



# Maharashtra State Board of Technical Education, Mumbai

## Teaching and Examination Scheme for Short Term Diploma Courses

**Program Name : Advance Diploma in Maintenance of Building Management System**

**Program Code : MB**

**With Effect From Academic Year: 2021 - 22**

**Duration of Program : 2 Semesters**

**Duration : 16 Weeks**

**Semester : First**

**Scheme - I**

								Examination Scheme														Grand Total		
S. N.	Course Title	Course Abbreviation	Course Code	Teaching Scheme			Credit (L+T+P)	Theory								Practical								
				L	T	P		Exam Duration in Hrs.	ESE		PA		Total		ESE		PA		Total					
									Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
1	HVAC Systems	HSY	26111	3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150			
2	Surveillance & PA Systems	SPS	26112	3	2	-	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150			
3	Fire Alarm Systems	FAS	26113	3	-	2	5	1	25	10	25*	00	50	20	25@	10	25	10	50	20	100			
4	Access Control System	ACS	26114	3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150			
5	IBM Systems	ISY	26115	3	1	2	6	3	70	28	30*	00	100	40	25@	10	25	10	50	20	150			
Total				15	03	08	26	--	305	--	145	--	450	--	125	--	125	--	250	--	700			

Student Contact Hours Per Week: **26 Hrs.**

Medium of Instruction: **English**

**Theory and practical periods of 60 minutes each.**

**Total Marks : 700**

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

@ Internal Assessment, # External Assessment, \*# On Line Examination, ^ Computer Based Assessment

~ For the courses having ONLY Practical Examination, the PA marks Practical Part - with 60% weightage and Micro-Project Part with 40% weightage.

- If Candidate not securing minimum marks for passing in the "PA" part of practical of any course of any semester then the candidate shall be declared as "Detained" for that semester.
- The average of 2 test to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.
- During Internship and project period students shall attend Institute one day in a week to meet the mentor and appraise about the progress. The log book, Project Dairy and Internship performance shall be recorded by the mentor for progressive assessment





# Maharashtra State Board of Technical Education, Mumbai

## Teaching and Examination Scheme for Short Term Diploma Courses

**Program Name : Advanced Diploma in Maintenance of Building Management System**

**Program Code : MB**

**With Effect From Academic Year: 2021 - 22**

**Duration of Program : 2 Semesters**

**Duration : 16 Weeks**

**Semester : Second**

**Scheme - I**

S. N.	Course Title	Course Abbreviation	Course Code	Teaching Scheme			Credit (L+T+P)	Examination Scheme												Grand Total	
				L	T	P		Theory						Practical							
								Exam Duration in Hrs.	ESE		PA		Total		ESE		PA		Total		
									Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks		Min Marks
1	Project	PRO	26005	-	-	4	4	--	--	--	--	--	--	--	50#	20	50~	20	100	40	100
2	Industrial Training	ITR	26006	-	-	30	30	--	--	--	--	--	--	--	150#	60	50~	20	200	80	200
Total				-	-	34	34	--	--	--	--	--	--	--	200	--	100	--	300	--	300

Student Contact Hours Per Week: **34 Hrs.**

Medium of Instruction: **English**

**Theory and practical periods of 60 minutes each.**

**Total Marks : 300**

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

@ Internal Assessment, # External Assessment, \*# On Line Examination, ^ Computer Based Assessment

~ For the courses having ONLY Practical Examination, the PA marks Practical Part - with 60% weightage and Micro-Project Part with 40% weightage

- If Candidate not securing minimum marks for passing in the "PA" part of practical of any course of any semester then the candidate shall be declared as "Detained" for that semester.
- The average of 2 test to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.
- During Internship and project period students shall attend Institute one day in a week to meet the mentor and appraise about the progress. The log book, Project Dairy and Internship performance shall be recorded by the mentor for progressive assessment



**Program Name** : Advance Diploma in Maintenance of Building Management System  
**Program Code** : MB  
**Semester** : First  
**Course Title** : HVAC Systems  
**Course Code** : 26111

## 1. RATIONALE

Knowledge of building environments is essential for design, operation and maintenance of complex HVAC systems. Knowledge of systems and controls enables building personnel to create a healthy, productive indoor environment. This course will help the students to understand the various aspects of HVAC systems and maintenance of HVAC systems.

## 2. COMPETENCY

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

- **Maintain the HVAC Systems.**

## 3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Identify the elements and types of HVAC systems
- To maintain the different HVAC components.
- To maintain the different types of HVAC sensors
- To control HVAC system.

## 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
L	T	P		Theory								Practical					
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	--	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	

(\*): Under the theory PA, 30 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

**Legends:** L-Lecture; T- Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, ESE -End Semester Examination; PA - Progressive Assessment

## 5. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency:



Sr. No.	Practical Outcomes (PrOs)	Unit No.
1	To identify the parts of HVAC systems	I
2	To identify the types of HVAC systems	I
3	To maintain HVAC boiler system and sensors.	II,III
4	To maintain HVAC chiller system and sensors.	II,III
5	To maintain AHU system and sensors.	II,III
6	To operate & control HVAC pumps systems and sensors.	II,III
7	To observe overall maintenance of HVAC system and sensors.	IV
8	To observe & test HVAC controls.	IV

**Note**

- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practicals need to be performed, out of which, the practicals marked as '\*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.
- The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

Sr. No.	Performance Indicators	Weightage in %
a.	Preparation of experimental set up	20
b.	Setting and operation	20
c.	Safety measures	10
d.	Observations and Recording	10
e.	Interpretation of result and Conclusion	20
f.	Answer to sample questions	10
g.	Submission of report in time	10
<b>Total</b>		<b>100</b>

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Practice good housekeeping.
- Practice energy conservation.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment.
- Follow ethical Practices.

