1. COURSE DETAILS

Programme: Chemical Engineering	**Semester: V**
Course: # Inplant Training	**Group: A***
Course Code: IPT190625	**Duration: 26 Weeks**

2. EXAMINATION SCHEME

Course Name	Training Duration	Credits		Weekly Report	Quiz Test	Dissertation (Report)	Oral/ Viva	Total	Group (Gr)
# Inplant Training (IPT190625)	26 Weeks **	20	**Maximum Marks**	50	50	50	50	200	A*
			Minimum Marks	20	20	20	20	80	

****Total Inplant Training Duration 26 weeks equal to 24 weeks actual training plus 2 weeks examination and processing**

*Compulsory, # Award Winning, Weekly Report and Quiz Test are assessed by Internal Examiner Only, Dissertation and Oral/Viva are Assessed by Internal and External Examiner Jointly

Gr- Group, B - Basic, C - Core, A - Application, M – Management

3. COURSE OBJECTIVE: -

The inplant training facilitates students to understand the various domains of chemical industry along with work environment and the students are exposed to the latest developments in technologies. By exposing and interacting with the real-life chemical industry set up, student will appreciate and understand the actual working and best practices adopted in the chemical industry. This short association with industry will be instrumental in orienting the students in transforming them into chemical industry ready output after completion of diploma program.

4. SKILL COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.

- **Soft Skill including Communication, Presentation and liaising etc.**
- **Life skills including Time management, Safety, Innovation, Entrepreneurship, Team building etc.**
- **Hands-on including Reading Drawings and Design, Implementation and Quality Assurance aspects etc.**
- **Industry specific tools including Value Engineering, Concurrent Engineering etc.**

5. COURSE OUTCOMES(COs) At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME	Bloom's LEVEL
CO1	Communicate effectively (verbal as well as written) the work carried out.	Apply
CO2	Prepare and present the report of the work carried out.	Apply
CO3	Exercise time management and safety in the work environment.	Apply
CO4	Work in a team.	Apply
CO5	Demonstrate various quality assurance.	Apply
CO6	Interpret and solve routine technical problems through the application of engineering principles.	Apply

6. IMPLEMENTATION STRATEGY (PLANNING)

Students shall be sent for 24 weeks inplant training in the V semester. Students understand basic working of industry and its work culture. Students are made aware about industrial safety norms. Before the training begins, the students are addressed by the Principal about rules, safety precautions and discipline to be maintained in the company during the training. The same is reminded by the institute supervisor on every visit. The company supervisor also takes care about students' safety

In the initial weeks company personnel train, the students about their manufacturing process and products. The students are involved inplant operation, process engineering, design and drawings, use of software and similar work.

Each company is visited by the institute supervisor on regular basis till the end of in plant training. Each student is monitored for performance, any difficulty, grievances and absenteeism. Accordingly corrective and preventive actions are taken.

7. EVALUATION CRITERIA

Each student performance is assessed by a company supervisor and is recorded in weekly report. The same record is maintained and assessed by the institute supervisor. Depending on the grades given by the company supervisor and also by examining the performance in the weekly report, marks are given out of 50 by the institute supervisor. Considering their work profile in the company, institute supervisor gives 5 quiz tests each of 10 marks (consisting of five questions each) to the students. The same are assessed by institute supervisor. The training report submitted by a student is assessed together by internal and

external examiner and accordingly marks are given out of 50. Students presents the work done by them in the company and are examined by internal and external examiner together for 50 marks, constituting total 200 marks. These marks are converted to out of 100 marks for final evaluation (for award of diploma). The external examiner appointed for inplant training examination is from industry.

8. COURSE EXPERT COMMITTEE MEMBERS

SR.NO		NAME	SIGNATURE
1.	Internal	M. M. Belwalkar	
2.	Internal	R.D. Shimpi	
3.	internal	N.R.Nagose	
4.	External	Manish Tiwari	
		Organization: MPSTME	

SHRI BHAGUBHAI MAFATLAL POLYTECHNIC
MUMBAI 400 056.

1. COURSE DETAILS

Program: Chemical Engineering	**Semester: VI**
Course: #Process Instrumentation and Control	**Group: A***
Code:PIC190616	**Duration:16 Weeks**

2. TEACHINGAND EXAMINATIONSCHEME

Scheme of Instructions and Periods per Week					ExaminationSchemeandMaximumMarks							
Theory Hrs. L	Practical Hrs. P	Drawing Hrs. D	Tutorial Hrs. T	Credits (L+P+D+T)	Theory Paper Duration and marks(ESE)		SSL	TA	TH	TW	PR	OR	TOTAL
					Hours	Marks							
4	2	--	--	6	3	70	20	10	70	50	50	--	200

3. COURSE OBJECTIVE

Monitoring and control of processes is an important activity of chemical engineer. The student must be aware of principles as well as applications regarding instrumentation and process control.

4. SKILL COMPETENCY:

Aim of this course is to help the students to attain following industry identified competency through various teaching learning experiences:

Apply Relevant Instrumentation and Process Control Parameters in the Chemical Plant.

5. COURSE OUTCOMES(COs) At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME	Bloom's LEVEL
CO1	Identify measurement techniques for various process variables.	Remember, Understand
CO2	Select the instruments for measurement of process variables.	Understand, Apply
CO3	Identify various components of control system and their role.	Understand, Apply
CO4	Apply the basic principle of control action.	Apply

6. COURSE CONTENTS

Sr. No	Topic/Sub Topic	Hours	Marks	Cos
1.	**1.0 Introduction to instrumentation and process control** 1.1 Measurement and its aim 1.2 Functional elements of a measuring system 1.3 Characteristics of measuring system : Static characteristics Dynamic characteristics 1.4 Steady state and unsteady process 1.5 Block diagram of automatic control system and its components 1.6Introduction to DCS and simulation	06	08	CO1
2.	**2.0 Temperature :** 2.1 Temperature scales 2.2 Liquid and gas filled thermometers 2.3 Bimetallic thermometers 2.4 Resistance thermometers (R.T.D) and Thermisters 2.5 Pyrometers Radiation pyrometer Optical pyrometer 2.6 Thermocouple	09	10	CO2
3.	**3.0 Pressure :** 3.1 Elastic deformation elements 3.1.1 Bourdon pressure gauge 3.1.2 Bellows pressure gauge 3.1.3 Helix and capsule pressure gauge 3.2 Manometers 3.3 Measurement of differential pressure 3.4 Electrical pressure transducers 3.5 Measuring pressures in corrosive fluids 3.6 Bell gauges 3.7 Mcleod gauge, vacuum gauge, Pirani gauge	09	10	CO2
4.	**4.0 Flow, Level, Density, Viscosity, Composition Measurements** **Flow:** 4.1 Differential pressure meter such as venturi meter, orifice meter etc. 4.2 Variable meter such as rotameter, valve type meters Etc. 4.3 Positive displacement type flow meters 4.4 Velocity meter, mass flow meter, integrators etc. **Level : Direct level measurement :** 4.5 Bob and tape, sight glass, floats etc. indirect level measurement : 4.6Liquid head pressure type 4.7Air trap type, bubbler type 4.8Measure of level based on radio active source	14	14	CO2

Chapter	Contents	Hours	Marks	CO
	4.9Measure of level based on sound waves. **Instruments for measuring :** 4.10 Specific gravity 4.11 Viscosity 4.12 Electrolytic and thermal conductivity 4.13 Combustibility 4.14Component analysis (Gas Chromatography)			
5.	**5.0 Fundamentals of process control** 5.1 Study of first order systems 5.2 Study of second order system (only theoretical study) 5.3 Types of lags, Transfer function 5.4 Types of forcing functions (step, impulse, ramp) 5.5 Feedback and feedforward system *Servo and regulator systems* 5.6 P&I Diagram of CSTR, Heat exchanger, Distillation column	15	16	CO3
6.	**6.0 Control Actions and Control Valves** 6.1 Open loop and closed loop response 6.2 Control action – Definition, characteristics, Single mode action 6.2.1ON – OFF control 6.2.2Proportional control (P-action) 6.2.3 Integral control(I-action) 6.2.4 Derivative control (D-action) Two mode action-:P+I, P+D. Three mode action: P+I+D 6.2.5Comparison of various controllers based on control action. 6.2.6 Pneumatic controller circuits with amplifying Elements 6.2.7 Comparison of pneumatic controller and Electronic controller. 6.3Control valves 6.3.1Characteristics of linear and equal percentage valve 6.3.2Different types of valves and valve positioner 6.3.3 Valve selection and sizing	11	12	CO4
	Total	64	70	

7. LIST OF PRACTICALS/ASSIGNMENTS/EXERCISES/TUTORIALS/DRAWINGS

Term Workconsists of Journal containing minimum ten experiments/demonstration/ Assignments.

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approx.Hrs required	Cos
1	To study the components of Control System	02	CO4
2	To determine the Response of Mercury in Glass Thermometer	04	CO3
3	To determine the Response of Liquid Level Tank System	04	CO3
4	To determine the Response of U-Tube Manometer	04	CO3
5	To study measurement&calibration of Thermocouple	02	CO2
6	To study measurement&calibration ofBimetallic Thermometer	02	CO2
7	To study demonstration of Bourdon Tube	02	CO1
8	To study demonstration of Diaphragm Pressure Gauge	02	CO1
9	To find Co-efficient of Orifice meter	04	CO2
10	To measure level by Air Purge Method	04	CO2
11	To study demonstration of Optical Pyrometer	02	CO1
12	To plot Control Valve Characteristics	04	CO4
13	To study demonstration of Gas Liquid Chromatography	02	CO1
14	Calibration of Rotameter	02	CO2
	Total	40	

8. IMPLEMENTATION STRATEGY (PLANNING)

1.Teaching Plan/Tutorials
2. Minimum no of practical/assignments/demonstration etc.
3.Guest/Expert lecture
4.Presentation
5.Case Study
6. Self-learning online resources

9. LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Chemical Process Control: An Introduction to Theory and Practice	Stephanopoulos George	Pearson Education India; New Delhi, 2015, ISBN-13: 978-9333549463
2	Process System Analysis and Control	Coughanowr, Donald R.;LeBlanc, Steven E.	McGraw Hill International, New York
3	Industrial instrumentation and control	Singh,S.K.	McGraw hill, New Delhi,2010 ISBN-13: 978-0070678200
4	Fundamentals of industrial instrumentation	Barua,Alok	Wiley India Pvt. Ltd. New Delhi, 2011, ISBN-13 ; 978-8126528820
5	Industrial control and instrumentation	Bolton,W	Longman, New York, 1991 ISBN-13 : 978-0582068025
6	Instrumentation	Kirk,Franklyn W.; Weedon, Thomas A.: Kirk, Phillip	American Technical Pub; Orland Park, 2010, ISBN: 978-0826934307

10. WEB REFERENCES

1. https://nptel.ac.in/courses/103103037/1
2. https://ocw.mit.edu/courses/chemical-engineering/10-450-process-dynamics
3. https://textofvideo.nptel.iitm.ac.in/103105064/lec1.pdf
4. https://ww.engmatl.com/home/finsh/21-manufacturing/186-fundamentals-of-industrail-instrumentation-and-process-control
5. http://www.learnerstv.com/Free-Engineering-video-lectures-ltv689-page1.htm
6. http://www.freeengineeringbooks.com/chemical-books-download/process-dynamics-and-control-lecture-notes.php

11. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Sr. No.	TOPIC	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to instrumentation and process control	4	4	--	08
2	Temperature	3	3	4	10
3	Pressure	3	3	4	10
4	Flow, Level, Density, Viscosity, Composition Measurements	4	4	6	14
5	Fundamentals of process control	4	4	8	16
6	Control actions and control valves	--	6	6	12
	Total	18	24	28	70

R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

12. COURSE EXPERT COMMITTEE MEMBERS:

SR.NO		NAME	SIGNATURE
1.	Internal	Shri. M. M. Belwalkar	
2.	Internal	Shri. R.D. Shimpi	
3.	Internal	Shri. N.R.Nagose	
4.	External	Dr. Ramesh V	
		Organization: Ex Head, Chemical Department, DJSCE.	

