

# MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

## Diploma Programme in **Chemical Engineering**

### I – Scheme

#### Programme Structure

#### **Programme Educational Objectives (PEO)** (*What s/he will continue to do even after 3-5 years of working in the industry*)

- PEO 1. Provide socially responsible, environment friendly solutions to Chemical Engineering related broad-based problems adapting professional ethics.
- PEO 2. Adapt state-of-the-art of Chemical Engineering by implementing advanced technologies to work in multi-disciplinary work environments.
- PEO 3. Solve broad-based problems individually and as a team member communicating effectively in the world of work.

#### **Program Outcomes (PO)** given by NBA. (*What s/he will continue to do at the entry point of industry soon after the diploma programme*)

- PO 1. **Basic knowledge:** Apply knowledge of basic mathematics, sciences and basic engineering to solve the Chemical engineering problems.*
- PO 2. **Discipline knowledge:** Apply Chemical engineering knowledge to solve industry based Chemical Engineering problems.*
- PO 3. **Experiments and practice:** Plan to perform experiments and practices to use the results to solve technical problems related to Chemical engineering.*
- PO 4. **Engineering tools:** Apply relevant technologies and Chemical engineering tools with an understanding of the limitations.*
- PO 5. **The engineer and society:** Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in field of Chemical engineering.*
- PO 6. **Environment and sustainability:** Apply Chemical engineering solutions also for sustainable development practices in societal and environmental contexts.*
- PO 7. **Ethics:** Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice also in the field of Chemical engineering.*
- PO 8. **Individual and team work:** Function effectively as a leader and team member in diverse/ multidisciplinary teams.*
- PO 9. **Communication:** Communicate effectively in oral and written form.*
- PO 10. **Life-long learning:** Engage in independent and life-long learning activities in the context of technological changes also in the Chemical engineering and allied industry.*

#### **Program Specific Outcomes (PSOs)** (*What s/he will continue to do in the Chemical engineering specific industry soon after the diploma programme*)

- PSO 1. Chemical engineering equipment:** Operate equipment and materials effectively and efficiently used in chemical reactions.
- PSO 2. Material management and quality control:** Manage chemicals and equipment to produce quality chemical products.

## Notes for All the Semesters

1. Every student has to **separately pass in End-Semester-Examination (ESE)** for **both theory and practical** by securing minimum of 40% marks, (i.e. 30 out of 75, 28 out of 70, 20 out of 50, and 10 out of 25).
2. **Progressive Assessment (PA) for Theory** includes Written Exam/micro projects/ Assignment/Quiz/Presentations/attendance according to the nature of the course. The scheme and schedule for progressive assessment should be informed to the students and discussed with them at the start of the term. This scheme should also be informed in writing to the principal of the institute.
3. Teachers need to give **marks judiciously for PA of theory and practicals** so that there is always a **reasonable correlation** between the **ESE marks** obtained by the student and the **PA marks** given by **respective teachers for the same student**. In case the PA marks in some courses of some students seems to be relatively inflated in comparison to ESE marks, then MSBTE may review the PA records of such students.
4. For developing self-directed learning skills, from each course about 15-20% of the topics/sub-topics, which are relatively simpler or descriptive in nature are to be given to the students for self-study and proper learning of these topics should be assured through classroom presentations by students (see implementation guideline for details).

Programme Code: .....I – Scheme Diploma Programme in Chemical Engineering												
I – Semester												
Weighted mean score	S. No. & (Rank No.) of Report	Industry Questionnaire S.No.	Course Title	Teaching Scheme/Week			Credits (L+T +P)	Examination Scheme				
				L	T	P		Theory		Practical		Grand Total
								ESE	PA	ESE	PA	
3.34	G2(2)	37	English (Common to all)	3	-	2+	5	70	30*	25	25	150
2.79	26(21)	1	Basic Science	2	-	2	4	35	15*	25	25	200
2.21	35(30)	2	(Common to all) Chemistry									
2.81	24(20)	4	Basic Mathematics (Common to all)	4	2	-	6	70	30*	-	-	100
3.22	G4(4)	45	Fundamentals of ICT (Common to all)	2#	-	2	4	-	-	25	25~ <sup>1</sup>	50
2.97	15(13)	6	Engineering Graphics Mech. Gp.(AE, ME, PT, FG, EE, CE, CH, PS, DC, TC, TX)	2#	-	4	6	-	-	50	50~ <sup>2</sup>	100
3.24	3(2)	11	Workshop Practice Mech. Gp.(AE, FG, ME, PT, CE, EE, CH, PS)	-	-	4	4	-	-	50	50~ <sup>2</sup>	100
<b>Total</b>				<b>15</b>	<b>2</b>	<b>16</b>	<b>33</b>	<b>210</b>	<b>90</b>	<b>200</b>	<b>200</b>	<b>700</b>

(#): No theory Exam; (\*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment (5 marks each for Physics and Chemistry) to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs; (+): Language Lab Practical; (~): For the courses having ONLY practical examination, the PA has two parts – marks, for~<sup>1</sup> (i) practical part - 15 marks(60%) (ii) micro-project part - 10 marks (40%) and for~<sup>2</sup> (i) practical part - 30 marks (60%) (ii) micro-project part - 20 marks (40%).