**6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED**

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

Sr. No.	Equipment Name with Broad Specifications	PrO. No.	Approx cost
1	HVAC systems (Air handling unit, Chiller unit, Pump system, Cables, DDC/VFD/VA, etc., Filters, Ventilation fans, A/c piping, design, and sensors etc.		₹ 1,00,000/-





## 7. UNDERPINNING THEORY COMPONENTS

The following topics/sub topics should be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency.

Unit	Topic and contents	Hours	Marks
<b>01</b> <b>The Basic Central Air Conditioning System</b>	<b>The basic central air conditioning system</b> 1.1 Components of air conditioning systems & definitions 1.2 Classification of HVAC systems: All Air system, All water system, Air – water system, (Diagram, construction & working, advantage & Disadvantage), 1.3 HVAC Zones and Rooms.	10	20
<b>02</b> <b>Components of HVAC</b>	<b>Components of HVAC</b> 2.1 Boiler, 2.2 Chiller, (Refrigeration cycle ) 2.3 Cooling Tower 2.4 Air-handling unit (AHU), 2.5 Air terminal unit (ATU), 2.6 PAC system(Precision Air conditioning system 2.7 Variable air volume equipment (VAV) (Diagram, construction & working)	18	25
<b>03</b> <b>Sensors and Systems</b>	<b>Sensors and systems</b> 3.1 Temperature Sensors 3.2 Pressure sensors 3.2 Occupancy sensors 3.3 Duct smoke detectors 3.4 Humidity Sensors 3.5 Indoor air quality Sensors	12	10
<b>04</b> <b>HVAC operation and Maintenance</b>	<b>HVAC operation and maintenance</b> 3.1 Sequence of operation. 3.2 DDC control system 3.2 Maintenance. 3.3 HVAC Controls 3.4 SOP (standard operating Procedure of Chiller) 3.5 Dos & don't	8	15
<b>Total</b>		<b>48</b>	<b>70</b>

## 8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	The Basic Central Air Conditioning System	10	10	10	--	20
II	Components of HVAC	18	10	10	05	25
III	Sensors and systems	12	03	03	04	10
III	HVAC maintenance	8	05	05	05	15
<b>Total</b>		<b>48</b>	<b>28</b>	<b>28</b>	<b>04</b>	<b>70</b>



**Legends:** R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

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

## 9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 3-5 pages for each activity, and also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Identify the various types of HVAC system
- Identify the various units in HVAC system
- Test the given sensor
- Troubleshoot the errors if the system is not working as per the requirements

## 10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).

## 11. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1.	Honeywell Engineering manual of Automatic Control for Commercial buildings	Honeywell	Honeywell
2.	Building Environment: HVAC Systems	Alan J Zajac	Johnson Controls, Inc.
3.	HVAC Controls and Systems	Levenhagen, John I. Spethmann, Donald H.,	McGraw-Hill Pub.
4.	Smart Buildings	Jim Sinopoli	Butterworth-Heinemann imprint of Elsevier, 2nd ed., 2010.

## 12. SOFTWARE/LEARNING WEBSITES



**Program Name** : Advance Diploma in Maintenance of Building Management System  
**Program Code** : MB  
**Semester** : First  
**Course Title** : Surveillance & PA Systems  
**Course Code** : 26112

### 1. RATIONALE

Security of the building and safety of personal are becoming important aspects now a day and in near future, it will be in a great demand. This course will help the students to understand the various aspects of video surveillance and PA systems and its maintenance.

### 2. COMPETENCY

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

- **Maintain the video surveillance systems and PA Systems.**

### 3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Identify the elements of CCTV systems and PA systems.
- Troubleshoot the faults in CCTV and PA systems
- Maintain the CCTV and PA systems.

### 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
L	T	P		Theory								Practical					
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	2	--	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	

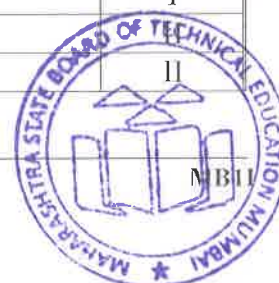
(\*): Under the theory PA, 30 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

**Legends:** L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, ESE -End Semester Examination; PA - Progressive Assessment

### 5. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency:

Sr. No.	Practical Outcomes (PrOs)	Unit No.
1	To test the given CCTV camera& cable	I
2	To test the given DVR / NVR system	II
3	To connect the CCTV assembly circuit as per given block diagram	



Sr. No.	Practical Outcomes (PrOs)	Unit No.
4	Configuration of CCTV surveillance systems with DVR connectivity	II
5	Configuration of CCTV surveillance systems with NVR connectivity (LAN/Wan/android, etc)	II
6	To assemble PA system as per given circuit diagram.	III
7	To test the given Public addressable system	III
8	To troubleshoot the problem in PA system	III

**Note**

- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '\*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.
- The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

Sr. No.	Performance Indicators	Weightage in %
a.	Preparation of experimental set up	20
b.	Setting and operation	20
c.	Safety measures	10
d.	Observations and Recording	10
e.	Interpretation of result and Conclusion	20
f.	Answer to sample questions	10
g.	Submission of report in time	10
<b>Total</b>		<b>100</b>

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Practice good housekeeping.
- Practice energy conservation.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment.
- Follow ethical Practices.