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1. COURSE DETAILS

Programme: Chemical Engineering	**Semester: VI**
Course: #Mass Transfer Operation	**Group: A***
Course Code: MTO 190617	**Duration:16 Weeks**

2. TEACHING AND EXAMINATION SCHEME

Scheme of Instructions and Periods per Week					Examination Scheme and Maximum Marks								
Theory Hrs L	Practical Hrs P	Drawing Hrs D	Tutorial Hrs T	Credits (L+P+D+T)	Theory Paper Duration and marks(ESE)		SSL	TA	TH	TW	PR	OR	TOTAL
					Hours	Marks							
03	02	--	1	06	03	70	20	10	70	50	50	--	200

3. COURSE OBJECTIVE:

After study of Course the students will be able understand the mechanism of diffusion, operate and control various parameters related mass transfer equipment. They compare and select different mass transfer operations with respective to applications. They deal with equipment related to mass transfer operations like absorption, distillation, extraction, drying & crystallization. They will be able to handle the said equipment safely & effectively.

4. SKILL COMPETENCY:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

Safely use of chemical process plant equipment for mass transfer operation.

5. COURSE OUTCOMES(COs) At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME	Bloom's LEVEL
CO1	Apply the basic concept of Mass Transfer	Remember, Understand, Apply
CO2	Use gas absorption and extraction as a separation technique in process industries.	Remember, Understand, Apply
CO3	Use various distillation methods in process industries.	Understand, Apply
CO4	Select the dryer for required unit process.	Understand, Apply
CO5	Calculate the yield of crystals.	Understand, Apply

6. COURSE CONTENTS

Sr. No.	TOPIC/Sub-topic	Hours	Marks	Cos
1	**1.0 DIFFUSION** : 1.1 Introduction, Role of diffusion in mass transfer 1.2 Molecular diffusion, Fick`s law Steady state molecular diffusion 1.2.1. Diffusion of A through non diffusing B. 1.2.2.Equimolar diffusion 1.3 Diffusivity of gases, liquids and solids	04	08	CO1
2	**2.0MASS TRANSFER COEFFICIENTS** : 2.1 Introduction, Theory of Mass transfer, Film Theory, Penetration Theory, Surface renewal Theory 2.2 Interphase mass transfer 2.3 Local and overall mass transfer coefficients	04	06	CO1
3	**3.0 GAS ABSORPTION** : 3.1 Introduction, Characteristics of ideal liquid solutions. Choice of solvent for absorption 3.2 Concept of equilibrium, minimum liquid-gas ratio, material balance. 3.3Hydrodynamics of packed column: Loading and flooding of packed column 3.4 Concept of HETP, NTU and HTU. 3.5 Gas absorption Equipment: Mechanically agitated vessel, packed column, types of packing, Characteristics of packing, Channelling in packed column	06	08	CO2
4	**4.0 EXTRACTION :** 4.1 Introduction, Comparison between liquid-liquid extraction and Distillation 4.2 Selection of solvent, ternary system, Triangular diagram. 4.3 Extraction equipment- Stage wise contractors, mixer settlers, sieve tray, spray towers, packed towers, mechanically agitated tower, Rotating disc contactor.	06	08	CO2

5	**5.0 DISTILLATION** : 5.1 Concept of distillation, boiling point diagram, effect of pressure on boiling point diagram. 5.2 Raoults law, Henry's law, vapour liquid equilibrium diagram. 5.3 Calculation of vapour phase composition using relative volatility 5.4Methods of Distillation : Differential distillation & derivation of Rayleigh's equation. Equilibrium or flash distillation. 5.5Problems based on equilibrium & differential distillation. 5.6Rectification : Derivation of rectifying & stripping line equation, ideal plate calculation using Mcabe – Thiele method. 5.7 Effect of feed condition on slope of q-line, 5.8 Total, minimum and optimum reflux ratio. 5.9 Construction and comparison of packed & plate column 5.10 Azeotropes : Maximum boiling & minimum boiling azeotrope, 5.11Steam distillation.	16	24	CO3
6	**6.0 DRYING :** 6.1General principles, properties of air moisture mixture Moisture content on dry basis, wet basis, bound, unbound, Free, critical and equilibrium moisture content 6.2 Rate of batch drying, drying curve- constant rate & falling rate period ,total time of drying & problems based on the same. 6.3 Mechanism of batch drying, Classification : Direct Dryer indirect dryer. 6.4 Tray drier, rotary drier drum drier, spray drier. Fluidized bed driers	06	08	CO4
7	**7.0 Crystallization:** 7.1Concept of crystallization, mechanism, saturation, super Saturation, solubility curves 7.2 Method of super saturation, Mier's super saturation theory 7.3 Crystallization equipment: Agitated tank crystallizer, vacuum Crystallizer, Oslo crystallizer and Swenson-Walker crystallizer 7.4 Material balance, numerical based on % yield and % recovery	06	08	CO5
	TOTAL	48	70	

7. LIST OF PRACTICALS/ASSIGNMENTS/EXERCISES/TUTORIALS/DRAWINGS

Term Work consists of Journal containing minimum 10no of experiments/Assignments:

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approx.Hrs required	COs
1.	To find rate of drying under atmospheric pressure/ vacuum.	04	CO4
2	To separate a binary mixture by simple distillation.	04	CO3
3	Study of different types of packing.	02	CO3
4	Hydrodynamics in packed tower-study a)Flooding point b)Loading point	04	CO2
5	To find NTU by using absorption column	04	CO2
6	To find distribution coefficient for liquid system.	02	CO2
7	Liquid-Liquid extraction byPacked Tower	02	CO2
8	Liquid-Liquid extraction bySpray Tower	02	CO2
9	To determine diffusivity of vapour of volatile liquid in air.	02	CO1
10	To plot binodal curve ternary system	02	CO2
11	Study of different types of plate column	02	CO3
12	Draw solubility and supersolublity curve	02	CO5
	Total	32	

List of Tutorials

Sr. No.	Title of Tutorial (any eight)	Approx.Hrs required	COs
	Total	16	
1	Tutorial on diffusion, one component diffusing through stagnant layer, equimolal counter current diffusion	2	CO1
2	Tutorial on mass transfer coefficient.	2	CO1
3	Tutorial on percentage recovery of solute in gas absorption	2	CO2
4	Tutorial on minimum solvent requirement in gas absorption	2	CO2
5	Tutorial on simple distillation, flash distillation	2	CO3
6	Tutorial on rectification.	2	CO3
7	*Tutorial on Extraction*	2	CO2
8	Tutorial on drying.	2	CO4
9	Tutorial on crystallization	2	CO5

8. IMPLEMENTATION STRATEGY (PLANNING)

1.Teaching Plan/Tutorials
2. Minimum no of practical/assignments/drawings etc.
3.Guest/Expert lecture
4.Presentation
5. Online learning resources.

9. LEARNING RESOURCES

Sr.No.	Title of Book	Author	Publication
1	Unit operations of chemical engineering	McCabe, W.L.Smith Harriott	McgrawHill Inc. New York
2	Mass Transfer Operations	Robert E. Treybal	McgrawHill Inc. New York
3	Chemical Engineering Series	J.M. Coulson J.F. Richardson	Pergomon Press Oxford
4	Mass Transfer Principals and Operations	A.P.Sinha Parameswar De	Prentice Hall of India

10. WEB REFERENCES :

1. www.nptel.ac.in
2. **www.che.utah.edu**
3. **www.chemguide.co.uk>physical>basicrates>orders**
4. **www.chemguide.co.uk/physical/catalysis/introduction.html**
5. **https://www.britannica.com/science>catalyst**

11. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Sr. No.	TOPIC	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Diffusion	04	04	--	08
2	Mass transfer coefficients	02	04	--	06
3	Gas absorption	02	--	06	08
4	Extraction	--	04	04	08
5	Distillation	04	06	14	24
6	Drying	02	02	04	08
7	Crystallization	02	02	04	08
	Total	**16**	**22**	**32**	**70**

R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

12. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.		NAME	SIGNATURE
1	Internal	Shri.R.D. Shimpi	
2	Internal	Shri.Nilesh R Nagose	
3	Internal	Mrs. J S Sangle	
4	External	Dr. Anita Sharma	
		Organisation: V.J.T.I, Matunga, Mumbai	

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1. COURSEDETAILS

Programme: Chemical Engineering **Course: #Project** **Course Code:PRO190618**	**Semester: VI** **Group: A*** **Duration:16 Weeks**

2. TEACHING AND EXAMINATION SCHEME

Scheme of Instructions and Periods per					Examination Scheme and Maximum Marks								
Theory Hrs L	Practical Hrs P	Drawing Hrs D	Tutorial Hrs T	Credits (L+P+D+T)	Theory Paper Duration and marks(ESE)		SSL	TA	TH	TW	PR	OR	TOTAL
					Hours	Marks							
--	06	--	--	06	--	--	--	--	--	50	--	50	100

3. COURSE OBJECTIVE

The diploma students as a technician must be able to solve the problems at the shop floor. The project work cultivate the systematic methodology for problem analyzing & solving using acquired technical knowledge which also exhibit their ability to work in a team, develop planning, & execute skills.

4. SKILL COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences

- **Plan innovative/creative solutions independently and/or collaboratively to integrate various competencies acquired during the semesters to solve/complete the identified problems/task/shortcomings faced by industry/user related to the concerned occupation.**
- **Solve the identified problem/task faced by industry/user related to the concerned occupation by integrating the various types of skills acquired during the programme.**

5. COURSE OUTCOMES(COs) At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME	Bloom's LEVEL
CO1	Write the problem/task specification related to the process industries	Remember, Understand
CO2	Select, collect and use required information/knowledge to solve the problem/complete the task.	Remember, Understand, Apply
CO3	Assess the impact of the project on society and environment	Remember, Understand, Apply
CO4	Prepare 'project proposals' with action plan and time duration before beginning of project and technical project report after the performing.	Remember, Understand, Apply
CO5	Communicate effectively and confidently as a member and leader of team.	Apply

6. Identification of projects and allocation methodology to faculty members and relevance of the projects and their contribution towards attainments of PO's

The knowledge gained by studying various Courses separately utilized as a single task. The topic could be on plant design, specific equipment, process development, manufacturing process, live industrial problem etc. The project work involves experimental / theoretical / computational work. It is expected to do necessary literature survey by referring current journals belonging to chemical engineering, reference books & internet.

The department Head /Incharge/ Co-ordinator will form the balanced groups of maximum four students per group. The project groups are formed, project topics are identified based on the group potential, feasibility, availability of time, cost and project guides are assigned in preceding semester.

A brief synopsis of the project to be submitted to the HOD & guide. The synopsis should include project title, aim, block diagram, list of components required, & brief working whichever necessary. The students should make sure that all the requisites are available in the local market.

