanning friction factor.- Laminar flow in Newtonian fluid in circular pipes-Relationship between maximum velocity and average velocity. - The Hagen-Poiseuille equation-Turbulent flow in pipes – Effect of roughness- friction factor chart and its uses- -flow through non-circular conduits-Equivalent diameter-Hydraulic radius- friction losses from sudden enlargement & contraction, Flow of past immersed bodies: Fluidization-mechanism of Fluidization-minimum porosity-bed height-particulate and aggregative fluidization-dense and disperse fluidization -minimum fluidization velocity-pressure drop in fluidized on(excluding the derivations) – pressure drop in packed bed(excluding the derivations)-simple problems in pressure drop, head losses and Hagen-Poiseuille equation.	17 Hrs.
IV	**TRANSPORTATION OF LIQUIDS** Equipments for Liquid transport - Pumps – Classification of pumps- Capacity and Over all efficiency(Definition)- Positive displacement pumps Reciprocating pumps – single and double acting piston mps, single and double acting plunger pumps and Diaphragm pumps - Rotary pumps - internal gear and external gear pumps - their construction and working. Centrifugal pump –Principle, construction and Working – advantages Losses in centrifugal pump- start up procedure for centrifugal pump-Terminology - Suction head, Discharge head, Developed head, Horse power, Net Positive Suction Head, Priming, Cavitation- Operational Characteristics Curves of Centrifugal pumps- centrifugal pump troubles and remedies.	13 Hrs.

TRANSPORTATION OF GASES ,PIPINGS AND VALVES

V Fans- centrifugal and axial fans- Blowers- Positive displacement blower-Two-lobe blower and Centrifugal blower-single suction centrifugal blower- Compressors - reciprocating and axial compressors - vacuum producing equipment – steam-jet ejector its principles and operation. **13 Hrs**

Pipes and tubes-pipe size-steel pipe standards-pipe fittings ,hangers and supports –allowances for expenses.

Valves- Gate valve, Globe valve, Ball valve, Needle valve, NRV, Diaphragm valve their working and its industrial applications.

Text Books

1. Unit Operations of Chemical Engg. By W.L.McCabe and J.C.Smith – Sixth edition – McGraw Hill Book Co. Singapore – 2001.
2. Introduction to chemical Engg. By W.L.Badger and J T.Banchero – Tata McGraw Hill Publishing Co.Ltd., New Delhi – 1997.

Reference Books:

1. Principles of Unit Operations by A.S.Foustetal – Wiley International Edition – 1960.
2. Chemical Engineering Vol-1&II by J.M.Coulson and J.F.Richordson – Sixth Edition Butterworth –New Delhi – 2000.
3. Perry's Chemical Engineer's Hand Book by Robert H.Perry and D.W.Green - Seventh Edition – McGraw Hill Book Co. Singapore – 1997.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

IV SEMESTER

2015 – 2016 onwards

BASICS OF PETROCHEMICALS

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37143

Semester : IV SEMESTER

Subject Title : BASICS OF PETROCHEMICALS

TEACHING AND SCHEME OF EXAMINATION:

No. of W per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Basics of Petrochemicals	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION F HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Introduction And Importance Of Organic Compounds	15
2.	Nomenclature And IUPAC Names	15
3.	Carbohydrates And Aromatics	15
4.	Synthetic Fibers	15
5.	Plastics	15
6.	Test & Revision	-
Total		75

Rationale:

With the advent of Globalization the face of the industry is changing. Large expansions in production capacities are presently taking place. This is the first time that major investments are taking place in all areas of the Petrochemical Industry. The Petrochemical industry in India is poised for explosive growth in the coming years. The various chapters of Basics of Petrochemicals like Importance of Organic Compounds, IUPAC names, Carbohydrates, Synthetic Fibers and Plastics etc, provide the complete idea about the processes in all petrochemical industries and the processing of various commercial products like plastics, fibers based on crude petroleum.

Objective:

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

1.1 Basics of fundamentals of chemistry related to petro chemicals.

1.2 Purification

2.1 Nomenclature and naming of compounds.

3.1 Basic principles of saccharides.

3.2 Preliminary ideas of manufacturing carbohydrates

3.3 Aromatics.

4.1 Synthetic fibers and its applications.

5.1 Classification of plastics.

5.2 Industrial applications

DETAILED SYLLABUS

UNIT	NAME OF TOPICS	Hours
I	**INTRODUCTION AND IMPORTANCE OF ORGANIC COMPOUNDS** Introduction- Importance of organic compounds ,Purification and Estimation methods of Nitrogen, Oxygen, Carbon and sulphur.	15
II	**NOMENCLATURE AND IUPAC NAMES** Nomenclature- importance, IUPAC rules for naming alkanes, alkenes, alcohol, aldehyde and acids. General methods for preparation and properties of alkanes, alkenes, alcohol, aldehyde and Acids.	15

III	**CARBOHYDRATES AND AROMATICS** Classification of Carbohydrates, Manufacturing methods of glucose, sucrose and cellulose and their properties. Petroleum as a source of aromatics. Benzene – manufacturing methods and its properties	**15**
IV	**SYNTHETIC FIBRES AND RUBBER** Definition on Polymerization, Mass Polymerization, Solution Polymerization, Emulsion Polymerization. Introduction, General Properties of Fibres, Production technique, Melt Spinning, dry Spinning, Solution spinning. Production and uses of – Polyester Ribbon, Nylon 6.6, Nylon6, Acrylic Fibres, Synthetic paper.Production and uses of – Synthetic Isoprene, Butadiene Rubber, styrene Butadiene Rubber, Butyl Rubber, ABS Rubber.	**15**
V	**PLASTICS** Classification of Plastics – Thermosetting and Thermoplastic, Engineering Plastics. Production and uses of – Phenol formaldehyde Resins, Polyethylene, Epoxy resins - ABS plastics, Polycarbonate, Polystyrene.	**15**

Text Books:

1. B.K. BhaskaraRao "Modern Petroleum Refining Process" 4th Edition,OXFORD & IBH Publishing Co. Pvt. Ltd.,
2. Dr. B.K. BhaskaraRao A Text on Petro Chemicals" 1st Edition, Khanna Publishers.
3. Bhagan Sahay "Petroleum Exploration and Exploitation Practices" Allied Publishers Ltd., Chennai , 1994.
4. Richard Dawe, "Modern Petroleum Technology", Vol.I, Upstream,6th Edition, John and Wiley Sons Ltd,2000.

Reference Books:

1. W.L Nelson "Petroleum Refinery Engineering", 4th Edition, McGraw Hill.
2. G.D.Hobson and W.Rohl, Modern Petroleum Technology, Applied Science.
3. Howard B.Bradley, "Petroleum Engineering Handbook", Society of Petroleum Engineers, 1987.
4. Shay B., "Well site Geological Techniques for Petroleum Exploration "Allied Publishers Ltd., 1991

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

IV SEMESTER

2015 – 2016 onwards

ENGINEERING DRAWING*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMI LNADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37044

Semester : IV SEMESTER

Subject Title : ENGINEERING DRAWING*

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

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

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Sectional Views And Machine Elements	22
2.	Assembly Drawing	22
3.	Free Hand Drawing	8
4.	Test & Revision	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 addle Key Round Key
RIVETED JOINTS	:	siingle 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 Vi w 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.

Board Examination - Question Paper Pattern

- Answer any 2 questions out of 3 in part A.
- PART – B and PART – C must be answered compulsory.
- Each questions in Part A, Part B and Part C carries 10,40 and 15 respectively.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

IV SEMESTER

2015 – 2016 onwards

MECHANICAL OPERATIONS PRACTICAL*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37045

Semester : IV SEMESTER

Subject Title : MECHANICAL OPERATIONS PRACTICAL*

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MECHANICAL OPERATIONS 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/EXERCISES:

1.1 To determine the absolute viscosity of given liquid within the permissible limit of +/- 0.5 poise using different type and size of solid particles.

2.1 To study the settling characteristics of given slurry using Batch settling test jar and plot a set of curves using Kynch Theory .

3.1 To determine the power consumption, power number, Froude number & Reynolds number of given Impellor in the Mixing tank and compare the above parameters using the liquids of different viscosity.

4.1 To determine specific cake resistance and filter medium resistance of given slurry using Leaf filter and compare the above parameter with other types of filters.

5.1 To determine t h e sieve efficiency using the set of sieves and compare the efficiency for different nature of feed particles.

6.1 To determine the Reduction ratio and specific surface area of newly generated solid particles within the permissible limit of +/ - 0.5 &1 cm^2/ gm respectively using the Jaw crusher.

7.1 To determine the Reduction ratio an specific surface area of newly generated solid particles within the permissible limit of +/ 0.5 & 1 cm^2/ gm respectively using the Roller crusher.

8.1 To find out the parameters such as Grinding efficiency , optimum size of ball, critical speed, optimum speed and power requirement for grinding in A cylindrical ball mill and compare the above parameters with the same ball mill by hanging the size & number of balls.