**6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED**

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

Sr. No	Equipment Name with Broad Specifications	PrO. No.	Approx cost
1	CCTV Cameras (analog/IP based ,etc)		40,000/-
2	DVR / NVR system (4/8/16/32 channel, etc)		22,000/-
3	Cables (3+1/4+1/RG-6/11, CAT – 5/6, etc)		10,000/-
4	Power supply (12v – 1 amp to 8 amp DC source)		3,000/-
5	Video display		18,000/-





Sr. No	Equipment Name with Broad Specifications	PrO. No.	Approx cost
6	Video distributor		3,000/-
7	BNC/RC connectors, etc		5,000/-
8	Tools (crimping tool, punching machine, wire cutters, pliers, screw driver set, RG – 45 cable tester, drill machine, etc)		20,000/-
9	Microphone, amplifier, speaker system, mixer, etc		30,000/-
10	LAN/WAN, (Router, modem, etc)		8,000/-

## 7. UNDERPINNING THEORY COMPONENTS

The following topics/sub topics should be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency.

Unit	Topic and contents	Hours	Marks
<b>1</b> <b>Introduction</b>	<b>Introduction</b> ➤ Types of technologies used in CCTV Surveillance Systems according to the need of site ➤ Appropriate CCTV components according to the site ➤ CCTV systems with their specifications ➤ Applications	10	12
<b>2</b> <b>Video Surveillance Systems</b>	<b>Video surveillance systems</b> ➤ Types of camera, ➤ DVR/NVR systems ➤ Diagrams, Features of camera, ➤ DVR/NVR, power supply, etc ➤ Block diagram, circuit diagram on CCTV control systems and working. ➤ Reports & checklist of HDD back up. ➤ Various drills of video display(VGO/VGA/LAN/WAN), distributors, etc	20	28
<b>3</b> <b>Public Address Systems</b>	<b>Public Address systems</b> ➤ Types of PA systems ➤ Block diagram, circuit diagram and features of PA systems ➤ Reports & checklist of fader, amplifier, etc. ➤ Various drills of microphone, speakers, etc	18	30
<b>Total</b>		<b>48</b>	<b>70</b>

## 8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction	10	04	04	04	12
II	Video surveillance systems	20	08	10	10	28
III	Public addressable systems	18	10	10	10	30
<b>Total</b>		<b>48</b>	<b>22</b>	<b>24</b>	<b>24</b>	<b>70</b>



**Legends:** R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

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

## 9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 3-5 pages for each activity, and also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Identify type of CCTV system installed in premises.
- Identify the type of Camera
- Connect and install CCTV systems
- Connect and install PA systems
- Troubleshoot the fault/error in the system

## 10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).

## 11. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Smart Building Systems for Architects, Owners, and Builders	Jim Sinopoli	Butterworth-Heinemann imprint of Elsevier, 2nd ed., 2010.
2	CCTV Surveillance 2nd Edition	Herman Kruegle	Butterworth-Heinemann eBook ISBN: 9780080468181
3	PA systems		

## 12. SOFTWARE/LEARNING WEBSITES



**Program Name** : Advance Diploma in Maintenance of Building Management System  
**Program Code** : MB  
**Semester** : First  
**Course Title** : Fire Alarm Systems  
**Course Code** : 26113

### 1. RATIONALE

Security of the building and safety of personal are becoming important aspects now a day and in near future, it will be in a great demand. This course will help the students to understand the various aspects of Fire alarm systems and maintenance of fire alarm systems.

### 2. COMPETENCY

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

- Maintain the fire alarm systems.

### 3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Identify the elements of Fire alarm systems.

### 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
L	T	P		Theory								Practical					
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	--	2	5	1	25	10	25*	00	50	20	25@	10	25	10	50	20	

(\*): Under the theory PA, 30 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

**Legends:** L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, ESE -End Semester Examination; PA - Progressive Assessment

### 5. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency:

Sr. No.	Practical Outcomes (PrOs)	Unit No.
1	To identify components of fire alarm, hydrant and suppression systems	I
2	To test the given fire, heat detector.	II
3	To test the smoke detectors.	II
4	To connect FAS as per wiring loop diagram.	II
5	To study the operation of annunciator.	



Sr. No.	Practical Outcomes (PrOs)	Unit No.
6	To find out the fault in FAS control panel.	III
7	To troubleshoot the false alarm conditions.	III
8	To observe the protocols to be followed in fire situations.	III

**Note**

- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '\*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.
- The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

Sr. No.	Performance Indicators	Weightage in %
a.	Preparation of experimental set up	20
b.	Setting and operation	20
c.	Safety measures	10
d.	Observations and Recording	10
e.	Interpretation of result and Conclusion	20
f.	Answer to sample questions	10
g.	Submission of report in time	10
<b>Total</b>		<b>100</b>

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Practice good housekeeping.
- Practice energy conservation.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment.
- Follow ethical Practices.