Student can select any one problem/project work from following categories.

a) Literature survey based projects: Project related with collection tabulation, classification, analysis & presentation of the information. Topic selected must be related with latest technological developments, and should not be a part of diploma curriculum. Report should be of min 60 pages.

b) Industry sponsored projects- project related with solving the problems identified by industry should be selected. One person / engineer from industry is expected to work as co-guide along with guide from institution

c) Design & fabrication of mechanisms, machines, Devices, etc. Report involving aspects of designing & fabricating should be prepared & submitted.

d) Maintenance based projects: The institute may have some machine/ equipment/ system which need upgrading . Students may select the specific machines/equipment/system. Upgrade it. The systematic procedure for maintenance to be followed and the report of the activity be submitted.

e) Environmental management systems projects: Projects related with pollution control, Solid waste management, liquid waste management, Industrial hygiene, etc, Working model or case study should be undertaken.

f) Project can be selected other than the area specified above. Project should provide viable and feasible solution to the problem identified.

Based on above criteria and relevance to contribution towards attainment of POs, the project topics are finalized group-wise and groups are allocated to faculties based on their area of expertise.

7 Process for monitoring and evaluation, process to assess individual and team performance

i. The students are asked to prepare and submit synopsis and detail implementation plan of 16 weeks to their respective guides.
ii. Interaction between students and project guide to discuss implementation methodology.
iii. The project guide monitors the progress of implementation on continuous basis.
iv. Final evaluation of project by examiners through presentation, demonstration and viva-voice.

8. Methodology to assess individual/collective contribution/understanding:

a. Internal evaluation (50 marks) by project guide.

Project Evaluation:

Phase	Marks
Phase I Synopsis Approval Topic Relevance Topic Objective	 5 5 5
Phase II Topic Outcome Methodology Mid Review	 5 5 5
Phase III Report Submission Approval of Presentation	 10 10

b. External evaluation (50 marks) by expert from industry/institute (external examiner)

The students demonstrate the prototype/ working projects and give power point presentation in front of external examiner. Internal and external examiners evaluate the student on the following aspects:

a) Understanding and completeness of the Project
b) Approach to the solution of problem
c) Planning and implementation
d) Design and testing procedure
e) Project Report
f) Students' involvement in the Project

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9 COURSE EXPERT COMMITTEE MEMBERS

Sr. No.		NAME	SIGNATURE
1	Internal	Shri. R.D. Shimpi	
2	Internal	Shri.Nilesh R Nagose	
3	Internal	Mrs. J S Sangle	
4	External	Shri Burzin Sarbhanwala Organization: Vice President-Property Risk Management &VAS ICICI Lombard General Insurance Company Ltd, Prabhadevi, Mumbai-25	

1. COURSE DETAILS

Program: Chemical Engineering **Course: Petroleum Refining & Petrochemicals** **Code:PRP190619**	**Semester: VI** **Group:A*** **Duration:16 Weeks**

1. TEACHING AND EXAMINATION SCHEME

Scheme of Instructions and Periods per Week					Examination Scheme and Maximum Marks								
Theory Hrs. L	Practical Hrs. P	Drawing Hrs. D	Tutorial Hrs. T	Credits (L+P+D+T)	Theory Paper Duration and marks(ESE)		SSL	TA	TH	TW	PR	OR	TOTAL
					Hours	Marks							
4	2	--	--	6	3	70	20	10	70	50	--	--	150

2. COURSE OBJECTIVE

To study of various petroleum products, important tests and refinery operations, also to provide manufacturing processes of various petrochemicals.

3. SKILL COMPETENCY:

Aim of this course is to help the students to attain following industry identified competency through various teaching learning experiences:

Identify quality of various petroleum products by various testing methods.

4. COURSE OUTCOMES(COs) At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME	Bloom's LEVEL
CO1	Classify various types of petroleum products and their important properties.	Remember, Understand
CO2	Use various petroleum refining operations.	Understand, Apply
CO3	Classify various petrochemicals and safety aspects.	Understand, Apply
CO4	Select the raw material, reaction, process condition and manufacturing process of typical petrochemicals.	Understand, Apply

5. COURSE CONTENTS

Sr No	Topic/Sub topic	Hours	Marks	COs
1.	**Introduction to Petroleum Refining** 1.1Indian Petroleum Industry overview 1.2 Origin of petroleum 1.3 Composition of petroleum 1.4 Characteristics of crude, Desalting of crude 1.5 Exploration Methods, Scientific methods for petroleum survey, Rotary drilling Rigs 1.6 Flow sheet of overall Refinery operations.	09	10	CO1
2.	**Refining and testing :** 2.1 Fractional distillation of crude oil. 2.2 Products of fractional distillation of crude oil, theirproperties, uses and their boiling ranges. 2.3 Refinery product characteristics, Flash point, fire point, Smoke point, pour point, Cloud point, Viscosity Index, aniline point,Diesel index, octane number and anti-knocking agent	09	10	CO1
3.	**Unit processes in Refineries** 3.1 Types of Cracking 3.2 Thermal cracking – Coking, visbreaking 3.3 Catalytic cracking - Fluidized bed Catalytic Cracking 3.4 Comparison between thermal and Catalytic cracking 3.5Hydrocracking, Reforming, Isomerization 3.6 Alkylation – Hydrofluoric acid process, Sulphuric acid process, Comparison, Polymerization	20	22	CO2
4.	***Overview of petrochemicals*** 4.1 Petrochemicals from methane 4.2 Petrochemicals from ethylene 4.3 Petrochemicals from propylene 4.4 Petrochemicals from BTX	*03*	*03*	CO3
5.	**C1, C2 ,C3,C4 Petrochemicals and Aromatics** 5.1 Naphtha steam cracking 5.2 C1- Methanol, Formaldehyde, Chloromethanes 5.3C2– Vinyl chloride 5.4 C3 –Acrylonitrile, Isopropanol, Acetone 5.5 C4 –Butyl alcohol from butane, oxo Process. 5.6Aromatics – Cumene, Phenol	20	22	CO4
6.	**Hazards and safety** 6.1 Hazards associated in petrochemical industry *6.2 Safety in petrochemical industry.*	03	03	CO3
		64	70	

6. LIST OF PRACTICALS/ASSIGNMENTS

Term Work consists of Journal containing minimum Ten no of experiments/ Demonstration/Assignments.

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approx.Hrs required	Cos
1	To determine the viscosity and viscosity Index of given oil at different temperatures with the help of Redwood viscometer.	04	CO1
2	To determine the flash point by Pensky Martin apparatus	04	CO1
3	To determine Flash point by Abel's apparatus	04	CO1
4	To determine aniline point and Diesel Index of a given sample	04	CO2
5	Preparation of sodium Citrate	02	CO3
6	Preparation of Nitrobenzene	02	CO4
7	Preparation of m-di nitrobenzene	04	CO4
8	Preparation of Aniline	04	CO4
9	Preparation of Picric acid	04	CO3
10	To determine Pour point and cloud point of given sample.	04	CO1
11	To determine smoke point of given sample.	02	CO1
12	ASTM distillation of given sample.	04	CO2
13	Assignment on Petroleum refining	--	CO1
14	Assignment on Petro chemicals	--	CO3
	Total	42	

7. IMPLEMENTATION STRATEGY (PLANNING)

Manufacturing processes should be explained with flow chart. Uses of each product should be mentioned.

1.Teaching Plan/Tutorials
2. Minimum no of practical/assignments/Demonstration.
3.Guest/Expert lecture
4.Presentation
5.Case Study
6.Online learning resources.

8. LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Petroleum Refining	James Garry	Marcel Dekker,Inc
2	Modern Petroleum Refining Processes	Bhaskara Rao	Oxford & IBH Refining Processes Publishing Co Pvt.
3	Petrochemicals	Peter Wiseman	John Wiley & Sons, New York
4	Shreve"s Chemical process Industries	George .T. Austin	McGraw HillPublications
5	Handbook of petrochemicals and processes	G.Marganet Wells	Gower Publishing

9. WEB REFERENCES

1 www.nptel.ac.in
2 https://en.wikipedia.org/wiki/Petroleum_refining_processes
3 https://www.sciencedirect.com/topics/chemistry/petroleum-refining
4 https://mopng.gov.in/en
5 http://chemicals.nic.in/

10. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Sr. No.	TOPIC	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Petroleum Refining	6	4	--	10
2	Refining and testing	--	4	6	10
3	Unit processes in Refineries	4	8	10	22
4	Overview of petrochemicals	3	--	--	03
5	C1, C2 ,C3,C4 Petrochemicals and Aromatics	--	10	12	22
6	Hazards and safety	--	--	3	03
	Total	13	26	31	70

R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

11. COURSE EXPERT COMMITTEE MEMBERS:

SR.NO		NAME	SIGNATURE
1.	Internal	Shri.M. M. Belwalkar	
2.	Internal	Shri. R.D. Shimpi	
3.	internal	Mrs. J.S.Sangle	
4.	External	Ms Nishita Parekh	
		Organization: MPSTME, Vile Parle	

SHRI BHAGUBHAI MAFATLAL POLYTECHNIC MUMBAI 400 056.

1. COURSE DETAILS

Program: Chemical Engineering	**Semester:VI**
Course: # Computer Aided Drafting, Design and Estimation (CADD & Estimation)	**Group: A***
Course Code:CAD190620	**Duration:16 Weeks**

2. TEACHING AND EXAMINATION SCHEME

Scheme of Instructions and Periods per Week					Examination Scheme and Maximum Marks								
Theory Hrs L	Practical Hrs P	Drawing Hrs D	Tutorial Hrs T	Credits (L+P+D+T)	Theory Paper Duration and marks(ESE)		SSL	TA	TH	TW	PR	OR	TOTAL
					Hours	Marks							
2	4	-	-	6	03	70	20	10	70	50	50	-	200

3. COURSE OBJECTIVE

With the development of various software programs for engineering field the requirement to learn the computer aided graphics, designs and drafting software AUTOCAD, simulation software has been emphasized to be compulsory.

This subject deals with learning design and drafting of engineering and equipment drawing with the help of AutoCAD. It also covers basic features of various process and piping layouts prepared on AutoCAD. Students will also familiarizes with assembly drawing of major plant equipments, their mechanical design and cost estimation.

4. SKILL COMPETENCY

The aim of this course is to help students to attend the following industry identified competency through various teaching learning experiences:

Prepare the basic Engineering documents according to process requirement.

