MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

Diploma Programme in **Electrical 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 Electrical engineering related broad-based problems adapting professional ethics.
PEO 2. Adapt state-of-the-art Electrical 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 able 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 Electrical engineering problems.*
PO 2. ***Discipline knowledge:*** *Apply Electrical engineering knowledge to solve broad-based electrical engineering related problems.*
PO 3. ***Experiments and practice:*** *Plan to perform experiments and practices to use the results to solve broad-based Electrical engineering problems.*
PO 4. ***Engineering tools:*** *Apply relevant Electrical 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 the field of Electrical engineering.*
PO 6. ***Environment and sustainability:*** *Apply Electrical 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 Electrical 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 Electrical engineering and allied industry.*

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

PSO 1. Electrical Equipment: Maintain various types of rotating and static electrical equipment.
PSO 2. Electric Power Systems: Maintain different types of electrical power systems.

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 **Electrical 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 **Electrical 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**	
2.38	32(24)	4	Applied Mathematics Elect. & Elx. Gp. (DE, EJ, EE, IE, MU, IS)	4	2	-	6	70	30*	-	-	100
3.21	15(10)	1	Applied Science Physics	2	-	2	6	35	15*	25	25	150
2.21	34(25)	2	Elect. Gp. (EE, IE, IS) Chemistry	2	-			35	15*			
3.72	1(1)	11	Fundamentals of Electrical Engineering	4	2	2	8	70	30*	25@	25	150
3.0	20(15)	15	Elements of Electronics	3	-	2	5	70	30*	25	25	150
2.69	29(21)	8	Basic Mechanical Engineering	3	-	2	5	70	30*	25	25	150
3.36	G4 (3)	40	Business Communication Using Computers (Common to all)	2$	-	-	2	35$	15	-	-	50
Total				**20**	**4**	**8**	**32**	**385**	**165**	**100**	**100**	**750**

***($)**:Online 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; @: with external examiner.*

Programme Code: …….. **I – Scheme** Diploma Programme in **Electrical 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**	
3.69	2(2)	12	Electrical Circuits	4	2	2	8	70	30*	25	25	150
3.62	3(3)	14	Electrical and Electronic Measurements	4	-	2	6	70	30*	25	25	150
3.34	7(6)	28	Fundamentals of Power Electronics (IE, EE)	4	-	2	6	70	30*	25	25	150
2.38	33(24)	19	Electrical Power Generation	4	-	2	6	70	30*	25	25	150
3.48	4(4)	13	Electrical Materials and Wiring Practice	3	-	4	7	70	30*	50	50~[2]	100
Total				**19**	**2**	**12**	**33**	**350**	**150**	**150**	**150**	**800**

***(*):** 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; **(~[2]):** For the courses having ONLY practical examination, the PA has two parts – marks for~[2] (i) practical part - 30 marks (60%) (ii) micro-project part – 20 marks (40%).*

Programme Code: …….. **I – Scheme** Diploma Programme in **Electrical Engineering**													
IV – 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**	
2.9	23(17)	16	DC Machines and Transformers	4	2	2	8	70	30*	25	25	150
2.9	22(17)	22	Electric Power Transmission and Distribution	3	2		5	70	30*	-	-	100
2.97	21(16)	29	Industrial Measurement (EE IE & 3rd Sem IS)	3	-	2	5	70	30*	25	25	150
2.79, 2.79	26(19), 27(19)	32,33	Digital Electronics and Microcontroller Applications	4	-	2	6	70	30*	25	25	150
3.0, 93	G6(6), EJ2G7(7)	43, 39	Managerial skills and TQM (IS, EE & 5th Sem DE, PS, EJ, IE)	3	-	-	3	70	30*	-	-	100
3.17	16(11)	7	Electrical Drawing and CAD	-	-	4	4	-	-	50~	50~[2]	100
Total				**17**	**4**	**10**	**31**	**350**	**150**	**125**	**125**	**750**

***(*):** 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;* ***(~[2]):** For the courses having ONLY practical examination, the PA has two parts – marks for~[2] (i) practical part - 30 marks (60%) (ii) micro-project part – 20 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 **Electrical Engineering**													
V – 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**	
MSBTE guidelines and industry feedback			Industrial Training (during summer break after IV semester)	-	-	6^	6^	-	-	75	75	150
3.24	13 (9)	18	Induction, Synchronous and FHP Machines	4	-	2	5	70	30*	25	25	150
3.24	12 (9)	24	Switchgear and Protection	4	-	2	6	70	30*	25	25	150
2.79, 2.79	26(19), 27(19)	32, 33	Elements of Industrial Automation	4	-	2	6	70	30*	25	25	150
			Elective I	3	-	2	5	70	30*	25	25	150
3.31	8(7)	36	Energy Conservation and Audit	3	-	2	5	70	30*	25	25	150
2.31	G8 (8)	40	Entrepreneurship Development (Common to all)	2$	-	2	4	50$	-	25	25~[1]	100
3.66	G3(3)	38	Minor Project (Common to all)	-	-	4	4	-	-	50	50	100
Total				**20**	**-**	**20^**	**40^**	**400**	**150**	**250**	**250**	**1050**

***($)**: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%). **(^):** 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 – Industry Automation (Choose any one)
3.24	11(9)	26	**Elective I -** Elements of Industrial Automation
			Group B – Power System
2.45	31	20	**Elective I** - Wind Power Technologies (EE, IS)
			Group C – Commercial Electrification and Traction (Choose any one)
			Elective I - Electrification of Building Complexes

Programme Code**:** …….. **I – Scheme** Diploma Programme in **Electrical 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	Testing, Commissioning and Maintenance of Electric Equipment	3	-	2	5	70	30	25	25	150
3.21, 2.86	14(10), 25(18)	31, 30	Utilization of Electrical Energy	4	-	2	6	70	30*	25	25	150
2.62	30(22)	27	Electrical Estimation and Contracting	3	-	2	5	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
3.36	G4 (3)	40	Technical Writing (Common to all)	-	-	2	2	-	-	25	25	50
3.66	G3(3)	38	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. and (Rank No.) of Report	Industry Questionnaire S. No.	Group Number and Name of Specialization
		Group A – Industry Automation (Choose any one)	
3.21	14(10)	31	**Elective II** -Industrial Drives and Control
2.79	26(19)	33	**Elective III** - PLC and SCADA
		Group B – Power System (Choose any one for elective II)	
2.45	31	20	**Elective II** - Solar and Biomass Power Technologies (EE, IS)
2.9	22(17)	22	**Elective II** -Power System Operation and Control
3.24	13(9)	24	**Elective III** - Substation Practices
		Group C – Commercial Electrification and Traction (Choose any one)	
			Elective II -Maintenance of Transformers and Circuit Breakers
			Elective III - Electric Traction and Vehicle

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

Electrical 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	20	4	8	32	385	165	100	100	750
III	19	2	12	33	350	150	150	150	800
IV	17	4	10	31	350	150	125	125	750
V	20	-	20^	40^	400	150	250	250	1050
VI	16	-	18	34	350	150	225	225	950
Total	**107**	**12**	**84^**	**203^**	**2045**	**855**	**1050**	**1050**	**5000**

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