**6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED**

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

Sr. No.	Equipment Name with Broad Specifications	PrO. No.	Approx cost
1	Fire alarm panel (Conventional )	1	36000
2	Fire alarm panel( addressable)	1	90000
3	Heat detectors	2	10000
4	Smoke detectors	3	10000
5	Break glass unit or manual call point.	1,4	5000
6	VESDA system, VESDA pipe, FM – 200 system, etc.	4,5,6	700000
7	Fire extinguishers systems, etc.	6,7,8	50000





## 7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency.

Unit	Topic and contents	Hours	Marks
<b>1</b> <b>Introduction</b>	<b>Introduction</b> <ul style="list-style-type: none"> <li>➤ Introduction about fire (Types of Fire, Classification of Fire )</li> <li>➤ Methods for extinguish to Fire (Smoothening , Blanketing , ... Etc)</li> <li>➤ Types of fire Extinguishers</li> <li>➤ Overview FAS systems.</li> <li>➤ Block diagram of FAS.</li> <li>➤ Types of FAS <ul style="list-style-type: none"> <li>- Non-Addressable System</li> <li>- Addressable System</li> <li>- Hybrid System</li> </ul> </li> <li>➤ Applications.</li> </ul>	20	20
<b>2</b> <b>FAS Components</b>	<b>FAS Components</b> <ul style="list-style-type: none"> <li>➤ Fire and smoke detectors,</li> <li>➤ Smart sensors,</li> <li>➤ Fire Alarm Control Panel,</li> <li>➤ Annunciator panel,</li> <li>➤ Cabling installation and testing</li> </ul>	16	24
<b>3</b> <b>Maintenance</b>	<b>Maintenance</b> <ul style="list-style-type: none"> <li>➤ Regular Testing and Inspection</li> <li>➤ False Alarm Management</li> <li>➤ Common Maintenance Problems And Troubleshooting</li> <li>➤ Emergency Response</li> <li>➤ SOP (Standard Operating Procedure).</li> </ul>	12	26
<b>Total</b>		<b>48</b>	<b>70</b>

## 8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction	20	10	04	06	20
II	FAS Components	16	08	10	06	24
III	Maintenance	12	08	10	08	26
<b>Total</b>		<b>48</b>	<b>26</b>	<b>24</b>	<b>20</b>	<b>70</b>

**Legends:** R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

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



## 9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 3-5 pages for each activity, and also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Identify different types of sensors, detectors in given FAS
- Installing Heat/RoR Detectors, Smoke Detectors and Multi Criteria detectors as per requirement
- Wiring of FAS hardware.
- Troubleshoot the errors if the system is not working as per the requirements

## 10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).

## 11. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Smart Buildings	Jim Sinopoli	Butterworth-Heinemann imprint of Elsevier, 2nd ed., 2010.
2	Intelligent Building Systems	by Albert Ting-Pat So, WaiLok Chan,	Kluwer Academic publisher, 3rd ed., 2012.
3	Process Control-Instrument Engineers Handbook.	Bela G. Liptak,	Chilton book co

## 12. SOFTWARE/LEARNING WEBSITES

- [https://www.scdf.gov.sg/docs/default-source/scdf-library/fssd-downloads/fsmas\\_overview\\_of\\_fire\\_alarm\\_systems\\_-\\_maintenance.pdf](https://www.scdf.gov.sg/docs/default-source/scdf-library/fssd-downloads/fsmas_overview_of_fire_alarm_systems_-_maintenance.pdf)



**Program Name** : Advance Diploma in Maintenance of Building Management System  
**Program Code** : MB  
**Semester** : First  
**Course Title** : Access Control System  
**Course Code** : 26114

### 1. RATIONALE

Security of the building and safety of personal are becoming important aspects now a day and in near future, it will be in a great demand. This course will help the students to understand the various aspects of access control systems and its maintenance.

### 2. COMPETENCY

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

- **Maintain the access control systems.**

### 3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Identify the elements of access control systems.
- Troubleshoot the faults in access control systems
- Maintain the access control systems.

### 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
L	T	P		Theory								Practical					
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	--	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20	

(\*): Under the theory PA, 30 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

**Legends:** L-Lecture; T- Tutorial/Teacher Guided Theory Practice; P-Practical; C- Credit, ESE -End Semester Examination; PA - Progressive Assessment

### 5. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency:

Sr. No.	Practical Outcomes (PrOs)	Unit No.
1	To study operation of access control system	II
2	To test the sensors/ readers	



Sr. No.	Practical Outcomes (PrOs)	Unit No.
3	To test locks and relays	II
4	To test the controllers	II
5	To connect the system components as per diagram	II
6	Access control system: Access control deployment at a typical door.	II
7	To operate from the monitoring station	III
8	To trouble shoot the faults in the system	III
9	To program the proximity access card	III

**Note**

- i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '\*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.
- ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

Sr.No.	Performance Indicators	Weightage in %
a.	Preparation of experimental set up	20
b.	Setting and operation	20
c.	Safety measures	10
d.	Observations and Recording	10
e.	Interpretation of result and Conclusion	20
f.	Answer to sample questions	10
g.	Submission of report in time	10
<b>Total</b>		<b>100</b>

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- a. Follow safety practices.
- b. Practice good housekeeping.
- c. Practice energy conservation.
- d. Demonstrate working as a leader/a team member.
- e. Maintain tools and equipment.
- f. Follow ethical Practices.