5. COURSE OUTCOMES(COs) At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME	Bloom's LEVEL
CO1	Choose basic drafting commands in AutoCAD	Apply
CO2	Prepare PFD, P & ID, Equipment layouts, Tank-farms & plant layout for the given process.	Apply
CO3	Identify the process parameter of equipment's for process plant.	Remember
CO4	Estimate BOM for heat exchanger & reaction vessels by using assembly drawing.	Apply
CO5	Estimate the cost of the given objects	Apply

6. COURSE CONTENTS

Sr. No.	TOPIC/Sub-topic	Hours	Marks	COs
1	**1.0 Introduction to Computer Aided Design & Drafting** 1.1 Fundamentals of AutoCAD and use of AutoCAD as a design and drafting tool 1.2 Familiarization of commands of drawing editor and selection of AutoCAD menu 1.3 All basic DRAW, DISPLAY, EDIT, INQUIRY and BLOCK commands. 1.4 OBJECT SNAP MODES in AutoCAD commands. 1.5 Configuration of AutoCAD	03	07	CO1
2	**2.0 Creating a drawing, setting up work areas:** 2.1 Organizing information with layers. 2.2 Setting commands and 3D commands for drawing graphs, 2D and 3D views. 2.3 Labelling and dimensioning of drawing. 2.4 Various attribute commands – ATTDEF, ATTDISP, ATTEDIT and ATTEXT.	02	04	CO1
3	**3.0 Block Diagram & Process Flow Diagram, Utility line Diagram,** 3.1 IS-3232, 1976, symbols for pipelines, valves, pumps, compressor, Heating or cooling arrangements, furnace and boilers, process vessels, storage vessels, driers, separators, filters, centrifuges, mixers, conveyors, and miscellaneous 3.2 Block Diagram, Detailed process flow diagram 3.3 Introduction to utility line diagram (ULD) and use of ULD in piping engineering. 3.4 Service fluid code for piping (IS-9446- 1980), 3.5 Utility Block Diagrams 3.6 Line identification & Numbering.	05	12	CO2
4	**4.0 P& ID, Equipment Layout, Tank Farm and, Plant layout.** 4.1 P& ID`s for various plant equipment 4.2 P&ID`s of various temperature, pressure and level Controls of columns, reactors, etc. 4.3 P&ID layout drawing of a chemical plant 4.4 Introduction to Equipment layout & Tank farm 4.5 Introduction to Plant layout	06	12	CO2
5	**5.0 Assembly Drawing of major plant equipment:** 5.1 Assembly drawing of – (a) heat exchanger (shell and tube type) (b) reaction vessel 5.2 Bill of material (BOM) , specifications and estimation of the above equipment.	02	08	CO4

6	**6.0 Process Design of basic equipment.** 6.1 Heat Exchanger (shell and tube) 6.2 Distillation column	08	15	CO3
7	**7.0 Cost Estimation:** 7.1 Aims and objectives of cost accounting, elements and classifications of costs, purpose and function of estimating, constituents of a job estimation and estimating procedures. 7.2 Mensuration, Determination of volume, total weight, surface area of fabricated equipment	06	12	CO5
	TOTAL	32	70	

7. LIST OF PRACTICALS/ASSIGNMENTS/DRAWINGS

Term Work consists of Journal containing minimum no. of 12 experiments (AutoCAD software)/Assignments/Drawings/Demonstration

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approx.Hrs required	COs
1	DRAW : Line, Circle, Arc, Text, Dtext, Pline etc	06	CO1
2	DISPLAY : Attdisp, Dview, pan, plan, Redraw, Redrawall, Regen, Regenall, Regenauto, View, Zoom Etc.	06	CO1
3	EDIT : Arrary, Attedit, Break, Chamfer, Change, Copy, Divide, Erase, Explode, Extend, Fillet, Move, Mirror, Measure, Oops, Offset, Rotate, Select, Scale, Stretch, Trim etc	06	CO1
4	BLOCKS :Attdef, Base, Block, Insert, MINSERT, Wblock etc	06	CO1
5	OSNAP :CENter, ENDpoint, INsertion, INTersection, Apparent Intersection, MIDpoint, NEArest, NODE, NONE, PER pendicular, QUICK, QUADrant, TANgent etc	06	CO1
6	3D command: Addition, subtraction, Extrusion, 3D view	04	CO1
7	To prepare Block Diagram and PFD of a Chemical Process Plant on AutoCAD	04	CO2
8	To prepare layout of PFD Symbols (IS-3232) on AutoCAD	04	CO2
9	To prepare detailed PFD on AutoCAD.	04	CO2
10	To prepare ULD on AutoCAD.	04	CO2
11	To study basic features of P&ID`s prepared on AutoCAD	04	CO2
12	To prepare Equipment layout & Tankfarm layout drawing on AutoCAD.	04	CO2
13	To prepare plant layout of a chemical process plant on AutoCAD.	04	CO2
14	Assembly drawings of reaction vessel and heat exchanger.	04	CO4
15	Preparation of BOM and cost estimation of the unit operation	04	CO5
16	Design of heat exchanger/evaporator/Reactor/distillation column using simulation software	06	CO3
17	Demonstration of Piping software use in process industry.	04	CO1
	Total	80	

8. IMPLEMENTATION STRATEGY (PLANNING)

1. Each student should be given to practice AutoCAD software independently.
2. In addition student should be taught to make actual drawings using drafting tools.
3. Drawings prepared by hand and on AutoCAD have to be evaluated by the teacher on completion.
4. All topics should be covered as per lesson plan.
5. Guest/Expert Lecture
6. Online learning resources

9. LEARNING RESOURCES

Sr.No.	Title of Book	Author	Publication
1	Inside AutoCAD	D. Raker H. Rice	BPB Publication, New Delhi
2	Mastering AutoCAD	Omura	Tech, Publication, Singapore
3	Process equipment design	M.V. Joshi	McMillan India Ltd.,
4	A textbook of estimating & costing Mechanical	J.S, Charaya& G.S. Narang	Satya Prakashan, New Delhi
5	Mechanical Estimating & Costing	Sharma S.C. Banga T.R.	Khanna Publisher, New Delhi
6	Conceptual Design of chemical process	James Dougles	McGraw-Hill Chemical Engineering Series

10. WEB REFERENCES

1. www.nptel.ac.in
2. https://swayam.gov.in/

11. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Sr. No.	TOPIC	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Computer Aided Design & Drafting	-	03	04	07
2	Creating a drawing, setting up work areas	02	-	02	04
3	Block Diagram & Process Flow Diagram, Utility line Diagram	04	04	04	12
4	P& ID, Equipment Layout, Tank Farm and, Plant layout	-	04	08	12
5	Assembly Drawing of major plant equipment	-	04	04	08
6	Process Design of basic equipment	03	04	08	15
7	Cost Estimation	03	03	06	12
	Total	12	22	36	70

R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

12. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.	FACULTY	NAME	SIGNATURE
1	Internal	Mr. Nilesh R. Nagose	
2	Internal	Mr. Milind M. Belwalker	
3	Internal	Mrs. Jyoti S. Sangle	
4	External	Shri Burzin Sarbhanwala Organization: Vice President-Property Risk Management &VAS ICICI Lombard General Insurance Company Ltd, Prabhadevi, Mumbai-25	

SHRI BHAGUBHAI MAFATLAL POLYTECHNIC ★ MUMBAI 400 056.

1. COURSE DETAILS

Program: Chemical Engineering	**Semester:VI**
Course: #Piping in Chemical Engineering	**Group: A***
Course Code: PCE 190621	**Duration:16 Weeks**

2. TEACHING AND EXAMINATION SCHEME

Scheme of Instructions and Periods per Week					Examination Scheme and Maximum Marks								
Theory Hrs L	Practical Hrs P	Drawing Hrs D	Tutorial Hrs T	Credits (L+P+D +T)	Theory Paper Duration and marks(ESE)		SSL	TA	TH	TW	PR	OR	TOTAL
					Hours	Marks							
02	04	-	-	06	03	70	20	10	70	50	50	-	200

3. COURSE OBJECTIVE

The design engineering and construction of process plants involves a multidisciplinary team effort. Plant layout and design of piping systems constitutes a major part of the design and engineering effort. The objective of this course is to provide the students the basic knowledge and skills in discipline of piping engineering includes Pipe sizing, material selection, Leak testing and piping drawing.

4. SKILL COMPETENCY

The aim of this course is to help students to attend the following industry identified competency through various teaching learning experiences:

Maintain piping system for trouble free functioning in chemical Plant.

5. COURSE OUTCOMES(COs) At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME	Bloom's LEVEL
CO1	Identify the relevant pipes for various chemical processes as per standard	Remember, Apply
CO2	Select significant material of pipe for various chemical processes.	Remember, Apply
CO3	Choose relevant insulation material and accessory for piping system	Apply
CO4	Identify relevant leak testing and heat tracing methods for various chemical processes.	Apply
CO5	Interpret piping drawing for maintenance.	Understand, Apply

6. COURSE CONTENTS

Sr. No.	TOPIC/Sub-topic	Hours	Marks	COs
1	**PIPING FUNDAMENTALS** 1.1 Introduction to piping: Pipe, classification of pipe. 1.2 Pipe size, pipe wall thickness, schedule number. 1.3 Standards referred by piping engineer: API, ASME, BS, IS. 1.4 Fundamentals of design codes and selection criteria for piping. 1.5 Color coding of piping as per types of fluid passing through pipes (IS 2379:1990).	05	12	CO1
2	**PIPING MATERIAL, PROPERTIES AND GASKET.** 2.1 Selection of material for piping 2.2 Material properties of piping: – Chemical Properties. – Mechanical Properties: Modulus of elasticity, yield strength, elongation and reduction of areas, hardness, toughness. – Physical Properties: Density, thermal conductivity, thermal expansion, specific heat. 2.3 Metallic Material: Ferrous metals, Cast Iron, Steel, Copper and alloys, aluminum and alloys. 2.4 Gaskets: Functions and properties, types of gasket and their selection.	05	12	CO2
3.	**PIPING INSULATION** 3.1 Design parameters of insulation system design for piping, Service types for insulation design. 3.2 Critical thickness of insulation, estimating thickness of insulation, optimum thickness of insulation. 3.3 Insulation materials: Calcium silicate, cellular glass, Fiberglass And mineral wool, Phenolic foam, Polyurethane foam. 3.4 Accessory materials for Insulation: Acrylic latex mastic, Aluminum jacketing, Aluminum banding, FRP jacketing, Stainless steel jacketing, Mesh fabric. 3.5 Heat loss through insulation.	06	12	CO3

4.	**PIPING INSTALLATION, LEAK TESTING AND HEAT TRACING** 4.1 Piping Installation: Installation Drawings, Erection Planning, Cold spring, Joint alignment. 4.2 Leak testing: Methods of leak testing, Hydrostatic, Pneumatic, Vacuum and static head testing. 4.3 Heat Tracing: Types of heat tracing system, Steam tracing, Self-regulating heater, skin effect, Impendence heat tracing and Induction heating. Selection criteria for tracing system.	07	14	CO4
5	**PIPING DRAWINGS** 5.1 Information sources for piping arrangement drawings, layout procedure. 5.2 Pipe rack spacing and rack drawing organization. 5.3 Drawing formals – Single line drawings. – Double line drawings. 5.4 Piping Isometric drawing: – Isometric piping symbols. – Isometric dimension and text callouts' – Isometric offset	09	20	CO5
	TOTAL	32	70	

7. LIST OF PRACTICALS/ASSIGNMENTS

Term work consist of journal containing minimum 12 Experiments/assignment/ demonstration /Drawing

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approximate hrs. required	COs
1	Identify the different types of Pipes, Joints, Washers and related accessories used in chemical engineering Plants	04	CO1
2	*Describe the condition of given type of pipes and joints*	04	CO1
3	Determine the fluid velocity for given pipe size for different flow rate	04	CO1
4	Describe with sketches the condition of given gaskets	04	CO2
5	Use the drafting software to draw the sectional view of given pipe with insulation	04	CO3
6	Determine the heat loss from hot/cold insulation on pipe(s)	04	CO3
7	Describe with sketches the condition of the given steam tracing system.	04	CO4
8	Describe with sketches the conditions of the given self regulating parallel resistance heat tracer.	04	CO4

9	Perform the leak test to determine the pressure drop in straight pipe.	04	CO4
10	Use the drafting software to draw the given piping line symbol.	06	CO5
11	Use the drafting software to draw the pipe rack column spacing	06	CO5
12	Use the drafting software to draw the component of given pump suction and discharge piping system	06	CO5
13	Use the drafting software to draw the piping isometric symbols.	06	CO5
14	Use the drafting software to draw the piping isometric of given system.	06	CO5
15	Use the drafting software to draw the plant layout of given system.	06	CO5
16	Use the drafting software to draw the piping general arrangement of given system.	06	CO5
17	Use the drafting software to draw the single line drawing for given system	06	CO5
18	Use the drafting software to draw the double line drawing for given system	06	CO5
	Total	90	