9.1 To determine specific cake resistance and filter medium resistance of above given parameter with other types of filter.

10.1 To separate the given size range of solid particle from air stream and determine the settling velocity of solid particle in different regions of settling and compare the same using different size ranges of solid particle using a Cyclone Separator.

1. Stoke's Law of Settling
2. Batch Settling
3. Industrial Mixer
4. Leaf filter
5. Sieve Analysis
6. Jaw Crusher
7. Roller crusher
8. Ball mill
9. Filter press(Plate and Frame)
10. Cyclone Separator

LIST OF EQUIPMENTS:

- Long, Wide glass tube.
- Measuring Jar – 1Litre.
- Mixing Tank with accessories.
- Leaf Filter with accessories such as Vacuum pump, /manometer etc.
- Set of sieves and sieve shaker machine.
- Jaw Crusher.
- Double Roller Crusher.
- Ball mill with different size of balls.
- Plate and Frame filter press with accessories.
- Cyclone separator.

ALLOCATION OF MARKS

Contents	Maximum Marks
Procedure	15
Observation	20
Calculation	20
Result	10
Viva-Voce	10
Total	75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

IV SEMESTER

2015 – 2016 onwards

MOMENTUM TRANSFER PRACTICAL*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37046

Semester : IV SEMESTER

Subject Title : MOMENTUM TRANSFER PRACTICAL*

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Ma ks			Duration
			Internal Assessment	Board Examination	Total	
MOMENTUM TRANSFER PRACTICAL	6	90	25	75	100	3 Hrs

Rationale:

In Diploma level engineering education to skill development especially working with instruments and Equipment's play a vital role. These can be achieved by experience in handling various equipment's. This is accomplished by doing engineering related equipment's in practical classes.

Guidelines:

- All the ten experiments given in the list of experiment should be completed and given for the end semester practical examinations.
- In order to develop but best skills in handling instruct/equipment and taking reading in the practical classes.
- Every two students should be provide with a separate experimented setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimented question should not be given to more than four students while admitted a batch of 30 students during board examination.

LIST OF EXPERIMENTS

1. Determination of orifice coefficient
2. Determination of Venturi Coefficent
3. Flow through a straight pipe / annular pipe
4. Flow through a spiral coil /helical coil
5. Rota Meter Calibration
6. Flow through packed column
7. Flow through fluidization column
8. Centrifugal pump characteristics
9. Flow through a Weir
10. Reciprocating pump characteristics

LIST OF EQUIPMENTS

- Orifice Meter
- Venturi Meter
- Annular pipe /Straight pipe
- V notch experimental se up
- Rota Meter
- Packed column
- Fluidization column
- Centrifugal Pump
- Reciprocating Pump
- Helical coil / spiral coil

ALLOCATION OF MARKS

Contents	Maximum Marks
Procedure	15
Observation	20
Calculation	20
Result	10
Viva-Voce	10
Total	75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

II YEAR

M SCHEME

IV SEMESTER

2015 – 2016 onwards

TECHNICAL ANALYSIS PRACTICAL*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37047

Semester : IV SEMESTER

Subject Title : TECHNICAL ANALYSIS PRACTICAL*

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
TECHNICAL ANALYSIS PRACTICAL	4	60	25	75	100	3 Hrs

Rationale:

Analysis of various chemical commodities are necessary for controlling the quality of product in industry. This can be achieved in handling various analysis in the laboratory. The students can be learned all these by doing experiments in the practical classes.

Guidelines:

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

Objectives:

To train the students on basic principles involved in estimation and Characterization of industrially important materials like Water, Oils and Fat, Soap, Fertilizers, Cement, Bleaching powder, Glycerol, Pigments and Sugar.

1.1 To determine the water quality for various applications.
2.1 To determine the standard quality of fat and oil for food and cosmetic grades
3.1 To determine the quality of soap for pharmaceutical and cosmetic grades.
4.1 To determine components present in the fertilizer.
5.1 To determine the quality of cement.
6.1 To determine the disinfectant quality.
7.1 To determine the glycerol quality to meet cosmetics standards.
8.1 To determine the pigment quality to meet paint and dying industries standards.
9.1 To determine the purity of Sugar to meet the sugar and food industry standards.

LIST OF EXPERIMENTS

1. Analysis of Water

i. Hardness
ii. pH
iii. COD
iv. Chlorine Content

2. Analysis of Oils and Fats

i. Acid Value
ii. Iodine Value
iii. Saponification Value

3. Analysis of Soap

i. Moisture
ii. Total Fatty Matter
iii. Total Alkali content

4. Analysis of Fertilizers

i. Nitrogen
ii. Potassium
iii. Phosphorous

5. **Analysis of Cement**
   i. Moisture
   ii. CaO content
   iii. MgO content

6. **Analysis of Bleaching Powder**
   i. Estimation of available chlorine

7. **Analysis of Glycerol**
   i. Estimation of purity of Glycerol

8. **Analysis of Pigment**
   i. Zinc sulphate in Lithopone

9. **Analysis of Sugar**
   i. Estimation of Purity of Sucrose by Munson & Walker Method.

LIST OF GLASSWARES AND EQUIPMENTS

- Burettes 50 ml
- Pipettes 25ml , 20ml , 10ml .
- Conical flask 500 ml, 250 ml, 100 ml.
- Burette stand with clamp
- Round bottomed flask 500 ml, 250 ml.
- Liebig's condenser
- Distillation set
- Funnels & Separating funnels
- Watch Glass 6",3",3"
- Wash bottles plastics
- Tripod stand & Wire gauge
- Hot plate & Muffle Furnace
- Silica Crucible with lid
- Buchner funnel
- Glass Ejectors
- Suction pump
- Aspirator bottles
- Glass tubes 5mm diameter
- Burners
- Refractometer

ALLOCATION OF MARKS

Contents	Maximum Marks
Procedure	15
Observation	20
Calculation	20
Result	10
Viva-Voce	10
Total	75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

V SEMESTER

2015 – 2016 onwards

HEAT TRANSFER

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37051

Semester : V SEMESTER

Subject Title : **HEAT TRANSFER***

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Wee	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
HEAT TRANSFER	5	75	25	75	100	3 Hrs

TOPICS AND LLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Conduction	13
2.	Convection And Radiation	16
3.	Principles Of Heat Flow In Fluids And Heat Exchangers	16
4.	Evaporation	15
5.	Multiple Effect Evaporatorsand Insulation	15
6.	Test & Revision	-
Total		75

Rationale:

Most of the chemical engineering operations will involve either heat addition or heat removal in one way or the other. It is, therefore, extremely necessary to have good understanding about the heat transfer mechanisms such as conduction, convection and radiation. This subject enables the students to apply the understanding of heat transfer mechanisms such as conduction, convection and radiation for understanding the performances of various heat transfer equipment such as heat exchangers, condensers, boilers, evaporators etc. used in almost all chemical and related industries. The knowledge of this subject helps in design and fabricate different heat exchange equipment.

Objectives:

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

1.1 Mechanism of Heat Transfer, and Heat Transfer by conduction;

1.2 Conduction through Composite walls and Hollow cylinders

1.3 variation of Thermal conductivity with temperature.

1.4 To calculate the amount of heat loss through flat wall and cylinder.

2.1- To study the concept of convection heat transfer

2.2 dimensionless numbers

2.3 To calculate the amount of radiation and the laws.

3.1 Principles of Heat Transfer in Fluids, Log Mean Temperature Difference

3.2 Heat Exchange Equipment (Double Pipe, Shell and Tube, Plate Type, Fin).

3.3 To study the construction, working and application of various types of heat transfer equipments.

4.1 Principle of Evaporation, Performance of Evaporators, Types of Evaporators and their operational methods

4.2 Evaporator accessories

5.1 Multiple effect evaporators and methods of feeding

5.2 To study some of the evaporator accessories.

5.3 Insulating materials, need for insulation, properties and their applications.

DETAILED SYLLABUS

Unit	Name of the Topic	Hours
I	**CONDUCTION** Heat transfer- Modes of heat transfer– Fourier's law- steady state and unsteady state heat conduction – Heat conduction through composite walls, hollow cylinder and composite cylinders- thermal conductivity –variation of thermal conductivity with temperature – Analogy between heat conduction and electrical current flow. –simple problems.	**13 Hrs**
II	**CONVECTION AN RADIATION** Principles of convection – Types of Convection -He t transfer without phase change – concepts of Thermal boundary layer- Heat transfer by forced convection in laminar and turbulent flow– Dimensionless numbers and their significance in heat transfer: Graetz number, Prandle number, Nusselt number ,Froude number and Grashof number –Application of Dittus Bolter and Side- Tate equation. Heat transfer with phase change – Principles of heat transfer from condensing vapors- Drop wise and film type condensation (equations excluded) – Heat transfer to boiling liquids: Boiling of saturated liquid- natural convection, nucleate boiling, transition boiling and film boiling principles only).-sub cooled boiling. Radiation Heat transfer- reflectivity, absorptivity and transmissivity –emission and absorption of Radiation-concept of black body and grey body – Stefan Boltzmann law and Kirchhoff's law.- Radiation between surfaces -Radiation to	**16 Hrs**

