MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

Diploma Programme in **Mechanical Engineering**

I – Scheme

Programme Structure

Programme Educational Objectives (PEOs) *(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 Mechanical engineering related broad-based problems adapting professional ethics.

PEO 2. Adapt state-of-the-art Mechanical engineering broad-based 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 (POs) given by NBA. *(What s/he will be 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 broad-based Mechanical engineering problems.*

PO 2. ***Discipline knowledge:*** *Apply Mechanical engineering knowledge to solve broad-based mechanical engineering related problems.*

PO 3. ***Experiments and practice:*** *Plan to perform experiments and practices to use the results to solve broad-based Mechanical engineering problems.*

PO 4. ***Engineering tools:*** *Apply relevant Mechanical technologies and 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 Mechanical engineering.*

PO 6. ***Environment and sustainability:*** *Apply Mechanical 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 Mechanical 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 Mechanical engineering and allied industry.*

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

PSO 1. **Modern Software Usage:** Use latest Mechanical engineering related softwares for simple design, drafting, manufacturing, maintenance and documentation of mechanical engineering components and processes.

PSO 2. **Equipment and Instruments:** Maintain equipment and instruments related to Mechanical Engineering.

PSO 3. **Mechanical Engineering Processes:** Manage Mechanical engineering processes by selecting and scheduling relevant equipment, substrates, quality control techniques, and operational parameters.

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 **Mechanical 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 (Common to all) Physics	2	-	2	4	35	15*	25	25	200
2.21	35(30)	2	Basic Science (Common to all) Chemistry	2	-	2	4	35	15*	25	25	
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~[1]	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~[2]	100
3.24	3(2)	11	Workshop Practice Mech. Gp.(AE, FG, ME, PT, CE, EE, CH, PS)	-	-	4	4	-	-	50	50~[2]	100
Total				**15**	**2**	**16**	**33**	**210**	**90**	**200**	**200**	**700**

***(#):**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~[1] (i) practical part - 15 marks(60%) (ii) micro-project part - 10 marks (40%) and for~[2] (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.*

Programme Code: ……..	**I – Scheme**	Diploma Programme in **Mechanical Engineering**

II - 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	
2.75	28 (23)	3	Applied Mathematics (AE, CH, ME, PT, FG)	4	2	-	6	70	30*	-	-	100
2.79 2.21	26(21) 35(30)	12	Applied Science Physics Mech. Gp. (AE, ME, PT, FG, CE)	2	-	2	6	35	15*	25	25	150
			Chemistry	2	-			35	15*			
2.99	13(12)	5	Applied Mechanics (CE, CH, AE, ME, PT, FG)	3	2	2	7	70	30*	25	25	150
2.97	15(13)	6	Engineering Drawing (AE, ME, PT)	3	-	4	7	70	30*	25@	25	150
3.24	3 (2)	11	Mechanical Engg. Workshop (AE, ME)	-	-	4	4	-	-	50	50~[2]	100
3.42	G2 (2)	37	Business Communication Using Computers (Common to all)	2$	-	-	2	35$	15	-	-	50
Total				**16**	**4**	**12**	**32**	**315**	**135**	**125**	**125**	**700**

***($)**:Online Exam; **(#):**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; **(~[2]):** For the courses having ONLY practical, the PA has two parts (i) practical par – 30 marks (60%) (ii) micro-project part– 20 marks (40%); @: with external examiner.*

Programme Code: ……..	**I – Scheme**	Diploma Programme in **Mechanical Engineering**

III - 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	
2.79	25(21)	13	Strength of Materials (AE, FG, ME, PT)	3	2	2	7	70	30*	25	25	150
2.85	21 (17)	19	Thermal Engineering (ME& 3rd Sem FG, PT)	3	-	2	5	70	30*	25	25	150
3.17	6(5)	7	Mechanical Working Drawing	4	-	4	8	70	30*	50	50	200
3.19	5(4)	24	Engineering Metrology	3	-	2	5	70	30*	25	25	150
2.65 2.54	30 (25) 31 (26)	8, 9	Basic Electrical and Electronics Engineering (AE, ME & II Sem PT, FG, PS)	4	-	2	6	70	30*	25	25	150
3.31	1(1)	12	Mechanical Engineering Materials	3$	-	-	3	70$	30*	-	-	100
Total				**20**	**2**	**12**	**34**	**420**	**180**	**150**	**150**	**900**

***($)**: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.*

Programme Code: …….. **I - Scheme** Diploma Programme in **Mechanical Engineering**													
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**		
3.48	5 (4)	24	Mechanical Engineering Measurements	3	-	2	5	70	30*	25	25	150	
3.06	10 (9)	23	Fundamentals of Mechatronics	1#	-	2	3	-	-	25	25	50	
2.78	27(22)	14	Theory of Machines (4^{th} Sem AE, ME & 3^{rd} Sem PT)	3	-	2	5	70	30*	25	25	150	
2.96	16 (14)	21	Fluid Mechanics and Machinery	4	-	2	6	70	30*	25	25	150	
3.14 2.83	7(6) 22(18)	15, 16, 27	Manufacturing Processes	3	-	2	5	70	30*	25	25	150	
3.17	6 (5)	7	Computer Aided Drafting (4^{th} Sem ME,3^{rd} Sem FG & 2^{nd} PS, AE)	-	-	2	2	-	-	25	$25\sim^{1}$	50	
3.04 2.38 3.32	G6 (6) G9 (9) G3(3)	39 40 38	Entrepreneurship Development (Common to all)	2$	-	2	4	50	-	25	$25\sim^{1}$	100	
3.01	12 (11)	36	Environmental Technologies and Energy Management (4^{th} Sem ME, PT & 6^{th} Sem FG)	3	-	2	5	70	30*	25	25	150	
Total				**19**	**0**	**16**	**35**	**400**	**150**	**200**	**200**	**950**	