8. IMPLEMENTATION STRATEGY (PLANNING)

1. Teaching Plan/Tutorials
2. Assignments
3. Guest/Expert lecture
4. 3D piping software
5. Presentation
6. *Online learning resources*

9. LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Piping Handbook	Mohinder L. Nayyar	McGraw Hill; Seventh Edition 2000, ISBN -10: 0070471061
2	Process Plant Layout and Piping Design	Ed Bausbacher; Roger Hunt	PTR Prentice Hall Inc, 1993 ISBN : 0131386298
3	Pipe Drafting and Design	Roy A. Parisher, *Robert A. Rhea*	Gulf professional Publishing, ISBN: *0-7506-7439-3*
4	Indian Standard 2379:1990	Indian Standard	Bureau of Indian Standards, 1991
5	ASME code of Power Piping, B31.3	ASME	ASME B31.1,2004
6	ASME code of Process Piping, B31.3	ASME	ASME B31.3,2004

10. WEB REFERENCES

1. https://www.scribd.com/doc/185356810/Codes-Standards-for-Natural-Gas
2. Thermal Insulation Handbook, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjr9oSD1qrwAhUzzzgGHXcnAg8QFjAAegQIAxAD&url=https%3A%2F%2Fwww.tipsasa.co.za%2Fwp-content%2Fuploads%2F2019%2F08%2FTIPS-Notebook-2018.pdf&usg=AOvVaw31UCw6IUTFq3fPtGqAn-vy
3. Piping and Equipment Insulation, http://www.standard.no/pagefiles/1094/r-004.pdf
4. Single line and double line diagramhttp://www.wermac.org/documents/coordination_part3.html

11. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Sr. No.	TOPIC	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Piping fundamentals	04	04	04	12
2	Piping material, properties and gasket	04	04	04	12
3	Piping insulation	02	06	04	12
4	Piping installation, leak testing and *heat Tracing*	02	02	10	14
5	Piping drawings	04	06	10	20
	Total	16	22	32	70

R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

12. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.	FACULTY	NAME	SIGNATURE
1	Internal	Mr. Nilesh R. Nagose	
2	Internal	Mr. Milind M. Belwalker	
3	Internal	Mrs. Jyoti S. Sangle	
4	External	Shri Shashikant Teli	
		Organization: General Manager (Piping Engg Dept), Worley Parson, Andheri	

SHRI BHAGUBHAI MAFATLAL POLYTECHNIC MUMBAI 400 056.

1. COURSE DETAILS

Program: Chemical Engineering	**Semester: VI**
Course: Numerical Methods in Chemical Engineering	**Group: A**
Course Code: NMC190622	**Duration: 16 Weeks**

2. TEACHING AND EXAMINATION SCHEME

Scheme of Instructions and Periods per Week					Examination Scheme and Maximum Marks								
Theory Hrs L	Practical Hrs P	Drawing Hrs D	Tutorial Hrs T	Credits (L+P+D+T)	Theory Paper Duration and marks(ESE)		SSL	TA	TH	TW	PR	OR	TOTAL
					Hours	Marks							
03	-	-	01	04	03	70	20	10	70	25	-	-	125

3. COURSE OBJECTIVE

After studying this course, students will be able to solve the problems of Linear and Non-Linear equation, Data interpolation, Numerical integration and differential equation using Numerical analysis software and computer facilities. This will help students to solve and analyse the problems in chemical engineering.

4. SKILL COMPETENCY

The aim of this course is to help students to attend the following industry identified competency through various teaching learning experiences:

Apply Numerical Method to solve the basic chemical Engineering problems.

5. COURSE OUTCOMES(COs) At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME	Bloom's LEVEL
CO1	Use Scilab/Matlab/Python to visualize the data and solve problems.	Understand, Apply
CO2	Apply Numerical methods to solve linear system and non-linear system equations in chemical Processes.	Understand, Apply
CO3	Calculate Numerical Integration applying the Trapezoidal Rule, Simpson's Rule used in Chemical processes.	Apply
CO4	Apply Numerical methods for data interpolation chemical Processes.	Apply
CO5	Select Numerical Methods to solve ordinary differential equation related to chemical processes.	Remember, Apply

6. COURSE CONTENTS

Sr. No.	TOPIC/sub-topic	Hours	Marks	COs
1	**Introduction to Scilab/Matlab/Python** 1.1. Installation and running. 1.2. Variables, lists, tuples and arrays 1.3. Conditional statements 1.4. Iterative loops 1.5. Functions 1.6. Plotting graphs	12	17	CO1
2	**Solution of Linear Equations** 2.1 Gaussian Elimination 2.2 Jacobi Iteration 2.3 Gauss-Seidel Iteration 2.4 Applications in linear mass balances etc.	6	9	CO2
3	**Nonlinear Equations** 3.1. Newton's Method 3.2. Successive Substitution 3.3. Applications to EOS, friction factor etc.	6	9	CO2
4	**Interpolation** 4.1. Concept of least squares 4.2. Polynomial fitting by least squares 4.3. Lagrangian interpolation 4.4. Applications in experimental data	6	9	CO4
5	**Numerical Integration** 5.1. Simpsons Rule 5.2. Gaussian Quadrature	6	9	CO3
6	**Differential Equations** 6.1. Numerical approximations of derivatives 6.2. Euler's Method 6.3. Fourth order RK Method 6.4. Applications in unsteady balances and reactions	12	17	CO5
	Total	48	70	

7. LIST OF PRACTICALS/ASSIGNMENTS/EXERCISES/TUTORIALS/DRAWINGS

TermWork consists of Journal containing minimum no. of 08 experiments/ Assignment/Tutorial by using Scilab/Matlab/Python

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approx.Hrs required	COs
1	Solve Numerical Based on Matrix inversion by Scilab/Matlab/Python	02	CO1
2	Solve Numerical Based on Gaussian Elimination Method by Scilab/Matlab/Python	02	CO2
3	Solve Numerical Based on Jacobi Iteration by Scilab/Matlab/Python	02	CO2
5	Solve Numerical Based on Gauss-Seidel Iteration by Scilab/Matlab/Python	02	CO2
6	Solve Numerical Based on Newton's Method by Scilab/Matlab/Python	02	CO2
7	Solve Numerical Based on Successive Substitution Method by Scilab/Matlab/Python	02	CO2
8	Solve Numerical Based on Polynomial fitting by least squares Method by Scilab/Matlab/Python	02	CO4
9	Solve Numerical Based on Simpsons Rule by Scilab/Matlab/Python	02	CO3
10	Solve Numerical Based on Euler's Method by Scilab/Matlab/Python	02	CO5
	Total	20	

8. IMPLEMENTATION STRATEGY (PLANNING)

1. Teaching Plan
2. Minimum number of Practical/Assignment
3. Self Learning online Resources
4. Worksheet for practice.
5. Guest/Expert lecture

9. LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Introductory methods of Numerical Analysis	Sastry S.S	PHI Learning, New Delhi - 11001, ISBN-81-203-1266-X
2	Numerical Method for Engineers	Chapra, Steven C., Canale Raymond P.	McGraw-Hill Publication Company Limited, New Delhi , 2005, ISBN
3	Numerical Methods	Jain, M.K., Jain R.K., Iyengar, S.R.K	New Age International (P) Limited, Publishers, New Delhi, 2014,/ISBN 13: 9788122433234
4	Introduction to Scilab	Nagar, Sandeep	Independtly Published, 2016, ISBN 13:152015111X,9781520151113
5	Automate the Boring Stuff with Python	Al Sweigart	No Starch Press. Publish Date. November 12, 2019, EAN/UPC 9781593279929
6	MATLAB Programming for Engineers	Stephen J. Chapman	Cengage Learning India Pvt. Ltd.; Sixth edition (1 October 2019), ISBN-13 : 978-9353502874

10. WEB REFERENCES

1. www.nptel.ac.in
2. https://swayam.gov.in/

11. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Sr. No.	TOPIC	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Scilab/Matlab/Python	-	07	10	17
2	Solution of Linear Equations	04	-	05	9
3	Nonlinear Equations	04	-	05	9
4	Interpolation	-	04	05	9
5	Numerical Integration	04	-	05	9
6	Differential Equations	03	04	10	17
	Total	15	15	40	70

R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

12. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.	FACULTY	NAME	SIGNATURE
1	Internal	Mr. Nilesh R. Nagose	
2	Internal	Mr. Milind M. Belwalker	
3	Internal	Mrs. Jyoti S. Sangle	
4	External	Dr. Ramesh V	
		Organisation: Ex- HOD, DJSCOE, Vile-Parle	

BHAGUBHAI MAFATLAL POLYTECHNIC MUMBAI 400 056.

1. COURSE DETAILS

Program: Chemical Engineering **Course: Project Management** **Course Code: PMG 190623**	**Semester:VI** **Group: M** **Duration:16 Weeks**

2. TEACHING AND EXAMINATION SCHEME

Scheme of Instructions and Periods per Week					Examination Scheme and Maximum Marks							
Theory Hrs L	Practical Hrs P	Drawing Hrs D	Tutorial Hrs T	Credits (L+P+D +T)	Theory Paper Duration and marks(ESE)		SSL	TA	TH	TW	PR	OR	TOTAL
					Hours	Marks							
03	--	--	1	4	03	100	20	10	70	25	--	--	125

3. COURSE OBJECTIVE

In brief, project management objectives are the successful development of the project's procedures of initiation, planning, execution, regulation and closure as well as the guidance of the project team's operations towards achieving all the agreed upon goals within the set scope, time, quality and budget standards.