III	**HEAT FLOW IN FLUIDS AND HEAT EXCHANGERS** Principles of heat transfer in fluids- counter flow and parallel flow- Enthalpy balance in heat exchangers- Heat flux- Average temperature of fluid stream- Overall heat transfer coefficient- Derivation of overall heat transfer coefficient from hot fluid to cold fluid through a metal wall- Fouling factor-their significances- Derivation of Logarithmic mean temperature difference. Heat Exchangers: Types of heat exchangers- Double Pipe Heat Exchanger- Shell and Tube Heat E anger- Fixed Tube sheet 1-1 and 1-2 Shell and Tube Heat Exchangers, Plate Type Heat Exchanger, Extended Surface Heat Exchangers-Types of fins-Terminology used in heat exchangers such as shell, tube, tube sheets, baffles, guiding rods, tube pitch, passes, Heat transfer area, Overall heat transfer coefficient, correction factor for LMTD- Description, construction and working of all type of Heat exchangers-. simple problems.	**16 Hrs**
IV	**EVAPORATION** Evaporation- principles of evaporation- Liquid Characteristics, Performance of Tubular evaporators- Capacity and Economy- Methods of increasing the economy-Boiling point elevation- Duhring's rule- Effect of hydrostatic head- Enthalpy balance for single effect evaporator-simple problems on boiling point elevation and capacity of evaporator. Evaporators: Types of Evaporators- Horizontal tube evaporator, Calendria evaporator, Long vertical tube(climbing film) evaporator, Falling film evaporator, Forced circulation evaporator -construction ,operation and application of all types of evaporators.	**15 Hrs**
V	**MULTIPLE EFFECT EVPORATORS AND INSULATION** Multiple effect evaporation-Methods of feeding of multiple effect evaporator: Forward feed, Backward feed, Mixed feed and Parallel feed- Comparison- Merits and limitations. Vapor	**15 Hrs**

	Recompression: Mechanical and Thermal recompression.- Evaporator accessories: Steam traps, Entrainment separators and Salt catchers. Thermal insulation- Properties of insulating materials- Need for thermal insulation- Critical thickness of insulation- Important types of insulating materials and their specific applications. .	

Text Books:

1. McCabe, W. L., Unit Operations of Chemical Engineering, 2001, Sixth Edition, McGraw Hill Book Co, Singapore.
2. Badger W. L. and Banchero J. T., Introduction Chemical Engineering, 1997, Tata McGraw Hill Publishing Co Ltd., New Delhi
3. Gupta O. P., Elements of fuels, Furnaces and Refractories, 4th Edition, 2002, Khanna Publishers, New Delhi.
4. K.A.Gavhane, Heat Transfer, 24thedition,published by Nira Prakashan,Pune.

Reference Books:

1. Foust A. S., et al, Principles of Unit Operations, 1960, Wiley International Edition
2. Kern D. Q., Process Heat Transfer, 1965, McGraw Hill Book Co, Singapore.
3. Perry, Robert H., Perry's Chemical Engineers Hand Book, 1997, Seventh Edition, McGraw Hill Book Co, Singapore.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

V SEMESTER

2015 – 2016 onwards

CHEMICAL PROCESS CALCULATIONS

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICALENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37052

Semester : V SEMESTER

Subject Title : **CHEMICAL PROCESS CALCULATIONS**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CHEMICAL PROCESS CALCULATIONS	6	90	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Fundamentals Of Process Calculations	18
2.	Material Balance Without Chemical Reaction	18
3.	Material Balance With Chemical Reaction	18
4.	Energy Balance	18
5.	Chemical Kinetics	18
6.	Test &Revision	-
Total		90

Rationale:

This subject prepares the students to formulate and solve material and energy balances on chemical process systems. In process industries raw materials are processed to get different products. The components present in the raw material combine in a definite proportion and the percentage of product formed depend on various parameters like temperature and pressure etc. It is highly essential to know the stoichiometry ratio and proportions and the process conditions to achieve maximum product formation and recycle of the unused materials for better economy. Therefore, knowledge of stoichiometry is the first and foremost requirement for the success of a chemical engineer.

OBJECTIVES

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

1.1 The uses of different units

1.2 Basic concepts of chemical calculation

2.1 The law of conservation of mass

2.2 The material balance in unit operations.

3.1 Exact quantities of materials are to be used to achieve good percentage of conversion.

3.2 The concept of flue gas Analysis

4.1 The law of conservation of energy

4.2 The energy saving possibilities in chemical processes.

5.1 The concept of chemical kinetics.

5.2 The different type of reactors used in chemical industries.

DETAILED SYLLABUS

Unit	Name of Topics	Hours
I	**FUNDAMENTALS OF PROCESS CALCULATIONS** Dimensions – Measurement - Use of different units- Fundamental quantities and derived quantities- FPS,CGS,MKS and SI systems- conversion factors-Basic concepts of chemical calculations – gm atom and gm mole- use of molal units in computations-methods of expressing the composition of solids and solutions- weight present- volume present- Mole present and mole fraction- Equivalent weight- Molarity ,Molality and Normality- Density and specific gravity- different specific gravity scales-Behavior of ideal gases- ideal gas law- absolute pressure and gauge pressure- absolute temperature and relative temperature-temperature scales- gas density and specific gravities-gaseous mixtures- Dalton's law of partial pressure for gas mixtures-Amogot's law of partial volume - Average molecular weight and density of gaseous mixtures.	**18 Hrs**
II	**MATERIAL BALANCE WITHOUT CHEMICAL REACTION** Material balance- definition of steady state and unsteady state material balance equations- methods of solving the three basic types of material balance problems- definitions of terms Tie substance, Inert material, simultaneous equation - Problems in blending and separation- Material balance problems involving unit operation such as distillation ,absorption ,extraction and drying	**18Hrs**
III	**MATERIAL BALANCE WITH CHEMICAL REACTION** Material balance with chemical reaction- definition of terms limiting reactant , excess reactant, selectivity, percentage conversion, and yield- combustion stoichiometry –flue gas Analysis- Gross calorific value and Net calorific value- Theoretical air requirement- percentage excess air- proximate and ultimate analysis of coal- simple problems.	**18 Hrs**

IV	**ENERGY BALANCE** Energy balance - Steady state equation- definition of terms Heat capacity, molal heat, specific heat and sensible heat- heat capacity of pure gas and gaseous mixtures at constant pressure- specific heat and latent heat of pure liquid and liquid mixture- enthalpy changes accompanying chemical reaction - standard heat of formation- standard heat of combustion- heat of reaction-heat of mixing- heat of dissolution	**18 Hrs**
V	**CHEMICAL KINETICS** Importance of chemical kinetics -Classifications of Reactions- Reaction rate - Molecularity and order of Reaction- Rate constant- Fractional conversion- Kinetic data- Integral and differential method of Analysis-Integral method for Zero order and irreversible , unimolecular First order Reactions . classification of reactors- Batch Rea or, Flow Reactor- Tubular flow and stirred tank reactor, semi batch reactor, Fixed bed Reactor , Fluidized bed Reactors, Slurry Reactor and Trickle bed reactor- construction, operation and application of above Reactors . catalysis- process of solid catalyst- surface area, void volume, porosity a solid density –methods of preparation of solid catalyst- Promoters, Inhibitors and poisons.	**18 Hrs**

Text Books:

1. Stoichiometry -5 th edition, B.I Bhatt & S.B Thakore, TATA McGrew Hill education Pvt Ltd, New Delhi.
2. Chemical reaction Engineering., 2nd edition, Octave Levenspiel, published by Willey Eastern Ltd., N.D
3. Corrosion engineering , 3rd edition,Mars G.Fontana ,TATA McGrew Hill education Pvt Ltd,New Delhi.
4. Chemical Engineering Kinetics ,3rd edition J.M. Smith, McGrew Hill international edition.

Reference Books:

1. Chemical process Principles - Vol. 11 ,Hougkn & Watson ,
2. Basic principles &calculations in chemical Engineering, 6th edition, Prentice Hall Of India pvt Ltd, New Delhi.
3. Elements of Chemical Reaction Engineering,2 nd edition,
4. H.Scott FOGLER, Prentice Hall Of India pvt Ltd, New Delhi.
5. Principles of Electro- chemical Engg., L.N. Shemitt,
6. Chemical education Development centre ICT ,chennai,1977.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

V SEMESTER

2015 – 2016 onwards

PROCESS INSTRUMENTATION AND CONTROL*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

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	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Process Instrumentation And Control	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Basic Concepts Of Measurement And measurement Of Temperature	13
2.	Measurement Of Pressure	13
3.	Measurement Of Flow ,Liquid Level And Humidity.	13
4.	Process Control	19
5.	Computerized process control	17
6.	Test & Revision	-
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 using all type of measuring & control instruments along with heat transfer, mass transfer equipment's along with pumps, blowers, compressors, crushers and screens and size reduction machines.