### Legends

**L:** Lecture      **T:** Tutorial      **P:** Practical      **ESE:** End Semester Exam      **PA:** Progressive Assessment

**Note:** Blue highlights are courses common to all programmes and yellow highlights are courses common with other specific programmes.

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II – Semester												
Weighted mean score	S. No. & (Rank No.) of Report	Industry Question-naire S.No.	Course Title	Teaching Scheme/Week			Credits (L+T +P)	Examination Scheme				
				L	T	P		Theory		Practical		Grand Total
								ESE	PA	ESE	PA	
2.82	25(16)	3	Applied Mathematics (AE, CH, ME, PT, FG)	4	2	-	6	70	30*	-	-	100
2.57	30(21)	5	Applied Mechanics (CE, CH, AE, ME, PT, FG)	3	2	2	7	70	30*	25	25	150
GF-5	-	GF-5	Fundamentals of Chemical Engineering	4	-	2	6	70	30*	50@	50	200
2.54	31(22)	9	Electrical and Electronics Technology	4	-	2	6	70	30*	25	25	150
3.11	14(11)	11	Chemistry of Engineering Materials	4	-	2	6	70	30*	25	25	150
3.36	G3 (2)	G-2	Business Communication Using Computers (Common to all)	2\$	-	-	2	35\$	15	-	-	50
<b>Total</b>				<b>21</b>	<b>4</b>	<b>8</b>	<b>33</b>	<b>385</b>	<b>165</b>	<b>125</b>	<b>125</b>	<b>800</b>

(\$): Online Exam; (\*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs; @:with external examiner.

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III – Semester												
Weighted mean score	S. No. and (Rank No.) of Report	Industry Question-naire S.No.	Course Title	Teaching Scheme/Week			Credits (L+T +P)	Examination Scheme				
				L	T	P		Theory		Practical		Grand Total
								ESE	PA	ESE	PA	
3.21	10(8)	31	Plant Utilities	4	-	2	6	70	30*	-	-	100
2.79	26(17)	25	Chemical Engineering Plant Economics and Energy Management	4	-	2	6	70	30*	25	25	150
3.14	13(10)	36										
3.25	8(7)	12	Mechanical Operations	4	-	4	8	70	30*	50	50	200
3.57	2(2)	16	Technology of Inorganic Chemicals	4	-	4	8	70	30*	50	50	200
3.18	12(9)	14	Industrial Stoichiometry	4	2	-	6	70	30*	-	-	100
<b>Total</b>				<b>20</b>	<b>2</b>	<b>12</b>	<b>34</b>	<b>350</b>	<b>150</b>	<b>125</b>	<b>125</b>	<b>750</b>

(\$): Online Exam; (\*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs.

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IV – Semester												
Weighted mean score	S. No. & (Rank No.) of Report	Industry Questionnaire S.No.	Course Title	Teaching Scheme/Week			Credits (L+T +P)	Examination Scheme				
				L	T	P		Theory		Practical		Grand Total
								ESE	PA	ESE	PA	
2.93	21(14)	15	Chemical Engineering Thermodynamics	4	2	-	6	70	30*	-	-	100
3.25	7(7)	33	Chemical Process Instrumentation and Control	4	2	2	8	70	30*	25	25	150
3.61	1(1)	32	Chemical Industrial Safety and Maintenance	3	-	2	5	70	30*	25	25	150
3.43	5(5)	13	Fluid Flow Operation	4	-	4	8	70	30*	50	50	200
3.57	2(2)	16	Technology of Organic Chemicals	4	-	4	8	70	30*	50	50	200
<b>Total</b>				<b>19</b>	<b>4</b>	<b>12</b>	<b>35</b>	<b>350</b>	<b>150</b>	<b>150</b>	<b>150</b>	<b>800</b>

(\*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs.

**Note**

- During Summer Break after IV semester (i.e. between IV and V Semester), Polytechnics would ensure mandatory placement of students for 6 weeks industrial training. Preferably, the industry where students would be placed should be large or medium scale, however if such industries are not available, then students can also be placed in small or very small industries but it should be relevant to the branch or discipline of engineering. **This training would be evaluated during V semester.**
- The allotment of the group of students and orientation for industrial training shall be done before the end of IV semester.
- Students should prepare report of training, which will be evaluated during V semester.