4. SKILL COMPETENCY

The aim of this course is to help the students to attend the following industry identified Competency through various teaching learning experiences:

- **Optimization of the allocated resources.**
- **Development and implementation of all project procedures in given constraints.**

5. COURSE OUTCOMES(COs) At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME	Bloom's LEVEL
CO1	Identify the basic need of project Management.	Remember, Understand, Apply
CO2	Interpret the organizational structure with their roles and responsibility	Remember, Understand, Apply
CO3	Solve the problems based on CPM and PERT	Remember, Understand, Apply
CO4	Use contract management and performance measurement for evaluation of project and process for execution of project	Remember, Understand, Apply
CO5	Select the steps for Closing the Project, Project Termination and Project Follow-up	Remember, Understand, Apply

6. COURSE CONTENTS

Sr. No.	TOPIC/Sub-topic	Hours	Marks	COs
1	**Basics of Project Management** 1.1. Introduction, 1.2. Need for Project Management, 1.3. Project Management Knowledge Areas and Processes, 1.4. The Project Life Cycle, 1.5. The Project Manager (PM), 1.6. Phases of Project Management Life Cycle, 1.7. Project Management Processes, 1.8. Impact of Delays in Project Completions, 1.9. Essentials of Project Management Philosophy, 1.10. Project Management Principles	05	08	CO1
2	***Project Identification and Selection:*** 2.1. Introduction, 2.2. Project Identification Process, 2.3. Project Initiation, 2.4. Pre-Feasibility Study, 2.5. Feasibility Studies, 2.6. Project Break-even point **Project Planning:** 2.7. Introduction, 2.8. Project Planning, 2.9. Need of Project Planning, 2.10. Project Life Cycle, 2.11. Roles, Responsibility and Team Work, 2.12. Project Planning Process, 2.13. Work Breakdown Structure (WBS)	07	10	CO1
3	**Organisational Structure and Organisational Issues:** 3.1. Introduction, 3.2. Concept of Organisational Structure, 3.3. Roles and Responsibilities of Project Leader, 3.4. Relationship between Project Manager and Line Manager, Leadership Styles for Project Managers, 3.5. Conflict Resolution, 3.6. Team Management and Diversity Management, 3.7. Change management	07	10	CO2

4	**PERT and CPM:** 4.1. Introduction, 4.2. Development of Project Network, 4.3. Time Estimation, 4.4. Determination of the Critical Path, 4.5. PERT Model, 4.6. Measures of variability, 4.7. CPM Model, 4.8. Network Cost System **Resources Considerations in Projects:** 4.9. Introduction, 4.10. Resource Allocation, 4.11. Scheduling, 4.12. Project Cost Estimate and Budgets, *4.13. Cost Forecasts*	10	16	CO3
5	**Purchasing and Contracting for Projects:** 5.1. Introduction, 5.2. Purchase Cycle, 5.3. Contract Management, 5.4. Procurement Process	05	06	CO4
6	**Project Performance Measurement and Evaluation:** 6.1. Introduction, 6.2. Performance Measurement, 6.3. Productivity, 6.4. Project Performance Evaluation, 6.5. Benefits and Challenges of Performance Measurement and Evaluation, 6.6. Controlling the Projects **Project Execution and Control:** 6.7. Introduction, 6.8. Project Execution, 6.9. Project Control Process, 6.10. Purpose of Project Execution and Control	06	08	CO4
7	**Project Close-out, Termination and Follow-up:** 7.1. Introduction, 7.2. Project Close-out, 7.3. Steps for Closing the Project, 7.4. Project Termination, 7.5. Project Follow-up **Case Study**	08	12	CO5
	TOTAL	48	70	

7. LIST OF TUTORIALS

Term Work consists of Journal containing minimum no. of 06 tutorials.

Sr. No.	Title of Tutorials	Approx. Hrs required	COs
1.	Assignment on basics of project management	02	CO1
2.	Presentation based on selection of project.	02	CO2
3.	Problems on Pert	02	CO3
4	Problems on CPM	02	CO3
5.	Assignment on purchase and performance measurement	02	CO4
6	Assignment on project close out	02	CO5
7	Case study based on industry	02	CO5
8	Case study	02	CO5
	Total	16	

8.IMPLEMENTATION STRATEGY (PLANNING)

1.Teaching Plan/Tutorials
2. Minimum no of practical/assignments/drawings etc.
3.Guest/Expert lecture
4.Presentation
5.Case Study

8. LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Project management	David I Cleland	Mcgraw Hill International Edition
2	Project Management	Gopalakrishnan	Mcmillan India Ltd

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Sr. No.	TOPIC	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Basics of Project Management	04	02	02	8
2	Project Identification and Selection	02	04	04	10
3	Organizational Structure and Organizational Issues	02	04	04	10
4	PERT and CPM	04	04	08	16
5	Purchasing and Contracting for Projects	02	02	02	6
6	Project Performance Measurement and Evaluation	02	02	04	8
7	Project Close-out, Termination and Follow-up	04	04	04	12
	Total	20	22	28	70

R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

12.COURSE EXPERT COMMITTEE MEMBERS

Sr. No.	FACULTY	NAME	SIGNATURE
1	Internal	Mrs. Jyoti S. Sangle	
2	Internal	Mr. Milind M. Belwalker	
3	Internal	Mr. Nilesh Nagose	
4	External	Dr. Ajitkumar Gudekar Organization: Assistant Professor, DJSCOE, Vile- Parle	

SHRI BHAGUBHAI MAFATLAL POLYTECHNIC ★ MUMBAI 400 056.

Annexure: I

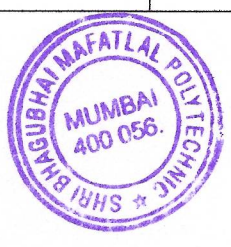
Committees

I.1 Managing Council (MC)

Representatives of Shri Vile Parle Kelavani Mandal		Shri Amit Balwant Sheth, Chairman Shri Nayan Patel Shri Hiten V.Parekh Shri Asoke Basak Dr.Madhav N.Welling Dr.Sharad Mhaiskar Dr.D.J.Shah
Member,Industry Representative		Mr, Hemant Minocha ,MD,Rajiv Plastics,Mumbai
Representatives of Government		
Representative of the State Government		Dr.Abhay Wagh Director, Directorate of Technical Education, Maharashtra State,
Representative of the Maharashtra State Board of Technical Education		Dr.Vinod Mohitkar Director, Maharashtra State Board of Tech.Education
Representative of Central Government		Shri P.N.Jumle Director, Board of Apprenticeship Training (W.R.)
Representative of the All India Council for Technical Education		Dr. Ajeet Singh, Regional Officer& Assistant Director,All India Council for Technical Education (WesternRegion)
Expert Members nominated by the State Government/AICTE		----------
Ex-Officio –Secretary-Principal		Dr.M.Z.Shaikh

I.2 Board of Studies (BOS)

Sr. No.	Name	Designation & Organisation	BOS Designation
1.	Dr.(Mrs) Shubha Pandit	Principal,K.J.Somaiya Engg.College,Mumbai	Chairman
2.	Dr.Vinod Mohitkar	Director, MSBTE	Member
3.	Dr. M.Z.Shaikh	Principal, S.B.M.Polytechnic	Member
4.	Mrs.Neeta Kadukar	Vice Principal and Head, Information Technology Department,SBM Polytechnic	Member
5.	Shri Dhirajkumar Pandirkar	Chief Engineer, MHADA, Mumbai	Member
6.	Shri B.R.Patel,	Director, Procem Consultant (Alumni), Mumbai	Member
7.	Dr. A.V.Bhonsale	Rtd. Principal, Vidyavardhini College of Engineering, Vasai	Member
8.	Shri Sunil Kangane,	Director, Invotech, (Alumni), Mumbai	Member
9.	Shri Ricky Uchil,	Vice President, Adani Electricity Mumbai	Member
10.	Shri Apurva Patel	Director, Exult Industries Ltd. Mumbai	Member
11.	Shri V.M.Joshi,	Adjunct Faculty. Swami Vivekananda Institute of Technology, Mumbai	Member
12.	Shri Paresh Haria,	General Manager PCS Technology, Mumbai	Member
13.	Shri Hemant Minocha	Managing Director, Rajiv Plastics, Mumbai	Member
14.	Prof.E.Narayanan	Ex-Faculty DJSCOE, Mumbai	Member
15.	Shri Ramesh Vulavala	Rtd, HOD DJSCOE, Mumbai	Member
16.	Dr.D.J.Shah	Ex-Principal SBMP	Member
17.	Shri Milind Kamat	General Manager, Toyo Engg. Ltd., Mumbai	Member
18.	Shri Harinder Salwan	Managing Director, Tircom Multimedia Pvt. Ltd. Mumbai	Member



19.	Shi Ashih Tapiawala	Trainer, Vibrant Bootcamp, (Alumni) Mumbai	Member
20.	Shri Ashok Mehta	Ex-Principal SBM Polytechnic	Invitee
21.	Shri Vinod B.Vanvari,	Head, Civil Engg.Dept. SBM Polytechnic	Member
22.	ShriA.K.Chore	Head, Mechanical Engg.Deptt. SBM Polytechnic	Member
23.	Shri N.D.Adate	I/c. Head, Electrical Engg.Deptt. SBM Polytechnic	Member
24.	Mrs.A.A.Kulkarni	Head, Electronics Deptt. SBM Polytechnic	Member
25.	Shri D.M.Karad	Head, Plastics Engg.Deptt. SBM Polytechnic	Member
26.	Shri R.D.Shimpi	Head, Chemical Engg. Deptt. SBM Polytechnic	Member
27.	Shri J.S.Kulkarni	Head, Computer Engg.Deptt. SBM Polytechnic	Member
28.	Shri Abhijit Dongaonkar	Lecturer, IT SBM Polytechnic	Member
29.	Shri S.T.Khelkar	Controller of Exam. SBM Polytechnic	Member
30.	Shri Gajanan Badwe	Lecturer, Mechanical (TPO) SBM Polytechnic	Member
31.	Shri L.B.Deshpnade	Lecturer, Electronics SBM Polytechnic	Convenor

I.3 Programme wise committee (PBOS)

Sr. No.	Name & Office address	PBOS Designation
1	Dr. Ramesh Vulavala, Retired- Professor & H.O.D. Chemical Department, DJ Sanghvi College of Engineering, Vile Parle West, Mumbai – 56.	Chairman Institute
2	Dr.D.J.Shah, B-9, Bridham, Bangurnagar, Link Road, Goregaon (west), Mumbai	Academician Institute
3	Mr. Milind Kamat, Retired-Dy.Division Head, Engineering Division, Toyo India Pvt.Ltd, 301,Ajmera Regalia, Link Road, Opp. Eskay Resort, Yogi Nagar, Borivali (West), Mumbai-400091.	Member Industry
4	Mr. Sundip D More, Vice President-Strategic Business Development, TUV India Pvt. Ltd. 2A,1605-06, Siddhachal, Phase VI, Pokaran Road No.2, Thane (West)-400610	Member Industry
5	Mr.Ketan B Khant, CEO, Filtra Cosultants And Engineers Ltd. 1501, Synergy Business Park, Sahakar Wadi, Off Aarey Road, Near Synthofine Ind. Est. Goregaon (East), Mumbai-400063	Member Alumni, Industry
6	Mr. Atul B Choudhari, General Manager, Discipline Head-Process, Tata Consulting Engineers, Mumbai 502, Cirrus-A, Cosmos Paradise, Opposite Devdaya Nagar, Pokaran Road No.1, Thane-400606.	Member Industry-Invitee

SHRI BHAGUBHAI MAFATLAL POLYTECHNIC * MUMBAI 400 056.

I.4 PROGRAMME CURRICULUM DEVELOPMENT COMMITTEE

Institute Level Curriculum Development Cell

Sr. No.	Name of the Faculty	Designation
1	Dr. M.Z.Shaikh,Principal	Chairman
2	Mrs. Neeta Kadukar, Vice-Principal and Head, IT Dept.	Member
3	Shri V.B.Vanvari, Head, Civil Engg.Dept.	Member
4	Shri A.K.Chore, Head, Mechanical Engg.Dept.	Member
5	Shri N.D.Adate,I/C Head, Electrical Engg.Dept.	Member
6	Mrs. A.A.Kulkarni, Head, Industrial and Digital Elex.Dept.	Member
7	Shri D.M.Karad, Head, Plastics Engg.Dept.	Member
8	Shri R.D.Shimpi, Head, Chemical Engg.Dept.	Member
9	Shri J.S.Kulkarni, Head, Computer Engg.Dept.	Member
10	Shri A.B.Dongaonkar, Lecturer, IT Dept.	Member
11	Mrs.K.P.Bhave,Lecturer,Chemistry Dept.	Member
12	Shri G.J.Badwe,Training and Placement Officer	Member
13	Shri S.T.Khelkar,Controller of Examinations	Member
14	Shri L.B.Deshpande,Lecturer,Electronics Dept.	Member Secretary

Department Level Committee (Department CO-Ordinators)

Sr. No.	Name of the Faculty	Designation
1	Shri S. N. Ranshur	Lecturer, Civil Engineering
2	Shri A. S. Shukla	Lecturer, Mechanical Engineering
3	Shri D. G. Rajmandai	Lecturer, Electrical Engineering
4	Ms. P. J. Nikhade	Lecturer, Industrial/Digital Electronics
6	Shri S. A. Kamble	Lecturer, Plastics Engineering
5	Shri M. M. Belwalkar	Lecturer, Chemical Engineering
7	Shri P. H. Shah	Lecturer, Computer Engineering
8	Shri P. D. Rathod	Lecturer, Information Technology

Certificate

The curriculum of the programme has been modified in the year 2019, as per the provision made in curriculum development process of Shri Bhagubhai Mafatlal Polytechnic, Mumbai. This is the **outcome based Curriculum of Diploma in Chemical Engineering programme**, which shall be implemented from academic year 2019-20.