Objective:

1.1To understand the application of various Industrial instruments & control
1.2System to measure the process variables
1.3To know the necessity of studying Instrumentation
1.4To list out various Temperature measuring Instruments
2.1To list out various pressure measuring Instruments
2.2To understand the working of various temperature measuring Instruments
2.3To understand the working of various pressure measuring Instruments
3.1To list out various Flow measuring Instruments
3.2To list out various Liquid level measuring Instruments
3.3To measure the Flow rate using different flow measuring Instruments
3.4To handle various level measuring Instruments
3.5 To understand the operation of different Humidity measuring Instruments
4.1To understand the significance of automatic control system.
4.2To distinguish the various modes of control actions
4.3To understand the principle of various controllers
5.1To understand about transmission of both analog and digital signals
5.2 To understand the concept about Distributed Controlled System and its applications.

DETAILED SYLLABUS

Unit	Name of Topics	Hours
I	**BASIC CONCEPT OF MEASUREMENT AND MEASUREMENTOF TEMPERATURE** 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.	**13 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 (LVD).	**13 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.	**13 Hrs**

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. 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) - Final control element: control valves, variable speed drives. Control application in (a)liquid level system (b) Heat Exchanger- control of temperature and flow rate. (c) Batch Reactor- control of temperature and pressure.	**19Hrs**
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 e-versa. Process control computers: Analog computer system, Digital computer system-Features of both types- application of Distributed Controlled System(DCS) in unit operation ,unit processand plant control-schematic diagrams for the control of simple unit process-computer supervisory control-simple control flow sheets using computer for Batch reactor and CSTR. Simulation: Basic concepts-Analog simulation ,Digital simulation and Hybrid simulation-characteristics of each types-basic concepts in writing mathematical models- scope – Principles of formulation – mathematical modeling for the following system – liquid flow in mixed tank – uniform diameter circular type – single CSTR and Tubular reactor. *Using mass balance equation for unimolecular First order and irreversible chemical reaction.	**17 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 Control by 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 Engineers by Luyben, McGraw Hill Kogakasha Ltd.
3. Chemical process control by George Stephanopoulos, PHI learning pvt Ltd.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

V SEMESTER

2015 – 2016 onwards

PETROCHEMICAL TECHNOLOGY

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37171

Semester : V SEMESTER

Subject Title : **Petrochemical Technology**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Petro Chemical Technology	4	60	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	C_1 Compounds	12
2.	C_2 Compounds	12
3.	C_3 Compounds	12
4.	C_4 Compounds	12
5.	Aromatics	12
6.	Test & Revision	-
Total		60

Rationale:

The scope for Petrochemical Engineers is tending to grow in future due to industry expansion and the related scarcity of resources needed. The Petrochemical industry in India is poised for explosive growth in the coming years. Over all chemical engineers could make very important contributions for the improvement and maintenance of the quality of life. The various chapters of petrochemical technology like **C1, C2, C3, C4** fractions and **Aromatics** etc, provide the complete sketch about the processes in all petrochemical complexes also provides the processing of raw materials for various commercial products based on crude petroleum.

Objectives:

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

1.1 The manufacturing process, Physical properties and uses from C_1 compounds.

1.2 Chemicals like methanol, Chloromethane.

2.1 The manufacturing process, Physical properties and uses from C_2 compounds.

2.2 Ethylene, acetylene, Ethylene Oxide, Ethanol amines.

3.1 Manufacturing process, Physical properties and uses from C_3 compounds.

4.1 The manufacturing process, Physical properties and uses of C_4 compounds

4.2 Butadiene from various compounds.

5.1 The manufacturing process, Physical properties and uses of Aromatic compounds

5.2 Benzene, Phenol, Styrene, Phthalicanhydride.

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DETAILED SYLLABUS

UNIT	NAME OF TOPICS	Hours
I	**C1 COMPOUNDS** Process Description, flow diagram, Physical Properties and uses of -Methanol via synthesis gas route, Formaldehyde from methanol,Chloromethane by direct chlorination of methane, Trichloroethylene Perchloroethyene by Pyrolysis of carbon tetrachloride.	**12 Hrs**

II	**C2 COMPOUNDS** Process Description, flow diagram, Physical Properties and uses of -Ethylene and acetylene Production by steam cracking of hydrocarbons, Ethylene dichloride, Vinyl Chloride Via ethylene dichloride pyrolysis, Ethylene oxide by oxidation of ethylene, Ethanol amines from ethylene oxide and Ammonia.	**12 Hrs**
III	**C3 COMPOUNDS** Process Description, flow diagram, Physical Properties and uses of -Isopropanol by hydration of propylene, Acetone by dehydrogenation of Isopropanol,Acrylonitrile from Propylene Ammonia Oxidation, Isoprene from propylene dimmer, Propylene Oxide via Chlorohydrins.	**12 Hrs**
IV	**C4 COMPOUNDS** Process Description, flow diagram, Physical Properties and uses of -Butadiene from Dehydrogenation of butane, Butadiene by Oxydehydrogenation, Butadiene from ethanol, Butadiene from steam cracking f hydrocarbons.	**12 Hrs**
V	**AROMATICS** Process Description, flow diagram, Physical Properties and uses of –Benzene from Alkyl Aromatics, Phenol by Cumene Process, Phenol from toluene Oxidation, Styrene from benzene and ethylene, Phthalic anhydride by Oxidation of Naphthalene.	**12 Hrs**

Text Books:

1. Dryden's Outliness of Chemical Technology Edited and Reprinted by M. Gopala Rao Marshall Sittig, 2nd Edition
2. Dr. B.K.Bhaskararao"A Text on Petro Chemicals" 1st Edition, Khanna Publishers

Reference Books:

1. Austin, G.T., Shreve's Chemical Process Industries, 5th Edition, McGraw Hill.
2. Kirk-Othmer, Encyclopedia of Chemical Technology, 4th Edition, 1993, Wiley – Inter Science Publication, John Wiley & Sons, New York.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

V SEMESTER

2015 – 2016 onwards

NATURAL GAS ENGINEERING

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37172

Semester : V SEMESTER

Subject Title : NATURAL GAS ENGINEERING

TEACHING AND SCHEME OF EX MINATION:

No. of Weeks per Semester: 15 Weeks

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

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Properties And Composition Of Natural Gas	12
2.	Estimation And Production Of Natural Gas	12
3.	Gas From Condensate Oil Fields	12
4.	Acid Gas Treating Of Natural Gas	12
5.	Dehydration Of Natural Gas And Ngl Recovery	12
6.	Test & Revision	-
Total		60

Rationale:

The process of making the oil and gas available in the huge quantities needed to sustain our industrial economy and maintain our standard of living is quite challenging. Petroleum engineers are trained to face these challenges. Oil and gas must be discovered: its quantity and production potential must be assessed: optimal extraction methods must be established to maximize recovery; and it must be transported from the point of production to the refinery and then stored. All these processes need to be carried out in an environmentally benign manner. Petroleum engineers must be multi-faceted in order to cover all these various aspects.

Objectives:

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

1.1 understand the basic concept and application of natural gas engineering.

1.2 Formulating, communicating and implementing solutions to engineering problems in a variety of professional environment.

2.1 Understand the Importance, properties and composition of natural gas.

2.2 Estimate and production of natural gas.

3.1 Understand Principles and production of acid gas treating of natural gas.

4.1 Understand Processing of condensate well fluids.

5.1 Know about different types of dehydration of natural gas and NGL recovery.

5.2 Learn the Natural gas processing, gas compression, Gas gathering ,operation and trouble shooting of natural gas pipelines.

DETAILED SYLLABUS

UNIT	NAME OF TOPICS	Hours
I	**PROPERTIES AND COMPOSITION OF NATURAL GAS** Natural gas origin-Composition of natural gas-Sources of Natural gas-Thermodynamics Properties, Specific gravity, Pseudo critical Properties, viscosity- Compressibility factor and chart for natural gas-Heating value and flammability limit of natural gas-Source of information for natural gas engineering and its applications.	**12 Hrs**

II	**ESTIMATION AND PRODUCTION OF NATURAL GAS** Estimation of gas reserves by volumetric method: Isopach, isowall map, material balance method, model studies method,– Production of natural gas- LPG treatment process -Pressure decline method-Problems in the production of natural gas-Field separation -Vertical separations, Horizontal separations.	**12 Hrs**
III	**GAS FROM CONDENSATE OIL FIELDS** Processing of condensate well fluids- High pressure gas and gas sales system, Reabsorption in condensate system, distillation in stabilization-Cycling of gas condensate reservoirs-Sweep patterns-Katy cycling pla -Gathering and transmission, and natural gas liquefaction.	**12 Hrs**
IV	**ACID GAS TREATING O NATURAL GAS** Acid gas removal: Metal oxide process- Iron oxide proces , Zinc oxide process-Slurry process- Chem Sweet process, sulfa check process -Amine process , girbotol process-Carbonate washing process-Methanol based process - rectisol process, ifp process, potassium phosphate process, alkazid process,hotpotassiumcarbonate process, giamarco vetrocoke process, m olecular sieve and membrane waste process-Sulphur recovery process-Claus process, sulphur production by redox process.	**12 Hrs**
V	**DEHYDRAT N OF N TURAL GAS AND NGL RECOVERY** Dehydration: Glycol dehydration-Solid desiccant dehydration, refrigeration cooling of gas desiccant dehydration ,membra nce -vortexdehydration process, supersonic dehydration process. NGL Recovery: shrinking process- Refrigeration process-mechanical cascade refrigeration process, mixed refrigeration process, self refrigeration process, cryogenic refrigeration process-ortloff gas sub cooled process, ortloff residue split vapour pressure- Lean oil absorption process-Solid bed adsorption and membrane separation process-NGL fractionation.	**12 Hrs**

Text Books:

1. Katz and Lee “Hand Book of Natural Gas Engineering” McGraw Hill, 1968.
2. Lyons, W.C., “Standard Handbook of Petroleum and Natural Gas Engineering”, Vol. 2, Gulf Professional Publishing, Elsevier Inc., 2006.