**6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED**

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

Sr. No.	Equipment Name with Broad Specifications	Approx cost
1	Access control reader	
2	Electromagnetic lock	10000





Sr. No.	Equipment Name with Broad Specifications	Approx cost
3	Access door controller	60000
4	Proximity access card (consumable)	125
5	Access control software	15000
6	cabling and tools	25000
7	Backnet/ Ethernet protocol	5,000
8	Exit / push button switches	10000

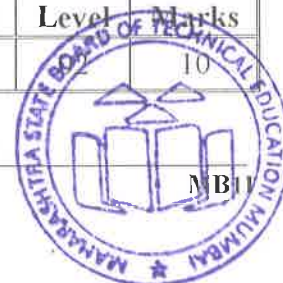
## 7. UNDERPINNING THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency.

Unit	Topic and contents	Hours	Marks
<b>1</b> <b>Introduction</b>	<b>Introduction</b> <ul style="list-style-type: none"> <li>➤ Components of an access control system</li> <li>➤ Access Control Technologies &amp; types</li> <li>➤ Data Encryption &amp; Security</li> <li>➤ Access Control Strategy</li> <li>➤ Access Controllers</li> <li>➤ Biometrics</li> <li>➤ Applications and benefits</li> </ul>	12	10
<b>2</b> <b>Installation and control</b>	<b>Installation and control</b> <ul style="list-style-type: none"> <li>➤ Requirements of Access Controls Systems by site survey</li> <li>➤ Server or Host Computer</li> <li>➤ Control Panels</li> <li>➤ Wiring</li> <li>➤ Peripheral Devices <ul style="list-style-type: none"> <li>- Door contacts</li> <li>- Card readers</li> <li>- Request-to-exit</li> </ul> </li> <li>➤ Features</li> </ul>	24	30
<b>3</b> <b>Maintenance</b>	<b>Maintenance</b> <ul style="list-style-type: none"> <li>➤ Maintenance of Access Control devices and controller</li> <li>➤ Maintenance of Access Control relay, readers</li> <li>➤ Maintenance of power supply</li> <li>➤ Software's and protocols</li> <li>➤ SOP (standard Operating Procedure )</li> <li>➤ Dos &amp; Don'ts</li> </ul>	12	30
<b>Total</b>		<b>48</b>	<b>70</b>

## 8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction	12	04	04		10



II	Installation and control	24	10	10	10	30
III	Maintenance	12	10	10	10	30
<b>Total</b>		<b>48</b>	<b>24</b>	<b>24</b>	<b>22</b>	<b>70</b>

**Legends:** R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

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

## 9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 3-5 pages for each activity, and also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Identify type access control system
- Wiring, installation and testing
- Troubleshoot the fault/error in the system

## 10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).

## 11. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Smart Building Systems for Architects, Owners, and Builders	Jim Sinopoli	Butterworth-Heinemann imprint of Elsevier, 2nd ed., 2010.
2	Understanding Building Automation system:	Reinhold A. Carlson, Robert A. Di Giandomenico	R.S. Means Company
3	Intelligent Building Systems	by Albert Ting-Pat So, WaiLok Chan,	Kluwer Academic publisher, 3rd ed., 2012.

## 12. SOFTWARE/LEARNING WEBSITES



**Program Name** : Advance Diploma in Maintenance of Building Management System  
**Program Code** : MB  
**Semester** : First  
**Course Title** : IBM Systems  
**Course Code** : 26115

### 1. RATIONALE

Knowledge of systems and controls enables building personnel to create a healthy, productive indoor environment. This course will help the students to understand the various aspects of IBMS systems and operation of IBMS systems.

### 2. COMPETENCY

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

- Integrate HVAC, FAS, and Access Control and CCTV systems on Building Automation System Control Panel and verify correct operation.

### 3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Identify the elements IBMS.
- Operate the IBMS system.
- Monitor various building parameters IBMS system
- Use the IBMS system features

### 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme													
L	T	P		Theory								Practical					
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	1	2	6	3	70	28	30*	00	100	40	25@	10	25	10	50	20	

(\*): Under the theory PA, 30 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain UOs required for the attainment of the COs.

**Legends:** L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, ESE -End Semester Examination; PA - Progressive Assessment

### 5. SUGGESTED PRACTICALS/ EXERCISES

The practical's in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency:

Sr. No.	Practical Outcomes (PrOs)	Unit
1	Study of BMS room layout	1



Sr. No.	Practical Outcomes (PrOs)	Unit No.
2	Demonstration of fire alarm systems.	II,III
3	Demonstration of Access control systems.	II,III
4	Demonstration of HVAC control systems.	II,III
5	Demonstration of CCTV systems.	II,III
6	Drills of fire alarm & BMS systems.	III
7	Maintenance of BMS systems.	III
8	Case studies.	III

**Note**

- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '\*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.
- The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

Sr. No.	Performance Indicators	Weightage in %
a.	Preparation of experimental set up	20
b.	Setting and operation	20
c.	Safety measures	10
d.	Observations and Recording	10
e.	Interpretation of result and Conclusion	20
f.	Answer to sample questions	10
g.	Submission of report in time	10
<b>Total</b>		<b>100</b>

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Practice good housekeeping.
- Practice energy conservation.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment.
- Follow ethical Practices.