Verified by

Department Level CDC Representative
S.B.M.Polytechnic, Mumbai.

Head of Department
Chemical Engineering
S.B.M.Polytechnic, Mumbai.

Incharge, Curriculum Development Cell
S.B.M.Polytechnic, Mumbai.

Principal
S.B.M.Polytechnic, Mumbai.

SHRI BHAGUBHAI MAFATLAL POLYTECHNIC ★ MUMBAI 400 056.

APPENDIX-II

PROGRAMME - Diploma in Chemical Engineering.

MAPPING MATRIX OF PO'S, PSO's AND CO'S:

Semester I										
COURSE NAME/CODE	CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Basic Mathematics (BMT 190001)	C101.1	1.00		2.00						
	C101.2	2.00				3.00			1.00	1.00
	C101.3	1.00					2.00			
	C101.4		3.00				1.00		3.00	1.00
	C101.5									
	Average 101	1.33	3.00	2.00		3.00	1.50		2.00	1
Applied Chemistry (ACH 190002)	C102.1	3.00		2.00	1.00				2.00	
	C102.2	3.00								
	C102.3	3.00	2.00	2.00	1.00	2.00		1.00	2.00	
	C102.4	2.00	2.00	1.00	1.00	2.00		1.00	2.00	
	C102.5	2.00	1.00	1.00		1.00		1.00	1.00	
	Average 102	2.60	1.67	1.50	1.00	1.67		1.00	1.75	
Environmental Studies (EVS 190003)	C103.1	2.00		1.00		3.00			1.00	
	C103.2					2.00				
	C103.3			3.00		2.00			1.00	
	C103.4		1.00	2.00		2.00	1.00		1.00	
	C103.5	2.00		2.00		2.00	1.00	1.00		
	Average 103	2.00	1.00	2.00		2.20	1.00	1.00	1.00	
Communication Skill (CMS 190011)	C104.1	1.00	2.00	2.00		2.00	3.00	1.00		
	C104.2		1.00	1.00	1.00	1.00	3.00	1.00	1.00	1.00
	C104.3	2.00	1.00	1.00			3.00	1.00		
	C104.4		1.00	1.00	1.00	1.00	3.00	2.00	1.00	1.00
	C104.5									
	Average 104	1.50	1.25	1.25	1.00	1.33	3.00	1.25	1.00	1.00
Applied Mechanics (APM190005)	C105.1	1.00							1	
	C105.2	2.00							2	
	C105.3	1.00					2.00	2.00	1	
	C105.4	3.00	2.00				3.00	2.00	3	
	C105.5	3.00		1.00	1.00		2.00	2.00	1	
	Average 105	2.00	2.00	1.00	1.00		2.33	2.00	1.60	
Engineering Drawing (EDG 190006)	C106.1	2.00	1.00	3.00	3.00			1.00		3.00
	C106.2	2.00	2.00	1.00	3.00			1.00		3.00
	C106.3	2		2	3			1		2.00
	C106.4	1.00		2.00	2.00			1.00		2.00
	Average 106	1.75	1.50	2.00	2.75			1.00		2.50

Workshop Practice(CH) (WSP 190624)	C107.1	2.00		1.00	3.00		2.00	2.00	3.00	
	C107.2	3.00	1.00	1.00	2.00	1.00	1.00	2.00	2.00	1.00
	C107.3	3.00		1.00	3.00	1.00	3.00	2.00	2.00	1.00
	C107.4	3.00	2.00	1.00	1.00	2.00	2.00	3.00	3.00	
	Average107	2.75	1.50	1.00	2.25	1.33	2.00	2.25	2.50	1.00
Semester II										
COURSE NAME/CODE	**CO NO.**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
Engineering Mathemathics (EMT 190009)	C201.1	3.00	2.00	2.00	1.00	1.00	1.00	2.00	3	
	C201.2	3.00		1.00	1.00	1.00	1.00	2.00	2	
	C201.3	3.00	1.00	1.00	1.00	1.00	1.00	2.00	3	
	C201.4	3.00	2.00	2.00	2.00	1.00	2.00	2.00	3	
	C201.5									
	Average201	3.00	1.67	1.50	1.25	1.00	1.25	2.00	2.75	
Development of life skills (DLS 190004)	C202.1			1.00		2.00	3.00	1.00		
	C202.2	1.00	1.00	1.00	1.00	1.00	3.00	2.00	1	1
	C202.3	1.00	2.00	2.00	1.00	2.00	3.00	2.00	1	1
	C202.4			1.00		2.00	3.00	2.00		
	Average 202	1.00	1.50	1.25	1.00	1.75	3.00	1.75	1.00	1.00
Applied Physics (APH 190010)	C203.1	3.00	2.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00
	C203.2	3.00	2.00	2.00	2.00	1.00	2.00	1.00	1.00	1.00
	C203.3	3.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00
	C203.4	3.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00
	Average 203	3.00	1.50	1.50	1.75	1.00	1.50	1.00	1.00	1.00
Organic and Physical chemistry (OPC 190601)	C204.1	3.00				2.00		1.00		
	C204.2	3.00	2.00	1.00	2.00	1.00			2.00	
	C204.3	3.00	1.00		1.00					
	C204.4	3.00		1.00					1.00	
	C204.5	3.00	1.00		1.00			1.00	2.00	
	Average 204	3.00	1.33	1.00	1.33	1.50		1.00	1.67	
Basics of Electrical and Electronics (BEE 190016)	C205.1	3.00	1.00		1.00				2	3
	C205.2	3.00	2.00	2.00	2.00	2.00		2.00	2	3
	C205.3	3.00	3.00		2.00				2	3
	C205.4	3.00								
	C205.5	2.00		2.00					1	1
	C205.6	1.00	2.00		2.00	1.00		1.00	3	3
	Average 205	2.50	2.00	2.00	1.75	1.50		1.50	2.00	2.60
Fundamental of chemical Engineering (FCE 190602)	C206.1	2.00	3.00					2.00	3	
	C206.2	3.00	1.00	1.00	2.00			2.00	2	
	C206.3	2.00	3.00		2.00			1.00	2	
	C206.4	1.00		2.00		3.00			2	
	C206.5			3.00	1.00	1.00			1	2
	Average 206	2.00	2.33	2.00	1.67	2.00		1.67	2.00	2.00

Stess Management (STM 190012)	C207.1	3.00	1.00	1.00	2.00	2.00	1.00	2.00	1	
	C207.2	1.00	1.00	2.00		3.00	1.00	2.00	3	
	C207.3	1.00	1.00			3.00	2.00	2.00	3	
	C207.4	1.00	1.00	2.00		2.00	3.00	1.00	2	
	Average 207	1.50	1.00	1.67	2.00	2.50	1.75	1.75	2.25	
Semester III										
COURSE NAME/CODE	CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Applied Mathematics (AMT190013)	C301.1	3.00	3.00	3.00	2.00	1.00	2.00	2.00		2.00
	C301.2	3.00	3.00	3.00	2.00	2.00	2.00	2.00		2.00
	C301.3	3.00	3.00	3.00	2.00	1.00	1.00	2.00		
	C301.4	3.00	3.00	3.00	2.00	1.00	2.00	2.00		2.00
	C301.5									
	Average 301	3.00	3.00	3.00	2.00	1.25	1.75	2.00		2.00
Mechanical Operation (MOP 190603)	C302.1	2.00	3.00	1.00		1.00		1.00	2	
	C302.2	2.00	3.00		1.00	1.00		1.00	2	
	C302.3	2.00	2.00		2.00				3	
	C302.4	1.00	3.00	2.00	2.00			1.00	2	
	C302.5	2.00	2.00	2.00	2.00			1.00		
	Average 302	1.80	2.60	1.67	1.75	1.00		1.00	2.25	
Technology of Inorganic and organic Chemicals (TIC190604)	C303.1	3.00	1.00		2.00	1.00		1.00	3	1
	C303.2	3.00	1.00		2.00	1.00		1.00	3	1
	C303.3	3.00	1.00		2.00	1.00		1.00	3	1
	C303.4	3.00	1.00		2.00	1.00		1.00	3	1
	C303.5	3.00	1.00		2.00	1.00		1.00	3	1
	Average 303	3.00	1.00		2.00	1.00		1.00	3	1
Fluid Flow Operation (FFO190605)	C304.1	3.00	1.00					2.00	1.00	
	C304.2	3.00	1.00	2.00		1.00		1.00	1.00	
	C304.3	2.00	1.00	1.00				1.00	1.00	
	C304.4	3.00				1.00		1.00	2.00	
	C304.5		3.00			1.00		2.00	1.00	
	Average 304	2.75	1.50	1.50		1.00		1.40	1.20	
Heat Transfer Operation (HTO190606)	C305.1	3.00	2.00	1.00		1.00			2.00	
	C305.2	3.00	2.00	1.00		1.00			2.00	
	C305.3	3.00	2.00	1.00		1.00			2.00	
	C305.4	2.00	2.00	3.00		1.00	1.00		2.00	
	C305.5	2.00	2.00	2.00		1.00			2.00	-
	Average 305	2.60	2.00	1.60		1.00	1.00		2.00	-
Technology of Plastics (TOP190503)	C306.1	3.00	2.00	2.00				1.00	1	
	C306.2	2.00	2.00	2.00	2.00			1.00	2	
	C306.3	2.00	3.00	3.00	3.00			3.00	1	
	C306.4	3.00	3.00	3.00	3.00		3.00		1	