References:

1. Katz, D.L. and Lee, R.L., “Natural Gas Industry-A Review of World Resources and Industrial Applications”, Butterworth, 1974.
2. During, M.M., “The Natural Gas Industry-A Review of World Resources and Industrial Applications”, Butterworth, 1974.
3. Saied Mokhatab, William A. Poe, and James G.Speight, “Hand book of Natural Gas Transmission and Processing”, Gulf Professional Professional Publishing, Elsevier Inc., 2006.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

V SEMESTER

2015 – 2016 onwards

CHEMICAL PROCESS MEASUREMENT AND CONTROL PRACTICAL*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

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	Instructions		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. 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 or Analog.
8. Study of P,PI and PID controller us Liquid Level controller Trainer kit by monitoring the process in SCADA ode or Analog.
9. Study of P, PI and PID controller using Pressure controller Trainer kit by monitoring the process in SCADA mode r Analog.
10. Study of multidrop communication system for temperature, pressure and Level control Trainer kit (ON OFF and PID Controller) in SCADA mode or Analog.

LIST OF EQUIPMENTS

1. Temperature sensors like Thermocouple, R D 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 or Analog
8. Liquid Level control Trainer Kit with SCADA or Analog
9. Pressure Control Trainer Kit with SCADA or Analog
10. Multidrop communication system.

ALLOCATION OF MARKS

Contents	Maximum Marks
Procedure	15
Observation	20
Calculation	20
Result	10
Viva-Voce	10
Total	75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

V SEMESTER

2015 – 2016 onwards

HEAT TRANSFER PRACTICAL*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37056

Semester : V SEMESTER

Subject Title : Heat Transfer Practical*

TEACHING AND SCHEME OF EXAM NATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Heat Transfer 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:

After completing all the experiments of the laboratory the student will able to

- Determine the Thermal conductivity of the metal, Insulating Material and Glass wool.
- Determine the overall heat transfer coefficient of a double pipe heat exchanger by co-current flow & counter current flow.
- Determine the quantity of heat transferred and over all hear transfer coefficient of a condenser.
- Determine the heat transfer characteristics under forced convection
- Determine the heat transfer characteristics under free convection
- Determine the emissivity of the given metal
- Determine the Stefan Boltzmann Constant

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 reque ted 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. Thermal Conductivity of Metal Bar
2. Heat loss in pipe
3. Thermal Conductivity of G a s wool
4. Double Pipe Heat Exchanger by co-current Flow
5. Double Pipe Heat Exchanger by Cou nter-current flow
6. Natural Convection Heat Transfer
7. Forced Convection Heat Transfer
8. Heat Transfer in Condenser
9. Determination of Emissivity of a grey Body
10. Verification of Stefan Boltzmann constant

LIST OF EQUIPMENTS

Modules for the determination of the following:-

1. Thermal Conductivity of Meta Bar
2. Heat loss in pipes
3. Thermal Conductivity of Glass wool
4. Double Pipe Heat Exchanger by co-current Flow
5. Double Pipe Heat Exchanger by Counter-current flow
6. Natural Convection Heat Transfer
7. Forced Convection Heat Transfer
8. Horizontal Condenser
9. Emissivity
10. Stefan Boltzmann

ALLOCATION OF MARKS

Contents	Maximum Marks
Procedure	15
Observation	20
Calculation	20
Result	10
Viva-Voce	10
Total	75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

V SEMESTER

2015 – 2016 onwards

LIFE AND EMPLOYABILITY SKILL PRACTICAL
(COMMON TO ALL)

CURRICULAM 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 : **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

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

VI SEMESTER

2015 – 2016 onwards

REFINERY MASS TRANSFER - I

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37161

Semester : VI

Subject Title : REFINERY MASS TRANSFER

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Refinery Mass Transfer	6	90	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Distillation	18
2.	Distillation Equipments	18
3.	Extraction	18
4.	Absorption And Adsorption	18
5.	Crystallization	18
6.	Test & Revision	-
Total		90

Rationale:

The exponential growth of Engineering and Technology has benefited the mankind with extremes sophistication and comfort. Government of India has set in place polices and special economic zones to promote investment in its petrochemical sector and several key domestic companies have unveiled ambitious expansion plans for the next few years. The chapters of Refinery Mass Transfer deals with the various unit operations l i ke Distillation, Extraction, Absorption, Adsorption, Crystallization and Equipments, etc, provides the auxiliary operations carried out in petroleum refinery for the separation of crude petroleum.

Objectives:

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

1.1. Distillation of binary mixture
1.2. Vapour and Liquid behaviour in an Ideal plate
2.1. Overall Material balance of binary mixture in a Distillation Column
2.2. Principles of Raoult's Law and multi components system
2.3. Distillation equipments used in refinery
3.1. Necessity of extraction and importance of triangular chart
3.2. Extraction equipments and application of extraction
3.3. Principles of leaching
3.4. Importance of Adsorption &Absorption and their types
4.1. Different types of Adsorption &Absorption
4.2. Advantage & Disadvantage of packed towers
4.3. Adsorbents used in industry
5.1. Importance of Super Saturation
5.2. Phase change in crystallization
5.3. Mechanism of crystallization
5.4. Different crystallizer and purifying equipments

DETAILED SYLLABUS

UNIT	NAME OF TOPICS	Hours
I	**DISTILLATION** Distillation, Principle of Distillation, Raoult's law, Dalton's law, minimum boiling Azeotropes, maximum boiling azeotropes, multi-component systems. Flash distillation of binary mixtures, Continuous distillation with reflux – action on an ideal plate, Combination rectification and stripping, Material balances in plate Columns –Over al Material balance for two component systems, net flow rate, determination of theoretical plates required for a tray tower using McCabe-Thiele method, Optimum reflux ratio (Principles on) ,simple problems – Using Raoult's law ,Dalton's Law, No of plates by Mccabe thiele method.	18 Hrs
II	**DISTILLATION EQUIPMENTS** Description with Diagram: Simple distillation, Azeotropic distillation, Extractive distillation Molecular distillation, Steam distillation, Construction of rectifying column (Bubble cap, Sieve plate, Valve trays), Types of down comers, Packed column, Fractionating column with accessories (condenser, partial condenser, and reboiler) and its arrangement.	18 Hrs
III	**EXTRACTION** **LIQUID LIQUID EXTRACTION** Liquid – Liquid Extraction, Liquid Equilibrium, Triangular chart and its use, Choice of solvent for extraction, Industrial application of Extraction - System of three liquid – One pair partially soluble, two pair partially soluble - Co-current, Cross current, Counter current extraction (Principles only), Equipments - description with diagram – mixer settler Cascades, Sieve tray towers, Packed towers, Rotating disc contactor. **LEACHING** Principles of Leaching, Preparation of Solid, Industrial Application - Equipments - Description with diagram – Robert diffusion battery, Basket Extractor, Dorr Agitator, Dorr Thickener.	18 Hrs

IV	**ABSORPTION AND ADSORPTION** **ABSORPTION** Gas absorption principles, Equilibrium Solubility of gases in liquids, Two component systems, multi component systems, absorption with chemical reaction. Equipments description with diagram - Packed tower operation, packing, Packing Supports, liquid distributor, entrainment separator, and definition of loading and flooding of packed towers-simple problems to calculate solvent flow rate to tower, composition calculation,HTU. **ADSORPION** Adsorption, Industrial Application, Vapor phase adsorption systems, adsorption Isotherms (Principle n y), concentration vs. adsorbate loading, Break through Curve - Phys cal and Chemical Adsorption (Principles only) - Important Adsorbents - Molecular sieves, Silica gel, Zeolite, Decolorizing Carbons (short note only)	**18 Hrs**
V	**CRYSTALLISATION** Crystallization, Purity of product, Importance of Crystal size, Equilibria and Solubility curve, Preparation of Super saturation, Nucleation – Origins of Crystals in crystallizers, Primary Nucleation, Secondary Nucleation, Fluid Shear Nucleation, Contact Nucleation - Equipments - Description with diagram – Vacuum Crystallizers, draft tube baffles Crystallizers, Crystallization from melts.	**18 Hrs**

Text Books:

1. W.L. McCabe & J.C. Smith “Unit operation of chemical Engg” 6th Edition, Mc. Graw Hill Book.
2. W.L. Badger & J.T. Banchero “Introduction to Chemical Engg” Tata McGraw Hill Publishing Co,Ltd., New Delhi – 1997.