**6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED**

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

Sr. No.	Equipment Name with Broad Specifications	PrO No.	Approx cost
1	Monitoring stations of HVAC, Access control, Fire alarm systems	2,3,4	200000
2	BAC net protocol (Bckt) for all control systems	1	150000
3	Tools etc	All	10000





Sr. No.	Equipment Name with Broad Specifications	PrO No.	Approx cost
4	Schneider /Seimens / Jhonson / Honeywell Continuum software& hardware of BMS	All	175000
5	Genetic building management systems software	All	100000

## 7. UNDERPINNING THEORY COMPONENTS

The following topics/sub topics should be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency.

Unit	Topic and contents	Hours	Marks
<b>1. Introduction of IBMS Room</b>	<b>Introduction of IBMS room</b> 1 Roll of microprocessor in BMS 2 Controller Software, Operating Software, Application software, Energy Management Software 3 Types of I/Os (Analog, Digital, HS Pulse )	09	10
<b>2. Monitoring Station of IBMS</b>	<b>Monitoring station of IBMS</b> ➤ Introduction ➤ Monitoring stations of IBM control room ➤ Block diagrams, circuit diagrams, Features & hardware control ➤ DDC Networking & Architecture ➤ Construction, working & installation techniques. ➤ Testing of I/O Terminations (Point Testing) ➤ Reports & checklist of building management systems & control systems. ➤ Drills on building management systems.	18	24
<b>3. Integrating and Controlling Building Automation Systems</b>	<b>Integrating and controlling Building Automation Systems</b> ➤ Integrate HVAC Components ➤ Integrate Fire Alarm Systems ➤ Integrate Access Control Devices ➤ Integrate CCTV Surveillance Systems ➤ Control and Supervise Building Automation Systems using Control Panel	15	24
<b>4. Features of BMS</b>	<b>Features of BMS</b> 3.1 Features for optimal Control: Optimal START / Optimal STOP, Optimal Run time, Load Rolling, Demand limiting, Economizer switchover, Night purge, After hour, Supply air reset (Chilled water or Hot Water), Condenser water reset, chiller Sequencing 3.2 Information Management Features : i] Summaries, Password, Alarm Report, Time Scheduling, Trending, Totalization, Graphics	06	12
<b>Total</b>		<b>48</b>	<b>70</b>

## 8. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN



Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction of IBMS room	09	04	04	02	10
II	Monitoring station of IBMS	18	08	08	08	24
III	Integrating and controlling Building Automation Systems	15	08	08	08	24
IV	Features of BMS	06	02	04	06	12
<b>Total</b>		<b>48</b>	<b>22</b>	<b>24</b>	<b>24</b>	<b>70</b>

**Legends:** R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

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

## 9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 3-5 pages for each activity, and also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Study the layout of IBMS control room
- Study the ergonomic considerations
- Types of panels
- Connections and wiring.

## 10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the COs through classroom presentations (see implementation guideline for details).

## 11. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Building automation	Jonson Controls	Jonson Controls
2	Building automation system manual	Honeywell	Honeywell

## 12. SOFTWARE/LEARNING WEBSITES



**Program Name** : Advance Diploma in Maintenance of Building Management System  
**Program Code** : MB  
**Semester** : Second  
**Course Title** : Project  
**Course Code** : 26005

### TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
--	--	4	4	--	--	--	--	--	--	--	50#	20	50~	20	100	40

### RATIONALE

The main aim of the preparation of project on IBMS is to judge the knowledge gained by the students during their tenure of the IBMS programme, the transfer of learning that has taken place as well as their exposure to building automation; so that many faceted development of the students can be achieved under various skills of domains such as Personal, social, professional & lifelong learning. The students will be benefited lot by this exercise of preparation of project on their building automation experiences which will certainly add values in their attitudes such as value for health, work commitment, hardworking, honesty, problem solving, punctuality, loyalty and independent study. The Student should also make a brief presentation about the project and the salient observations and findings.

The Project report should essentially consists of the following

1. TITLE OF THE PROJECT WORK
2. ACKNOWLEDGEMENT
3. PREFACE
4. CERTIFICATE FROM THE ORGANISATION
5. CERTIFICATE FROM THE STUDENT THAT PROJECT HAS BEEN DONE BY HIM
6. EXECUTIVE SUMMARY
7. INDEX / CONTENTS
8. AIM, OBJECTIVE AND METHODOLOGY
9. INTRODUCTION
10. ABOUT THE ORGANISATION / COMPANY
11. SAFETY, HEALTH AND ENVIRONMENTAL ACTIVITIES IN THE COMPANY
12. OBSERVATIONS AND FINDINGS
13. SUMMARY OF RECOMMENDATIONS
14. REFERENCES / BIBLIOGRAPHY



## 15. MY KEY LEARNING IN BUILDING AUTOMATION AFTER PROJECT

### IMPLEMENTATION STRATEGY

The project report is to be assessed by external and internal examiners equally for

- a) **Project assessment – 50 marks** (To be reported under title term work – TW)
- b) **Oral based on Project work – 50 marks** (To be reported under title Oral– OR)

### IMPORTANT NOTE

- There should not be any sort of typographical, diagrammatic, chemical titles, chemical formulas / structures and any other mistake/s in the final bound copy of the project report submitted by the candidate.
- Refer General Guidelines given below.