	C306.5									
	Average 306	2.50	2.50	2.50	2.67		3.00	1.67	1.25	
Marerial of construction (MOC190607)	C307.1	3.00	2.00	2.00	1.00	2.00	1.00	1.00	1	
	C307.2	3.00	2.00	2.00	3.00	1.00	1.00	2.00	1	
	C307.3	2.00	2.00	3.00	3.00	2.00	2.00	3.00	2	
	C307.4	1.00	2.00	2.00	3.00	2.00	1.00	2.00	2	
	C307.5	3.00	2.00	2.00	2.00	2.00	2.00	2.00		
	Average 307	2.40	2.00	2.20	2.40	1.80	1.40	2.00	1.50	
Semester IV										
COURSE NAME/CODE	**CO NO.**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
Chemical Reaction Engineering (CRE190608)	C401.1	3.00	2.00	2.00	1.00			1.00	2	
	C401.2	3.00	2.00	3.00	2.00			1.00	3	
	C401.3	2.00	2.00	3.00	1.00			1.00	3	
	C401.4	1.00	2.00	3.00	2.00	2.00	1.00	1.00	2	
	C401.5	3.00	2.00	2.00	2.00	1.00		1.00	2	
	Average 401	2.40	2.00	2.60	1.60	1.50	1.00	1.00	2.4	
Principles of Stoichiometry (POS190609)	C402.1	3.00	2.00	1.00	1.00			3.00	2	
	C402.2	2.00	3.00	2.00	1.00			1.00	2	
	C402.3	3.00	3.00	2.00	1.00	1.00	1.00	2.00	3	
	C402.4	2.00	3.00	3.00	2.00	2.00	1.00	1.00	3	
	C402.5	3.00	2.00	2.00	1.00	2.00	1.00	1.00	2	
	Average 402	2.60	2.60	2.00	1.20	1.67	1.00	1.60	2.4	
Process Equipment Drawing (PED 190610)	C403.1	1.00		2.00	3.00	2.00	1.00	1.00		2
	C403.2	1.00		2.00	3.00	1.00		1.00		2
	C403.3	2.00	1.00	3.00	2.00	1.00		1.00		3
	C403.4	1.00		2.00	3.00	1.00		1.00		2
	C403.5	2.00	2.00	2.00	2.00	1.00		1.00		2
	Average 403	1.40	1.50	2.20	2.60	1.20	1.00	1.00		2.2
Plant Utilities (PUT190611)	C404.1	2	2	3	1	2	1	1	2	2
	C404.2	2	3	2	2	1	1	1	3	3
	C404.3	2	3	2	1	2	1	1	2	2
	C404.4	2	3	1	2	2	1	1	2	2
	C404.5	2	1	1		3		1	1	1
	Average 404	2	2.4	1.8	1.5	2	1	1	2	2
Industrial Management (IMG 190014)	C405.1	1	2	2	1	2	-	-	2	2
	C405.2	-	-	2	2	3	-	3	2	2
	C405.3	1	1	2	-	1	-	1	2	2
	C405.4	2	-	2	-	1	-	3	2	2
	C405.5	1	-	2	1	2	-	2	2	2
	Average 405	1.25	1.50	2.00	1.33	1.80		2.25	2	2

	CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Plant safety and loss prevention (PSL190612)	C406.1	3	2		2	2	2	1	1	
	C406.2	2	2		2	3	2	1		
	C406.3	2	2	3	2	2	2	1	2	
	C406.4	2	2	3	2	2	1	1	2	
	C406.5	2	1		3	2	2	1	2	
	C406.6	1				3	2	1		
	Average 406	1.8	1.75	3	2.25	2.4	1.8	1	1.75	
Pollution Control & Waste Disposal (PCW190613)	C407.1	2	3			2		2	3	
	C407.2	2	2			3		2	3	
	C407.3	1	2		3	2		2	3	
	C407.4	1	2	3		2		2	3	
	C407.5	1	3	2		2		2	3	
	Average 407	1.4	2.4	2.5	3	2.2		2	3	
Chemical Engineering Thermodynamics (CET190614)	C408.1	3		1		1		1	1	
	C408.2	3	1	1		1		2	2	
	C408.3	2	3	1		1		1	2	
	C408.4	3	1	1		1		1	1	
	C408.5	3	1	1		1		2	1	
	Average 408	2.8	1.5	1		1		1.4	1.4	
Introduction to Energy System (IES190615)	C409.1	1	1			3		2	2	
	C409.2	1	2	2					2	
	C409.3		2			2		1	2	
	C409.4	1		2		3			2	
	C409.5			2		2			2	
	Average 409	1	1.67	2		2.5		1.5	2	

Semester V

COURSE NAME/CODE	CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
INPLANT TRAINING (IPT190625)	C501.1	2	3	2	1	2	2	2	1	
	C501.2	3	2	2	1	2	2	2	1	
	C501.3	1	2	2	1	1	3	2	2	
	C501.4	2	2	2	1	1	3	2	2	
	C501.5	2	2	2	3	2	2	2	2	
	C501.6	1	3	2	1	2	2	3	2	
	Average 501	1.83	2.33	2.00	1.33	1.67	2.33	2.17	1.67	

Semester VI										
COURSE NAME/CODE	CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Process Instru. & Control (PIC190616)	C601.1	2	2	1	3		1	1	2	
	C601.2	3	1	1	1			1	2	
	C601.3	2	2	3	2		1	1	1	
	C601.4	1	2	2	2		1	1	2	
	C601.5	1	3	3	2					
	C601.6	3	3	2	3		1	1		
	Average 601	2	2.17	2	2.17		1	1	1.75	
Mass Transfer Operations (MTO 190617)	C602.1	3	2	2	1	1		1		
	C602.2	2	3	3	2	2	1	1		
	C602.3	2	3	3	2	1	1	1		
	C602.4	1	2	3	2	1		1		
	C602.5	3	1	2	1	1		1		
	Average 602	2.2	2.2	2.6	1.6	1.2	1	1		
Project (PRO190618)	C603.1	3	3	2	2	2	2	2	2	
	C603.2	2	3	3	2	1	2	1	2	
	C603.3	1	2	1	2	3	2	1	3	
	C603.4	1	2	1		2	3	2	2	
	C603.5	1	2	3		1	3	2	3	
	Average 603	1.6	2.4	2	2	1.8	2.4	1.6	2.4	
Petroleum Refining and Petrochemicals (PRP190619)	C604.1	2	2	2	3			1	2	
	C604.2	1	3	3	3		1	2	3	
	C604.3	3	2	2	2			1	2	
	C604.4	1	3	3	3	1	1	1	3	
	C604.5	1	2	2	1	2	3	1		
	Average 604	1.6	2.4	2.4	2.4	1.5	1.67	1.2	2.5	
Computer Aided Drafting, Design and Estimation (CADD & Estimation) (CAD190620)	C605.1	3	1		1			2		2
	C605.2	3	1	1		2		2		3
	C605.3	2	2	3		2		1	2	
	C605.4	1	3		2	1	1	2	1	
	C605.5	2	1			1		1	1	
	Average 605	2.2	1.6	2	1.5	1.5	1	1.6	1.33	2.5
Piping in Chemical Engineering (PCE 190621)	C606.1	2						1	2	
	C606.2	3						1	3	
	C606.3	3	1					1	2	
	C606.4	2	1					2	2	
	C606.5	2						1		2
	Average 606	2.4	1					1.2	2.25	2

	CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Numerical Methods in Chemical Engineering (NMC190622)	C607.1	3	1	2		1		1	2	
	C607.2	2	1	1				2	2	
	C607.3	3		2				1	2	
	C607.4	2		2				1	1	
	C607.5	2		1				1	2	
	Average 607	2.40	1.00	1.60		1.00		1.20	1.80	
Project Management (PMG 190623)	C608.1	3	2				2	2	2	
	C608.2		2	2			1	1	2	
	C608.3		2	2			2		2	
	C608.4	2		3	2		2	1	1	
	C608.5					2	2	1	1	
	Average 608	2.50	2.00	2.33	2.00	2.00	1.80	1.25	1.60	

3: High Relationship, 2: Medium Relationship, 1: Low Relationship.

Department Level CDC Representative
S.B.M.Polytechnic, Mumbai.

Head of Department
Chemical Engineering
S.B.M.Polytechnic, Mumbai.

SHRI BHAGUBHAI MAFATLAL POLYTECHNIC MUMBAI 400 056.

Shri Vile Parle Kelavani Mandal's
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC

PERIODICAL TEST (PT) QUESTION PAPER PATTERN FOR 2019 SCHEME
(For courses like Engg.Drawing, Design etc. refer question paper pattern given in curriculum)

All questions are compulsory

Bits to be solved			Bits with Option	
Question No	Marks*Bits	Total Marks	Marks* Bits	Total Marks
1	3*2	06	3*3	09
2	4*2	08	4*3	12
3	6*1	06	6*2	12
	Total Marks = 20		Total Marks = 33	

END SEMESTER EXAM (ESE) QUESTION PAPER PATTERN FOR 2019 SCHEME
(For courses like Engg.Drawing, Design etc. refer question paper pattern given in curriculum)

All questions are compulsory

Bits to be solved			Bits with Option	
Question No	Marks*Bits	Total Marks	Marks* Bits	Total Marks
1	2*6	12	2*8	16
2	4*3	12	4*5	20
3	4*3	12	4*5	20
4	6*3	18	6*4	24
5	8*2	16	8*3	24
	Total Marks = 70		Total Marks = 104	

Controller of Examination Secretary, CDC Principal/Vice Principal

SHRI BHAGUBHAI MAFATLAL POLYTECHNIC * MUMBAI 400 056

Date : 8th January,2022

To whomsoever it may concern

This is to certify that the curriculum-2019 of chemical engineering department at S.B.M Polytechnic is in line with the current requirement

The syllabus of scheme 2019 is well-design incorporating core engineering applications, emerging technologies and basic management skills.

The inplant training conducted in 5th semester gives the clear understanding about the industry standards and different products and processes.

Emerging courses like Pollution Control and waste Disposal, CADD & Estimation, Industrial Management, Process Instrumentation and Control etc. are much relevant to the chemical process industry.

Further the practice of reviving the curriculum frequently, which enables the courses to keep the pace with the industry and industrial revolution 4.0 requirement.

Looking forward to successful association.

For Seamak Hi Tech Products LLP

SEAMAK HI-TECH PRODUCTS LLP MUMBAI

Mrs. Rima Veera

(Designated Partner)

SEAMAK HI TECH PRODUCTS LLP
#101C, 1st Floor, Yasmin Heritage, 84, Vallabhbhai Patel Road,
Vile Parle (W), Mumbai - 400056.
Tel.: +91 22 2612 8452, 2612 8649, 2618 9372
Email : seamak.mumbai@vsnl.net Website : www.seamak.com

LUPIN

To,

The Chemical Engineering Dept.
Shri Bhagubhai Mafatlal Polytechnic,
Irla, Vile Parle(W),
Mumbai-400056

KIND ATTN.:- Shri R.D.Shimpi

Subject: Regarding the revised syllabus of the Diploma course in chemical Engg. of S.B.M.Polytechnic.

Respected Sir,

We congratulate H.O.D. Shri R.D.Shimpi and the whole chemical Engg. Department of S.B.M.P. for their revised syllabus. We have understood the new syllabus including emerging thrust area such as AUTO CAD, Energy system Engg, Advanced oxidation process, Reaction Engg, Thermodynamics etc. which enable their students to deliver the better performance in the industrial profession.

We state that the syllabus of the course is designed to fulfill the needs of the chemical industries and it can be considered bench mark for the other institutes in India.

We are ensuring the certificate of excellence for their curriculum.

Malekar

Sachin Malekar
Head – Process Engg.
Lupin Ltd. Tarapur

PARMAR BROTHERS

MANUFACTURERS: CHEMICAL PROCESS EQUIPMENTS

ISO 9001:2015

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e-mail: jignesh@parmarbrothers.com – info@parmarbrothers.com

Ref. No. PB/JMP/G4/2021-22

Date: 10th Jan, 2022

TO WHOM SO EVER IT MAY CONCERN

This is to certify that the curriculum-2019 of Chemical Engineering Program at S.B.M Polytechnic is in line with the current requirement. The syllabus of scheme 2019 is well-designed incorporating core engineering applications, emerging technologies and basic management skills. The Inplant training conducted in 5th semester gives the clear understanding about the industry standards and different products and processes. Emerging courses like Pollution Control and waste Disposal, CADD & Estimation, Industrial Management, Process Instrumentation and Control etc. are much relevant to the chemical process industry need. Further the practice of reviving the curriculum frequently, which enables the courses to keep the pace with the industry and industrial revolution 4.0 requirement.

Looking forward to successful association.

Regards,
For PARMAR BROTHERS

PARMAR BROTHERS PB

Jignesh Mukesh Parmar
Partner