Reference Books:

1. R.E. Treybal “Mass Transfer Operation” McGraw Hill Book Co. 1986
2. Robert H. Perry – and D.W. Green “Perry’s Chemical Engineers Hand book” 7th Edition,
   McGraw Hill Book Co. Singapore – 1997.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

VI SEMESTER

2015 – 2016 onwards

PROCESSING OF CHEMICALS

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37162

Semester : VI

Subject Title : PROCESSING OF CHEMICALS

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Processing Of Chemicals	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Chlor-Alkali Industries	15
2.	Fertilizers Industries	15
3.	Cement, Glass, Surface Coating Industries	15
4.	Synthetic Detergent	15
5.	Halogenation And Esterfication	15
6.	Test & Revision	-
Total		75

Rationale:

With the advent of Globalization the face of the industry is changing. Large expansions in production capacities are presently taking place. This is the first time that major investments are taking place in all areas of the Petrochemical Industry. The Petrochemical industry in India is poised for explosive growth in the coming years. The various chapters of Processing chemicals like Chlor-Alkali industries, Fertilizer, Cement, Glass, Detergents, Surface Coatings etc, provide the complete idea and basics about the processes in all petrochemical industries also provides the processing of various commercial products like fertilizers, detergents based on crude petroleum.

Objectives:

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

1.1.Membrane cell Process.

1.2.Solvay process, DCDA Process

2.1.Manufacturing of fertilizers and its importance.

3.1.Manufacturing of Portland cement

3.2.Manufacturing of Glass

3.3.Manufacturing process of Paint

4.1.Classification of detergent.

4.2.Detergent from olefins and Kerosene.

4.3.The importance of finishing of detergents.

5.1.Halogenation and its importance

5.2.Esterfication and its importance

DETAILED SYLLABUS

Unit	Name of the Topic	Hours
I	**CHLORO ALKALI INDUSTRIES** Manufacture of Soda Ash by Solvay's Process, Manufacture of caustic Soda- Membrane cells Sulphuric acid manufacture by DCDA process and Contact Process, Manufacture of Hydrochloric acid, Properties and uses. Manufacture of chlorine , Comparison of caustic soda by membrane, diaphragm and mercury cell process, manufacture of caustic soda by mercury process.	**15 Hrs**
II	**FERTILIZERS** Fertilizer industries : Introduction- growth in India- classification of fertilizers- nutrient content of fertilizers-Intermediate products of fertilizers: Manufacture of ammonia – Manufacture of Phosphoric acid- various methods of production- uses; Nitrogenous fertilizers: Manufacture of urea, Manufacture of Ammonium sulphate, Manufacture of Ammonium Nitrate Phosphatic fertilizers: Manufacture of Triple Super Phosphate, ,complex fertilizers: Manufacture of NPK, Manufacture of Ammonium Phosphate. Potassic fertilizers: Manufacture of Potassium chloride– properties and uses of these fertilizers.	**15 Hrs**
III	**CEMENT, GLASS, SURFACE COATING INDUSTRIES** Manufacture of Portland cement by dry process ,types of cement,- Raw materials and Method of manufacture of Glass, types of glasses, and commercial – Glasses - Electronic grade Silica, Constituent of paints - Definition of PVC (Pigment, Volume, Concentration) Manufacturing procedure – Pigments manufacture of Lithophone and Titanium di Oxide.	**15 Hrs**

IV	**SYNTHETIC DETERGENT** Classification of Detergent, Structure of Detergents, Anionic, Non –Ionic Detergents. Production with flow diagram – detergent through olefins, Sulphonation of Olefins, Keryl Benzene Sulphonate, Linear Alkyl Benzene Sulphonate, ISO SIV Adsorption Process for n-paraffin's - Finishing of Detergent – Builders, Bleaches and Whiteners, fillers and processing aids, perfumes, corrosion Inhibitors foams Agents, other Additives.	**15 Hrs**
V	**ESTERFICATION AND HALOGEN TION** Esterification definition, simple mechanism, manufacturing process for the production of Bio Diesel by esterfication, properties of ester and applications. Halogenation definition, manufacturing process for the production of 1-2 di-chloro ethane properties and uses. Manufacturing process of methyl iodide, properties and uses.	**15 Hrs**

Text Books:

1. Dr. B.K. BhaskaraRao "A Text on Petro Chemicals" 1st Edition, Khanna Publishers.
2. Austin, G.T., Shr s Chemical Process Industries, 5th Edition, McGraw Hill.
3. Dryden's, C.E., Outlines of Chemical Technology edited & Reprinted by M. Gopala Rao, Marshall Sittig, 2nd Edition

Reference Books:

1.Rubin Irwin J, Hand Book of Plastic Materials & Technology

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

VI SEMESTER

2015 – 2016 onwards

ENERGY RESOURCES AND SAFETY MANAGEMENT

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37181

Semester : VI

Subject Title : Energy Resources and Safety Management

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
REFINERY MASS TRANSFER	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Energy Production	15
2.	Furnaces	15
3.	Water Management	15
4.	Safety Management & Its Legislation	15
5.	Industrial Safety	15
6.	Test &Revision	-
Total		90

Rationale:

The exponential growth of Engineering and Technology has benefited the mankind with extreme sophistication and comfort. The Petrochemical industry in India is poised for explosive growth in the coming years. Over all chemical engineers could make very important contributions for the improvement and maintenance of the quality of life. The various chapters of Energy Resources and Safety Management like Energy Production, Furnaces, Safety Management and its legislation etc, provide the outline of Energy and Safety Management carried out in industries.

Objectives:

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

1.1. Three sources of Conventional Energy Production

1.2. The improvement of the fuel.

2.1. Furnaces that employ the fuels to harness Energy

2.2. Methods of achieving fuel economy.

3.1. Utilities, Management of Water from available resources.

3.2. Recovery and reuse, abating of contamination of Water Table, Controlling of sudden influx.

4.1. Safety legislation.

4.2. Acts to be followed in an Industry.

5.1. Standards for safety.

5.2. Safety methods, practices, equipments in Chemical and Petrochemical Industries.

5.3. Safety analysis and auditing.

DETAILED SYLLABUS

UNIT	NAME OF TOPICS	Hours
I	**ENERGY PRODUCTION** Solid Fuels – Characteristics of coal – Grindability index – Pulverization – advantages and disadvantages – Carbonization of coal - Briquetting of coal. Liquid fuels – types – improving Octane Number by blending and reforming (Principles only) – Colloidal Fuel – Benzol – Power alcohol, Biodiesel. Gaseous Fuels – Types – Production of CNG and LNG – Combustion efficiency of gaseous fuels - Comparative study	**15 Hrs**
II	**FURNACE** Introduction – Broad classification of furnace – Muffle furnace– Fuel Economy of furnace – Detailed study of factors affecting fuel economy in the furnace – use of waste heat as a secondary heat source – Waste Heat Boilers –Recuperation – Radiation and convection recuperation –Regenerator – Control of furnace atmosphere.	**15 Hrs**
III	**WATER MANAGEMENT** Water treatment procedures – Rain water harvest Demineralized water - Water conservation and recycling - Waste water treatment: Effluent Treatment for Toxic and non Toxic Chemicals - Disposal of Effluent, Sludge - Drainage systems for sudden outflow and flooding – Water for fire mains	**15 Hrs**
IV	**SAFETY MANAGEMENT & ITS LEGISLATION** Factories Act 1948, Workman's Compensation Act 1943, Employees State Insurance Act 1948.Functions of safety management, ILO Convention and Recommendations in the furtherance of safety, health and welfare. Occupational Safety, Health and Environment Management.OHSAS – 18001 standards, EPA Standards.Performance measurements to determine effectiveness of PSM,	**15 Hrs**

	Organizing for safety, Health and Environment, Organization-Structure, Function and responsibilities Safety Committee - Structure and function, Competence Building Technique (CBT).	
V	**INDUSTRIAL SAFETY** Common causes of accidents in Chemical and Petrochemical Industries – HAZOP Analysis – Personal Protective equipments. 5-S Principles and Housekeeping; Safety System: Safety Devices: Safety values, Process interlock – Shut off valves – Rupture disc – Safety in Handling and storage – Safety Audit concepts.	**15 Hrs**

Text Books:

1. Gupta O.P., Elements of Fuels, Furnaces and Refractories , 4th Edition, 2002, Khanna Publishers, New Delhi.
2. S.S Dara, Environmental Chemistry & Pollution Cont ol, S. Chand & company, NewDelhi.
3. Modern Handbook of Industrial Safety and Health, 1980, Trade and Technical Press Ltd., U.K.