### GUIDELINES FOR PREPARING THE PROJECT REPORT

Project work is a basic requirement for the award of Advance Diploma in IBMS. Project shall be prepared based on any one of the subjects of the Programme. The project work should be comprehensive and cover all aspects of the management of occupational health and Safety.

#### 1. TITLE OF THE PROJECT WORK

Select an appropriate title, e.g., “SAMRT HOMES”, “COMMERTIAL BUIDING AUTOMATION”, etc. The upper half of the first page of the project report should have the title of the project report in bold block letters and the lower half some important information like the year, the name of the author (report writer) and the name of the institute.

#### 2. CONTENTS

On the second page of the project report should be the table of contents. This table can be prepared after finishing the project report, i.e., when the typing work of the entire project report has been completed, the pages have been numbered and all annexure appended at the end.

#### 3. ACKNOWLEDGEMENT

It should appear on the third page and the report writer should acknowledge the guidance provided by the project guide. Here the author may also acknowledge other persons who might have rendered help or supplied the required data or information for completion of the project. It should be brief and crisp. Generally, one page should suffice for acknowledgement.

#### 4. PREFACE, OBJECTIVE AND METHODOLOGY

*Preface* should describe the choice of selected project work and its objective. The preface should be limited to one or two pages. It will be prudent to mention the objective and the methodology used for the project work, e.g., collecting data from various records available in the company, interviewing certain key employees, questionnaires, etc. Thereafter, briefly mention the scope of project work. The objective could be, for example, :

- (1) To study the IBMS system.
- (2) To study the fire alarm system in an organization/building
- (3) To study the different CCTV systems.
- (4) To study the different access control systems





- (5) To study the different HVAC systems
- (6) To give suggestions/recommendations for improving the automation performance of the company, preventing down time of HVAC system.

## 5. INTRODUCTION

Brief description of the system, the main components used its processes and the main features and operations. It is recommended to limit the description to about 5 to 10 pages.

## 6. AUTOMATION OF A BUILDING/PREMISES

This is the most important part of the project report and forms the main body of the project report. It needs very comprehensive coverage of all aspects of instrumentation and automation in the building. It will usually require about 60 to 100 pages. Write-up should include the details mainly in some of the following areas:

- Various systems in the building
- Architecture implemented vendors in the building.
- Diagram of systems and controls.
- Various process parameter sensors & actuators.
- Various control Strategies adapted.
- Features and uses of controller module installed in automation system.
- Various input and output devices used in system
- Features and work station.
- Power distribution for the system.
- Engineering and operation development software features.
- Alarm configuration for one of the loop.
- IBMS system startup & shut down procedure.
- Troubleshooting and Maintenance of IBMS system.

## 7. RECOMMENDATIONS

Based on the project work of automation system, student should identify areas needing improvement and recommend measures for improvement. The recommendations should be specific, relevant and practically implementable.

## 8. PROJECT REPORT FORMAT

- |                             |   |
|-----------------------------|---|
| Paper Size                  | - A4  |
| Printing                    | - Only on one side of the sheet                               |
| Line Spacing of Paragraph   | - 1 ½   |
| Font Face                   | - Times New Roman   |
| FontSize                    | - 12 for Normal text, 14 for Sub-headings and 16 for Headings |
| No of Project Report copies | - Two   |
| Binding                     | - Hard bound copies with Black cover (Golden Embossing)       |





**Program Name** : Advance Diploma in Maintenance of Building Management System  
**Program Code** : MB  
**Semester** : Second  
**Course Title** : Industrial Training (16 Weeks / Semester)  
**Course Code** : 26006

### 1. RATIONALE

Industrial training course is introduced for all programmes with the aim to imbibe the industry culture in the students before they enter into world of work. By exposing and interacting with the real life industrial setting, student will appreciate and understand the actual working of an industry, best practices adopted in industry and other requirements in the industry. The industrial needs such as the soft skills, life skills and hands-on practices are intended to be inculcated in the students through this training. This short association with the industry will be instrumental in orienting the students in transforming them to be industry ready after completion of diploma programme.

### 2. COMPETENCY

This course is intended to develop the following competencies:

- Soft Skills i.e. Communication, Presentation and others.**
- Life Skills i.e. Time management, Safety, Innovation, Entrepreneurship, Team building and others**
- Hands-on Practices i.e. Shop floor Implementation and Quality Assurance aspects.**

### 3. COURSE OUTCOMES

The industrial training is intended to acquire the competencies as mentioned above to supplement those attained through several courses up to fourth semester of the program:

- Communicate effectively (verbal as well as written) to execute the work.
- Prepare the industry report of the executed work.
- Exercise time management and safety in the work environment.
- Work in teams for successful completion of projects assuring quality.

