

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

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

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

- PSO 1: Instrumentation Equipment:** Maintain various types of field instrumentation equipment.
- PSO 2: Instrumentation Control Systems:** Maintain different types of process control systems.

Notes for All the Semesters

- 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).
- 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.
- 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.
- 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 Instrumentation 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		
3.36	G4 (3)	40	English (Common to all)	3	-	2+	5	70	30*	25	25	150	
2.76,	25 (20)	1	Basic Science	2	-	2	35	15*	10*	25	25	200	
2.09	(29)	37	(Common to all) Physics Chemistry	2	-	2	35	15*	10*	25	25		
2.88	21 (16)	3	Basic Mathematics (Common to all)	4	2	-	6	70	30*	-	-	100	
3.58	G2 (1)	48	Fundamentals of ICT (Common to all)	2#	-	2	4	-	-	25	25~ ¹	50	
3.0	18(14)	7	Engineering Graphics non-Mech.Gp.(EJ, DE, IE, IS, MU, CO, IF)	2#	-	4	6	-	-	50	50~ ²	100	
3.1	18(13)	9	Workshop Practice Elx. Gp. (EJ, DE, IE, IS, MU)	-	-	4	4	-	-	50	50~ ²	100	
Total				15	2	16	33	240	60	200	210	90	

(#):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%); @:with external examiner.

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 Instrumentation 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	
2.45	30 (23)	4	Applied Mathematics Elect. & Elx. Gp (IE, DE, MU, IS, EE, IE, EJ)	4	2	-	6	70	30*	-	-	100
2.76,	25 (20)	1	Applied Science	2	-	-	6	35	15*	25	25	150
2.09	(29)	37	Physics Chemistry Elect. Gp. (EE, IE, IS)	2	-	2		35	15*			
2.33	33(26)	21a	Basic Electronics Elx. Gp. (IE,DE, EJ, IS)	4	-	4	8	70	30*	50@	50	200
3.18	15(11)	9	Elements of Electrical Engineering Elx & Comp. Gp. (DE, EJ, IE, IS, CO, IF)	4	-	2	6	70	30*	25	25	150
3.06	17 (13)	11	Instrumentation Workshop	-	-	4	4	-	-	50	50~ ²	100
3.36	G4 (3)	40	Business Communication Using Computers (Common to all)	2\$	-	-	2	35\$	15	-	-	50
Total				18	2	12	32	315	135	150	150	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; (~):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%); @: with external examiner.

Programme Code: I – Scheme Diploma Programme in Instrumentation 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	
3.3	10(8)	17	Digital Techniques Elx. Gp. & Comp.(DE, EJ, IE, IS, MU, CO)	4	-	2	6	70	30*	25	25	150
2.33	33(26)	21b	Applied Electronics Elx. Gp (DE, EJ, IE, IS)	4	-	4	8	70	30*	50	50	200
IF	01	-	Electronic Instruments and Measurements Elx. Gp (IS, DE, IE, MU)	4	-	2	6	70	30*	25	25	150
3.55	2(2)	13, 22	Industrial Measurements (IS & 4 th Sem IE, EE)	3	-	2	5	70	30*	25	25	150
2.79	19	24	Instrumentation Data Communication	4	-	2	6	70	30*	25	25	150
2.03	38(30)	10	Programming in 'C' (IS & 2 nd Sem MU, IE)	2#	-	2	4	-	-	25	25~	50
Total				21	-	14	35	350	150	175	175	850

(#):No theory 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%); IF – Industry Feedback.

Programme Code: I – Scheme Diploma Programme in Instrumentation 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	
2.45	29 (23)	20	Linear Integrated Circuits (EJ, DE, IE, IS)	4	-	2	6	70	30*	25	25	150
3.48	5 (4)	23	Industrial Transducers	4	2	4	10	70	30*	50	50	200
2.73	26 (21)	29	Microcontroller and Applications (DE, EJ, IS & 5 th Sem IE)	4	-	2	6	70	30*	25	25	150
2.82	23 (18)	31	Basic Power Electronics (IS & 3 rd Sem DE, EJ)	3	-	2	5	70	30*	25	25	150
2.64	G6 (5)	42, 46	Managerial skills and TQM (IS, EE & 5 th Sem DE, PS, EJ, IE)	3	-	-	3	70	30*	-	-	100
IF	O3	-	VB.net Elementary programming	2#	-	2	4	-	-	25	25 ^{~1}	50
Total				20	2	12	34	350	150	150	150	800

(#):No theory 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.

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 Instrumentation 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 6 th semester)	-	-	6 [^]	6 [^]	-	-	75	75	150
3.39	8 (6)	19, 36	Control Systems	4	-	4	8	70	30*	50	50	200
3.52	4 (3)	16, 25	Process Instrumentation	4	-	2	6	70	30*	25	25	150
3.61	1 (1)	27	Industrial Automation (EJ, IS & 6 th Sem DE)	3	-	2	5	70	30*	50	50	200
Elective I				3	-	2	5	70	30*	25	25	150
2.36	G8 (7)	43	Entrepreneurship Development all (Common to)	2\$	-	2	4	50\$	-	25	25 ^{~1}	100
Minor Project (Common to all)				-	-	4	4	-	-	50	50	100
Total				16	-	20[^]	38[^]	330	120	300	300	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 4 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.

Weighted mean score	S. No. & (Rank No.) of Report	Industry Questionnaire S. No.	Elective I (choose any one)
2.91	19 (15)	26	Analytical Instrumentation
2.91	19 (15)	26	Optoelectronic Instrumentation
2.45	27 (22)	33	Embedded System Elx. Gp. (DE, EJ, IS & 6 th Sem IE)
2.45	31	20	Wind Power Technologies (EE, IS)

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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	
3.33	09 (7)	12,15	Process Control	3	-	2	5	70	30*	25	25	150
1.91	39 (31)	24	Biomedical Instrumentation	4	-	2	6	70	30*	25	25	150
			Elective - II	3	-	2	5	70	30*	25	25	150
2.67	27 (22)	39	Environmental Instrumentation and Energy Conservation	3	-	2	5	70	30*	25	25	150
2.27, 2.18	34,35 (27, 28)	34, 35	Power Plant Instrumentation	4	-	2	6	70	30*	25	25	150
3.36	G4 (3)	40	Technical Writing (Common to all)	-	-	2	2	-	-	25	25	50
			Major Project (Common to all)	-	-	6	6	-	-	75	75	150
Total				17	-	18	35	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

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 (choose any one)
3.52	3 (3)	28	Distributed Control System
2.18	36 (28)	37	Mechatronics (DE, EJ, IE, IS)
2.45	31	20	Solar and Biomass Power Technologies (EE, IS)
	IF		Building Automation

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

Instrumentation 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	18	2	12	32	315	135	150	150	750
III	21	-	14	35	350	150	175	175	850
IV	20	2	12	34	350	150	150	150	800
V	16	-	20 [^]	38 [^]	330	120	300	300	1050
VI	17	-	18	35	350	150	225	225	950
Total	107	6	92[^]	207[^]	1905	795	1200	1200	5100

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