Reference Books:

1. Engineering Chemistry , M. M. Uppal, Khanna Publishers, New Delhi
2. Engineering Chemistry , Jain & Jain, Khanna Publishers, New Delhi

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

VI SEMESTER

2015 – 2016 onwards

ENVIRONMENTAL ENGINEERING

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37182

Semester : VI SEMESTER

Subject Title : ENVIRONMENTAL ENGINEETING

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Environmental Engineering	5	75	25	7	100	3 Hrs

TOP CS AND ALLOCATION OF HOURS:

Sl.No.	Topic	Time (Hrs)
1.	Environmental Legislation	18
2.	Air Pollution & Its Control Measures	15
3.	Water Pollution & Its Control Measures	15
4.	Soil Pollution & Its Control Measures	12
5.	Noise Pollution	10
6.	Test & Revision	-
Total		75

Rationale:

The exponential growth of Engineering and Technology has benefited the mankind with extreme sophistication and comfort. India's government has set in place polices and special economic zones to promote investment in its petrochemical sector and several key domestic companies have unveiled ambitious expansion plans for the next few years. The chapters of Environmental Engineering deals with the various factors of environment like Air pollution, Water pollution, Noise pollution , Soil pollution, and Standards of environment , etc, provides the auxiliary operations carried out in preventing the Environment from pollution.

Objectives:

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

1.1 Environmental Legislation.

1.2 Knowledge about international treaty.

1.3 Need for renewable energy sources.

1.4 Alternate sources of energy.

2.1 Air pollution & its effects

2.2 Air pollution preventive measures.

2.3 Extraction equipments

3.1 Sources of water pollution

3.2 Preventive measures of water pollution

4.1 Soil pollution & its sources

4.2 Disposal of solid waste

5.1 Standards for noise level

5.2 Measures of noise pollution.

DETAILED SYLLABUS

UNIT	NAME OF TOPICS	Hours
I	**ENVIRONMENTAL LEGISLATION** Indian Constitution and Environmental Protection – National Environmental policies – Precautionary Principle and Polluter Pays Principle – Montreal Protocol, Kyoto agreement, Rio declaration . Environmental Protection act , Air & Water Pollution Control Acts & Rules (Salient Features only) – Functions of State / Central Pollution Control Boards – Environmental Management System: ISO 14 000 (Salient Features only) **CLEAN TECHNOLOGY AND ENERGY** Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in Industry.	**20 Hrs**
II	**AIR POLLUTION & ITS CONTROL MEASURES** Causes of air pollution – types & sources of air pollutants – Climatic & Meteorological effect on air pollution concentration – formation of smog & fumigation – Green house effect & Global Warming: Concepts of El Nino. Collection of Gaseous Air Pollutants – Collection of Particulate Pollutants – Analysis of Air Pollutants like: Sulphur dioxide – Nitrogen oxide – Carbon monoxide –Oxidants & Ozone – Hydrocarbons – Particulate Matter. Control of Particulate Emission – Control of Gaseous Emission – Flue Gas Treatment Methods**:** on, Settling Chambers, Cyclones, Filtration, Scrubbers, and Electrostatic Precipitators.	**18 Hrs**
III	**WATER POLLUTION & ITS CONTROL MEASURES** Origin of wastewater — Type of water pollutants and their effects Biological Pollution (point & non-point sources) – Chemical Pollutants Toxic Organic & Inorganic Chemicals – Oxygen demanding substances – Physical Pollutants Thermal Waste – Radioactive waste – Physiological Pollutants: Taste affecting substances – other forming substances. Adverse effects on Human Health & Environment, Aquatic Life, Animal life, Plant life — Water PollutionMeasurement Techniques – Water Pollution Control	**15 Hrs**

	Equipments & Instruments – Indian Standards for Water Pollution Control.	
IV	**SOIL POLLUTION & ITS CONTROL MEASURES** Liquid & Solid Wastes – Domestic & Industrial Wastes – Pesticides – Toxic**:** Inorganic & Organic Pollutants –Soil Deterioration – Poor Fertility, Septicity, Ground Water Pollution, Concentration of Infecting Agents in SoilDumping domestic & Industrial Solid Wastes: Advantages & Disadvantages – Incineration: Advantages &Disadvantages – Sanitary Land Field: Advantages & Disadvantages – Management of Careful & Sanitary Dispos of Solid Wastes	**12 Hrs**
V	**NOISE POLLUTION** Intensity, Duration – Types of Industrial Noise – effects of Noise– Noise Measuring & Control– Permissible Noise Limits, simple problems .	**10Hrs**

Text Books:

1. A text book on environmental engineering by SS Dara. .

Reference Books:

1. Environmental Science / J. Turk & A. Turk
2. Wastewater engineering by Medcalf-Eddy.
3. Environmental Pollution / Dix
4. Pollution Control Acts, Rules and Notification / Central Pollution Control Board.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

VI SEMESTER

2015 – 2016 onwards

MASS TRANSFER PRACTICAL*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37064

Semester : VI SEMESTER

Subject Title : MASS TRANSFER PRACTICAL*

TEACHING AND SCHEME OF EXAM NATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semeste	Marks			Duration
Mass Transfer Practical*	6	90	Internal Assessment	Board Examination	Total	
			25	75	100	3 Hrs

Rationale:

In Diploma level engineering education to skill development especially working with instruments an Equipment's play a vital role. These can be achieved by experience in handling various equipment's. This is accomplished by doing engineering related equipment's in practical classes.

Objectives:

- After completing all the experiments of the practical the student will be able to understand.
- Verification of Rayleigh equation. Determine vaporization efficiency of steam distillation .Construct equilibrium curve of a tertiary system. Determine drying character tics and crystallization behavior and solubility characteristics.

Guidelines:

- All the ten experiments given in the list of experiment should be completed and given for the end semester practical examinations.
- In order to develop but best skills in handling instruct/equipment and taking reading in the practical classes. Every two students should be provide with a separate experimented setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimented question should not be given to more than four students while admitted a batch of 30 students during board examination.

List of Experiments:

1. Simple Distillation
2. Determination of Vapour Liquid Equilibrium
3. Steam Distillation
4. Liquid-Liquid Extraction
5. Soxelt Extraction
6. Drying Characteristic solid
7. Crystallization by Cooling
8. Crystallization by Evaporation
9. Decolourization by Adsorption
10. Diffusivity Measurements

List of Equipments:

1. Simple Distillation Apparatus
2. Vapour Liquid Equilibrium Apparatus
3. Steam Distillation Apparatus
4. Liquid-Liquid Extraction Apparatus
5. Soxelt Extractor
6. Drier
7. Crystallization by Cooling Apparatus
8. Crystallization by Evaporation Apparatus
9. Decolourization by Adsorption Equipment
10. Diffusivity Measurements Apparatus

ALLOCATION OF MARKS

Contents	Maximum Marks
Procedure	15
Observation	20
Calculation	20
Result	10
Viva-Voce	10
Total	75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

VI SEMESTER

2015 – 2016 onwards

DISTILLATE TESTING PRACTICAL - II

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37165

Semester : VI SEMESTER

Subject Title : DISTILLATE TESTING PRACTICAL - II

TEACHING AND SCHEME OF EXAM NATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Wee	Hours/ mester	Marks			Duration
			Internal Assessment	Board Examination	Total	
DISTILLATE TESTING PRACTICAL -II	4	60	25	75	100	3 Hrs

Rationale:

In Diploma level engineering education skill development plays a key role. The skill development can be achieved by hands on experience in handling various instruments, apparatus and equipment in focus of improving new trends in petroleum Refinery .This is accomplished by doing engineering related experiments in practical classes in various laboratories.

Objectives:

After completion of this laboratory, the students will be able

- To understand methods of testing Petroleum distillates (Gasoline, Kerosene, Lube oil) is done.
- To know how distillates meet the specification to satisfy the end users requirement.
- To aware of the tests carried in Refinery.
- To know the importance of Bromine number, Refractive index for Aromatics
- To understand about carbon residue which is more important for heavier ends for further cracking operation.

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 readings in the practical classes, every six 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 admitting a batch of 30 students during Board Examinations.

LIST OF EXPERIMENTS

1. Copper Corrosion test
2. Say bolt color test
3. Determination of Reid vapor Pressure
4. Determination of Refractive Index
5. Carbon residue by Conradson method
6. Carbon residue by Rams bottom method
7. Determination of Bromine Number
8. Determination of Sediments by extraction
9. Determination of Kinematic Viscosity
10. Determination of Penetration number of Bitumen

LIST OF EQUIPMENTS

1. Copper Corrosion test
2. Say bolt color test
3. Reid vapor Pressure
4. Refractive Index
5. Carbon residue by Conradson method
6. Carbon residue by Rams bottom method
7. Bromine Number apparatus
8. Sediments by extraction
9. Kinematic Viscosity
10. Penetration number of Bitumen

ALLOCATION OF MARKS

Contents	Maximum Marks
Procedure	15
Observation	20
Calculation	20
Result	10
Viva-Voce	10
Total	75

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DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

VI SEMESTER

2015 – 2016 onwards

Chemical CAD & Process Simulation Practical*

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMIL NADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37066

Semester : VI SEMESTER

Subject Title : Chemical CAD & Process Simulation Practical*

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Chemical CAD & Process Simulation Practical	4	60	25	75	100	3 Hrs

Objectives:

- In this practical subject, the students are required to learn the basic
- Concepts o AutoCAD like screen inter face, various commands and co- Ordinate system use .
- This practical subject will also impart them requisiteknowledgeofcreating2D 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.
- Able to design pipes and storage vessel at various process condition using data book.
- Able to handle various unit operation and plant at different condition of process variable using simulator.