### 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
--	--	30	30	--	--	--	--	--	--	--	150#	60	50~	20	200	80

**Note:** Both ESE and PA part of assessment will be carried out by institute faculty and industry training supervisor as explained in table no. 2, 3 and 4

### 5. GENERAL GUIDELINES FOR INDUSTRIAL TRAINING

The Industries/Organizations can be Government/Public limited/or Private family enterprises.

- Duration of Industrial Training: 16 weeks per semester**



- b) **Training Area:** Students should be trained in large and medium scale Industry / Organization. However, despite the best efforts by the institute, if large and medium scale Industry / Organization are not available to all students then, students can also be placed in small scale Industry / Organization.

## 6. **ROLE OF PARENT DEPARTMENT OF THE INSTITUTE**

- Parent Institute should have an MOU with the industry according to the specialization of the programme
- Communication with Industry / Organization available for training along with capacity and its confirmation.
- Student enrollment for In-plant training
- Issue letter to the Industry / Organization for the training along with details of students and mentors.
- Mentors to carry out progressive assessment of the students during the in-plant Training.
- End of training assessment by mentor along with Industry / Organization expert as external examiner.

## Suggestions

- a) Institutes can take help of alumni or present students (if they or their parents or relatives have some contact in different industries) for securing placement.
- b) The students would normally be placed as per their choices, in case of more demand for a particular Industry / Organisation students would be allocated place based on their relative merit. However, if some students have arranged training placement in some companies with the help of their parents/relatives etc. then they will be given preference for placement in those companies.
- c) Principal/ HOD/ Faculty should address students about industrial safety norms, rules and discipline to be maintained in the Industry/ organisation during the training before relieving students for training.
- d) The faculty member during the visit to Industry/ organisation will check the progress of the student in the training, his/ her attendance, discipline and project report preparation.

## 7. **EXPECTATIONS FROM INDUSTRY**

Helping institute in developing the following competencies among students

- a) **Soft Skills i.e. Communication, Presentation and others.**
- b) **Life Skills i.e. Time management, Safety, Innovation, Entrepreneurship, Team building and others**
- c) **Hands-on Practices i.e. Shop floor Implementation and Quality Assurance aspects.**

## 8. **ROLES AND RESPONSIBILITIES OF THE STUDENTS**

Following should be informed to students in the letter deputing them for the training, an undertaking for this should also be taken from them

- a) Students would interact with the mentor to suggest choices for suitable Industry / Organization. If students have any contact in Industry / Organization (through their parents, relatives or friends) then same may be utilized for securing placement for themselves and their peers.





- b) Students have to fill the forms duly signed by authorities along with training letter and submit it to training officer in the industry on the first day of training. Student should also carry with him/her the Identity card issued by institute during training period.
- c) He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules and regulations of the Industry / Organization and safety procedures to be followed. Student is expected to observe these rules, regulations, procedures.
- d) Students should know that if they break any rule of industry or do not follow the discipline then industry can terminate the training and sent back the students.
- e) It is the responsibility of the student to collect information from Industry / Organization about manufacturing processes / testing and quality assurance methods/specifications of machines and raw materials/maintenance procedures/ production planning/organizational structure etc.
- f) During the training period students have to keep record of all the useful information in Log book
- g) Maintain the weekly diary as provided and get it signed from mentor as well as Industry / Organization training in-charge.
- h) In case they face any major problem in industry such as an accident or any disciplinary issue then they should immediately report the same to the institute.
- i) Prepare final report about the training for submitting to the department at the time of presentation and viva-voce and get it signed from mentor as well as Industry / Organization training in-charge.

## 9. FORMAT FOR TRAINING REPORT

Following is the suggestive format for the training report, actual format may differ slightly depending upon the nature of Industry / Organisation. The training report may contain the following

- Title page
- Certificate
- Abstract
- Acknowledgement
- Content Page

- Chapter 1. Organizational structure of Industry / Organisation and General Lay Out
- Chapter 2. Introduction of Industry / Organisation (Type of products and services, history, turn over and number of employees etc.)
- Chapter 3. Types of major equipment/instruments/ machines used in industry with their specification, approximate cost and specific use and their routine maintenance.
- Chapter 4. Manufacturing Processes along with production planning and control methods.
- Chapter 5. Testing of raw materials, components and finished products along with quality assurance procedures.
- Chapter 6. Major material handling product (lifts, cranes, slings, pulleys, jacks, conveyor belts etc.) and material handling procedures.
- Chapter 7. Safety procedures followed and safety gear used (includes Preventive maintenance schedule and breakdown maintenance procedures).
- Chapter 8. Particulars of Practical Experiences in Industry / Organisation if any in Production/ Assembly/ Testing/Maintenance.
- Chapter 9. Short report/description of the project (if any done during the training)
- Chapter 10. Special/challenging experiences encountered during training if any (may include students liking & disliking of work places)

## References /Bibliography

## 10. SUGGESTED LEARNING STRATEGIES



Students should visit the website of the industry where they are undergoing training to collect information about products, processes, capacity, number of employees, turnover etc. They should also refer the handbooks of the major machines and operation, testing, quality control and testing manuals used in the industry. Students may also visit websites related to other industries wherein similar products are being manufactured as their learning resource.