(#):*No theory Exam;* ***($)****: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;* ***(~[1]):*** *For the courses having ONLY practical, the PA has two parts (i) practical part - 15 marks (60%) (ii) micro- project part - 10 marks (40%).*

Note

a) *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.***

b) *The allotment of the group of students and orientation for industrial training shall be done before the end of IV semester.*

c) *Students should prepare report of training, which will be evaluated during V semester.*

Programme Code: …….. **I – Scheme** Diploma Programme in **Mechanical 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**				
								Theory		**Practical**		**Grand**
				L	**T**	**P**		**ESE**	**PA**	**ESE**	**PA**	**Total**
MSBTE guidelines and industry feedback			Industrial Training (during summer break after IV semester)	-	-	6^	6	-	-	75	75	150
2.38	33 (28)	30	Power Engineering and Refrigeration	3	-	2	5	70	30*	25	25	150
3.03 2.96	11 (10) 17(14)	17	Advanced Manufacturing Processes	3	-	2	5	70	30*	25	25	150
2.86	20 (16)	25	Elements of Machine Design (ME, PT)	3	-	2	5	70	30*	25	25	150
			Elective I	3	-	2	5	70	30*	25	25	150
2.97 2.93 2.46 3.47	14(13) 18 (15) G8 G1 (1) (8)	29 28 41 44	Production Management & Industrial Safety	3	-	2	5	70	30*	25	25	150
3.21	4 (3)	22	CNC Programming	-	-	2	2	-	-	25	25~[1]	50
3.17	6(5)	7	Solid Modeling and Additive Manufacturing (ME, PS, & 4th Sem AE)	-	-	2	2	-	-	25	25~[1]	50
2.96	17(14)	27	Minor Project (Common to all)	-	-	4	4	-	-	50	50	100
Total				**15**	**-**	**24**	**39**	**350**	**150**	**300**	**300**	**1100**

(*): *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;* ***(~[1]):*** *For the courses having ONLY practical, the PA has two parts (i) practical part - 15 marks (60%) (ii) micro- project part - 10 marks (40%);* ***(^)****: 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

a) *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.*

b) *Students have to choose any one elective group in V semester* ***as stream specific specialisation,*** *and have to take first course of that group as elective- I in V semester. They would be required to take another two courses of the same group/stream in VI semester as elective - II and elective - III. Their major and minor projects should also have emphasis preferably on the same stream of specialisation.*

Weighted mean score	**S. No. & (Rank No.) of Report**	**Industry Questionnaire S. No.**	**Group Number and Name of Specialization**
		Group A – Production Engineering	
3.08	8 (7)	18	**Elective I –** Tool Engineering
		Group B – Power & Thermal Engineering	
2.45 2.25	33 (28) 34 (29)	30 32	**Elective I -** Power Plant Engineering

Programme Code: …….. **I – Scheme** Diploma Programme in **Mechanical 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**		**Practical**		**Grand Total**
								ESE	**PA**	**ESE**	**PA**	
IF**	a1	-	Automobile Engineering	3	-	2	5	70	30*	25	25	150
3.08 2.93	9(8) 19 (15)	35 34	Industrial Hydraulics and Pneumatics	3	-	2	5	70	30*	25	25	150
3.31 2.90	2(1) G7 (7)	26 43	Industrial Engineering and Quality Control	4	-	2	6	70	30*	25	25	150
			Elective - II	3	-	2	5	70	30*	25	25	150
			Elective - III	3	-	2	5	70	30*	25	25	150
3.42	G2 (2)	37	Technical Writing (Common to all)	-	-	2	2	-	-	25	25	50
2.96	17(14)	27	Major Project (Common to all)	-	-	6	6	-	-	75	75	150
Total				**16**	**-**	**18**	**34**	**350**	**150**	**225**	**225**	**950**

(*): *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

*a) 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).*

*b) Students who have chosen the **stream specific specialisation** in elective – I in V semester, should choose the same stream/group courses in elective – II and elective – III in VI semester. Their **major project** should also have emphasis preferably on the same group/stream which could further sharpen their skills in that area.*

Weighted mean score	**S. No. & (Rank No.) of Report**	**Industry Questionnaire S. No.**	**Group and Name of Specialization**
		Group A – Production Engineering	
IF**	Other	Other	**Elective II** - Computer Integrated Manufacturing
IF**	Other	Other	**Elective III** - Fabrication Technology
		Group B – Power & Thermal Engineering	
2.82	23(19)	20	**Elective II –** Heating, Ventilation and Air Conditioning
2.40	32,27	31	**Elective III** - Wind and Solar Power Systems

(**): Industrial feedback

I – Scheme Summary of Teaching Scheme/Week, Credits and Examination Scheme

Mechanical Engineering

Semester	Teaching Scheme/Week			Credits (L+T+P)	Examination Scheme				
					Theory		Practical		Grand Total
	L	T	P		ESE	PA	ESE	PA	
I	15	2	16	33	210	90	200	200	700
II	16	4	12	32	315	135	125	125	700
III	20	2	12	34	420	180	150	150	900
IV	19	-	16	35	400	150	200	200	950
V	15	-	24	39^	350	150	300	300	1100
VI	16	-	18	34	350	150	225	225	950
Grand total	**101**	**8**	**98**	**207^**	**2045**	**855**	**1200**	**1200**	**5300**

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