DATA BOOK

The data book must be comprised with the following details for solving problems during Board examination. The tables and equations are available in **CHEMICAL ENGINEERS' HAND BOOK** BY **ROBERT H.PERRY** AND **CECIL H .CHILTON,** Fifth edition as mentioned below.

TABLE

Sl.No.	Table No.	Title	Page No.
1.	6-3	Allowable stress for Ferrous metals	6-38 to 6-41
2.	6-4	Allowable stress for Non-Ferrous	6-43
3	6-5	Longitudinal weld joint factor E	6-44
4.	6-6	Y value for steels	6-44
5.	6-7	Stress range reduction factor F	6-44
6.	6-9	Thermal expansion co.eff. for piping materials	6-46
7.	6-10	Moduli of elasticity r ferrous/non-ferrous metals	6-46
8.	6-15	Properties of Steel Pipe	6-65 to 6-66
9.	6-51A	Volume of Cylinders , 15" to 148" dia.	6-86
10.	6-51B	Volume of cylinders , 10' to 98' dia.	6-87
11.	6-52	Volume of partially filled horizontal cylinders	6-87
12.	6-53	volume of heads	6-87
13.	6-54	volume of partially filled heads in horizontal tank	6-88
14.	6-56	vessel design formulae for internal pressure	6-93
15.	6-57	maxallowable stress value in tension for carbon &steel	6-96
16.	6-58	maxallowable stress value in tension for carbon &s el for aluminum & alloys	6-97
17.	6-59	maxallowable stress value in tension for carbon &steel for high alloy steels.	6-97
18.	6-60	maxallowable joint efficiency for arc &gas welded.	6-97

Equations

Sl.No.	Eqn.No.	Page No.
1.	6-37	6-42
2.	6-38	6-42
3.	6-39	6-42
4.	6-40	6-42
5.	6-41	6-45
6.	6-42	6-46
7.	6-43	6-46
8.	6-45	6-86
9.	6-46	6-87

LISTOFEXPERIMENTS

1.CHEMICAL CAD

Using all Auto CAD commands for plotting (2D dimensional) chemical equipments- different views- dimensioning--3D fundamentals -2D to 3D conversion

2.DESIGN OF PIPING, STORAGE AND PRESSURE VESSELS

Piping codes-Design conditions such as internal & external pressure and metal Temperature- wall thickness- thermal expansion problems – pipe supports-joints &fittings-Ferrous, n -ferrous, non-metallic & lined pipes.(problems are excluded in fittings & joints)

Construction materials &safety - tank volume of pressure vessel- types of heads- volume of heads-calculation of internal pressure of tank- shell thickness calculation.

3.PROCESS SIMULATION

a)PROCESS SIMULATOR

Need of simulator- Application of simulators distributed controlled system-Dynamic Graphic (mimic),Bar graph- Trend and Alarm.

b)PROCESS SIMULATOR SOFTWARE

Installation of software- Introduction of software feature using member- Tool bar- Dialog bar-Status bar-Scroll bar- Title bar.

Screens(display) -Snap shots- Back track- Caution longing- Connectivity between Bar graph- Loading- Saving- Delete- Controlling the session- Run freeze, Quit etc.,- Mal function- On line hold- Start up and shut down procedure- mimic, exercise in Trend and Alarm.

EXERCISES

1. .Practice to draw the following Equipment (2-dimensional) using Autocad commends:

   a. Fractionation column
   b. Batch Reactor
   c. shell and tube Heat exchanger
   d. Long tube Evaporator
   e. Rotary Drum Filter

2(a). Determination of the minimum thickness of pipe /the pipe lay out design for

different materials and conditions of flow , using the data such as allowable stress ,thermal expansion coefficient, longitudinal weld joint factor etc.,

(b). Internal pressure that undergoes by the pressure tank ,shell thickness and volume of the tank if allowable stress and joint efficiency are considered in designing the tank for the fully filled and partially filled with liquid / design of tanks for different heads.

3. Practice the following using process simulator.

   1. Practice correct start up and shut down procedure of plant.
   2. Change the P,I values and process parameters and observe the change in trend, bar graph and mimics
   3. Attend the malfunction occurring in the plant then restoring to its design conditions.
   4. Practice the above exercise on the following modules given below using process simulator.
      a. Fractionation column for the distillation of binary mixture.
      b. Batch Reactor
      c. shell and tube Heat exchanger

d. Size reduction using Ball mill.
e. Level and flow control in different sizes of vessel
f. CSTR in series
g. Manufacture of urea in urea plant
h. Manufacture of cement in cement plant

Board Practical Examinations – Question Paper Pattern

Time : 3 Hrs Max.Marks : 75

- In board exam, the question consists of Part – A & Part – B
- Part – A should be either from chemical CAD or storage vessel design
- Part – B should be from the simulation of any one of exercises given in the syllabus.
- Marks should be allocated as 35 & 40 for Part – A & Part – B respectively.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN PETROCHEMICAL ENGINEERING

III YEAR

M SCHEME

VI SEMESTER

2015 – 2016 onwards

PROJECT WORK

CURRICULAM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN PETROCHEMICAL ENGINEERING
M-SCHEME

(to be Implemented for the student Admitted from the year 2015-2016 on wards)

Course Name : Diploma in Petrochemical Engineering (FT)

Subject Code : 37167

Semester : VI SEMESTER

Subject Title : PROJECT WORK

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15 Weeks

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

Objectives:

- To develop the creative talents in the students.
- The project work shou ld 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

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?

Equivalent paper:

Semester	Subject Code	L-SCHEME (Implementing academic year 2011-2012)	Subject Code	M-SCHEME (Implementing academic year 2016-2017)
III SEMESTER WITH EFFECT FROM OCT 16				
III	27131	Petroleum Refining	37131	Petroleum Refining
III	27032	Mechanical Engineering*	37032	Mechanical Engineering*
III	27033	Electrical and Electronics Engineering*	37033	Electrical and Electronics Engineering*
III	27034	Mechanical Engineering Practical*	37034	Mechanical Engineering Practical*
III	27035	Electrical and Electronics Engineering	37035	Electrical and Electronics Engineering
III	27136	Distillate Testing Practical - I	37136	Distillate Testing Practical- I
III	20001	Computer Applications Practical#	30001	Computer Applications Practical#
IV SEMESTER WITH EFFECT FROM APR 17				
IV	27041	Mechanical operations*	37041	Mechanical operations*
IV	27042	Fluid Mechanics*	37042	Momentum transfer*
IV	27143	Petrochemicals	37143	Basics of petrochemicals
IV	27044	Engineering Drawing*	37044	Engineering Drawing*
IV	27045	Mechanical operations Practical*	37045	Mechanical operations Practical*
IV	27046	Fluid Mechanics Practical*	37046	Momentum Transfer Practical*
IV	27047	Technical Analysis Practical	37047	Technical Analysis Practical
V SEMESTER WITH EFFECT FROM OCT 17				
V	27051	Heat Transfer*	37051	Heat Transfer*
V	27052	Principles of Chemical Engineering*	37052	Chemical process calculations*
V	27053	Process Instrumentation and Control*	37053	Process Instrumentation and Control*
V	27171	**Elective - I** 1. Petrochemicals	37171	**Elective - I** 1. Petrochemical Technology
	27172	2. Plastics Technology	37172	2. Natural Gas Engineering
V	27055	Chemical Process Measurement and Control Practical*	37055	Chemical Process Measurement and Control Practical*
V	37056	Heat Transfer Practical*	37056	Heat Transfer Practical*
V	20002	Communication and Life	30002	Life and Employability Skills Practical #
VI SEMESTER WITH EFFECT FROM APR 18				
VI	27161	Refinery Mass transfer	37161	Refinery Mass transfer
VI	27162	Processing of Chemicals	37162	Processing of Chemicals
VI	27181	**Elective - II** 1 Energy Resources and Safety Management	37181	**Elective - II** 1. Energy Resources and Safety Management
VI	27182	2. Industrial Ecology	37182	2. Environmental engineering
VI	27064	Mass Transfer Practical*	37064	Mass Transfer Practical*
VI	27165	Distillate Testing Practical - II	37165	Distillate Testing Practical - II
VI	27066	Chemical CAD Practical*	37066	Chemical CAD and Process Simulation Practical*
VI	27167	Project work #	37167	Project work #