Programme Code: ..... I - Scheme Diploma Programme in Chemical Engineering												
V – Semester												
Weighted mean score	S. No. & (Rank No.) of Report	Industry Questionnaire S.No.	Course Title	Teaching Scheme/Week			Credits (L+T +P)	Examination Scheme				
				L	T	P		Theory		Practical		Grand Total
								ESE	PA	ESE	PA	
MSBTE guidelines and industry feedback			Industrial Training (during summer break after IV semester)	-	-	6^	6^	-	-	75	75	150
2.64	G-7 (G-6)	G-43	Managerial skills and TQM (DE, EJ, IE, IS, CH)	3	-	-	3	70	30*	-	-	100
3.50	3(3)	17	Heat Transfer Operation	4	-	4	8	70	30*	50	50	200
3.25	9(7)	20	Environmental Pollution and Control	3	-	2	5	70	30*	25	25	150
2.82	23(16)	6	Chemical Engineering Drawing and Calculations	3	-	4	7	70	30*	50	50	200
			Elective – I	3	-	2	5	70	30*	25	25	150
			Minor Project (Common to all)	-	-	4	4	-	-	50	50	100
<b>Total</b>				<b>16</b>	<b>-</b>	<b>22^</b>	<b>38^</b>	<b>350</b>	<b>150</b>	<b>275</b>	<b>275</b>	<b>1050</b>

(\*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs; (^): Though 6 credits are allocated for Industrial Training it is only for awarding marks. As far as teaching load/time table preparation is considered, each faculty would be assigned with one batch of students (equivalent to practical batch size) for guiding the preparation of industrial training report and its evaluation. For this purpose 1 hour (or two hours on working

Saturdays) teaching load would be considered.

**Note**

Evaluation of industrial training and its reports is to be done during this semester. Credits of Industrial Training will not affect the framing of the time table.

Weighted mean score	S. No. & Rank No. of Report	Industry Questionnaire S. No.	Elective (choose any one)
2.96	20(13)	21	Elective – I Membrane Technology
3.14	13(10)	36	Elective – I Renewable Energy Technologies
2.89	22(15)	4	Elective – I Numerical Methods in Chemical Engineering

Programme Code: ..... I - Scheme Diploma Programme in Chemical Engineering												
VI – Semester												
Weighted mean score	S. No. & (Rank No.) of Report	Industry Questionnaire S. No.	Course Title	Teaching Scheme/Week			Credits (L+T +P)	Examination Scheme				
				L	T	P		Theory (ESE PA)		Practical (ESE PA)		Grand Total
3.36	6(6)	26	Chemical Reaction Engineering	4	2	-	6	70	30*	-	-	
3.46	4(4)	18	Mass Transfer Operation	3	-	4	7	70	30*	50	50	200
			Elective – II	3	-	2	5	70	30*	25	25	150
			Elective - III	3	-	2	5	70	30*	25	25	150
2.43	G8 (7)	G-4	Entrepreneurship Development (Common to all)	2\$	-	2	4	50\$	-	25	25~ <sup>1</sup>	100
3.36	G3 (2)	G-2	Technical Writing (Common to all)	-	-	2	2	-	-	25	25	50
			Major Project (Common to all)	-	-	6	6	-	-	75	75	150
			<b>Total</b>	<b>15</b>	<b>2</b>	<b>18</b>	<b>35</b>	<b>330</b>	<b>120</b>	<b>225</b>	<b>225</b>	<b>900</b>

(\$): Online Exam; (\*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs; (~<sup>1</sup>): For the courses having ONLY practical examination, the PA has two parts – marks for ~<sup>1</sup> (i) practical part - 15 marks (ii) micro-project part - 10 mark.

**Note**

The **Technical Writing** course is introduced as practical work, in which English faculty members would facilitate the framing of correct language for writing different chapters and presentation (i.e.PPT. and others) of their project work from English point of view. Name of English teacher has to be included as a 'Language Editor' in the project and this activity will be the part of practical shown against Technical Writing course at VI semester. This work shall be carried out for each batch (size same as for practical).

Weighted mean score	S. No. & (Rank No.) of Report	Industry Questionnaire S. No.	Elective II and III (choose any two)
2.61	29(20)	29	Polymer Technology
2.71	27(18)	24	Fertilizer Technology
3.00	17(12)	22	Petroleum and Petrochemical Technology
2.46	33(24)	30	Pharmaceutical Technology
2.36	34(25)	28	Food and Beverages Technology
-	IF 8 Dec 2016	-	Piping in Chemical Engineering

## I - Scheme Summary of Teaching Scheme/Week, Credits and Examination Scheme

### Chemical Engineering

Semester	Teaching Scheme/Week			Credits (L+T+P)	Examination Scheme				
	L	T	P		Theory		Practical		Grand Total
					ESE	PA	ESE	PA	
I	15	2	16	33	210	90	200	200	700
II	21	4	8	33	385	165	125	125	800
III	20	2	12	34	350	150	125	125	750
IV	19	4	12	35	350	150	150	150	800
V	16	-	22 <sup>^</sup>	38 <sup>^</sup>	350	150	275	275	1050
VI	15	2	18	35	330	120	225	225	900
<b>Total</b>	<b>106</b>	<b>14</b>	<b>88</b>	<b>208<sup>^</sup></b>	<b>1975</b>	<b>825</b>	<b>1100</b>	<b>1100</b>	<b>5000</b>

(<sup>^</sup>): This includes total 6 credits for Industrial Training conducted during Summer Break between IV and V semester.