GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI

STATE PROJECT COORDINATION UNIT

(Established under Canada India Institutional Cooperation Project)

CURRICULUM

Course Name	**PIPING AND DUCT DESIGN USING AUTO CAD**
Course Code	ME/2020/011
Course Duration	50 Hours
Minimum Eligibility Criteria	ITI/10th/+2/Diploma/Graduates
Pre-requisites (if any)	Basic knowledge in Auto CAD
Course Objectives	Training module has been designed for the participants to • Understand the HVAC systems and its components • Understand the Piping Layout design • Understand the Duct Layout design • Create and Modify of Piping and Duct drawings
Course Outcomes	At the end of training, the participants will be able to • Explain the HVAC systems and design its various components • Explain various legends and colour codes used in HVAC layouts • Create and Modify the Piping layout for large buildings • Create and Modify the Duct layout for large buildings
Expected Job Roles	MEP Draftsman (Piping and Duct Design)

TEACHING AND SCHEME OF EXAMINATION						
Course Code	Course Name	Hours		Assessment Marks		Duration of the Examination
				Min	Max	
ME/2020/011	**PIPING AND DUCT DESIGN USING AUTOCAD**	Theory	20	10	20	3 Hours
		Practical	30	40	80	
		Total	50	50	100	

ME/2020/011 - PIPING AND DUCT DESIGN USING AUTOCAD

DETAILED SYLLABUS

Unit No.	Modules	No. of Hours	
		Theory	Practical
I	**Introduction to HVAC systems**	**4 Hours**	
1.1	Introduction to Heating, Ventilation, and Air-Conditioning Systems – Its Field Equipment	04	
1.2	Valve Symbols – Valve Actuators – Remotely Controlled Valve – Level Control Valve – Control Valve Designations		
II	**Piping Layout Design**	**20 Hours**	
2.1	Piping Abbreviations, Legends and Sections	08	
2.2	Plant coordinate systems – Equipment location plan – Pipe Rack layout deign		
2.3	Pipe Insulation Shoes and Pipe Guides – Filed and Dummy Supports – Hanger Rods – Spring Hangers – Pick-Up Pipe Supports - Control Manifolds – Utility Stations Valve		
2.4	Liquid Lines - Suction Line – Pipe Sizing –Chilled Water Piping – Hot Water Piping - Sewer and Under Round Piping Systems		
2.6	**Practical:** ➢ Equipment design and Layout ➢ Suction Line Layout ➢ Chilled Water Line Layout ➢ Hot Water Line Layout ➢ Sewer Water Line Layout (Layouts with legends, colour codes, layer formatting, and for different large sized buildings must be given for practice)		12
III	**Duct Layout Design**	**26 Hours**	
3.1	Study of Ducts – Duct Design by Velocity Reduction Method	08	
3.2	Ducting Abbreviations, Legends and Sections - Air Handling Units – Fan Coil Units		
3.3	Floor Drawings – Roof Drawings – Sectional Drawings		
3.4	Builder Work Drawings – Co-ordination Drawings and Riser Drawings		
3.5	Duct Layout of Residence Buildings, Restaurants, and Commercial Buildings		

3.6	**Practical:** ➢ Equipment Design and Layout ➢ Legends, Colour Codes, and Layer Formatting ➢ Cross section of AHU and FCU ➢ Floor Drawings and Roof Drawings ➢ Builder Work Drawing, of Structure of the hydraulic system ➢ Duct layout of Residence Buildings ➢ Duct Layout of Commercial Buildings		18
	Total Theory and Practical hours	**20**	**30**
	Total hours	**50**	

HARDWARE REQUIREMENT

S.NO	LIST OF TOOLS /EQUIPMENTS
1.	Desktop Computer: Intel Core i7-9700,(8 Core, 12MB Cache, 3.0Ghz, 4.7 Ghz Turbo w/UHD Graphics 630) DirectX Graphics card 16GB, 2X8G, DDR4 2666MHz Non-ECC Memory M.2 256GB PCIe NVMe Class 40 SSD 3 Button Optical mouse with scroll option 101MM Keyboard ergonomically deigned
2.	Laser Printer (A0 Size Colour Plotter can be preferred)
3.	UPS with power backup for 30 minutes

SOFTWARE REQUIREMENT

S.NO	LIST OF SOFTWARE
1.	Operating Systems – Windows 10 Pro 64 bit or above
2.	Auto CAD 2016 or above

REFERENCE BOOKS

S.NO.	NAME OF THE BOOK	AUTHOR	PUBLISHER
01	SMACNA CAD	-	Standard Sheet Metal and Air Conditioning Contractors' National Association, INC., USA, Second Edition 2001
02	The Fundamentals of Piping Design	Peter Smith	Gulf Publishing Company, Houston, Texas, First Edition 2007
03	The Planning Guide to Piping Design	Richard Beale, Paul Bowers, and Peter Smith	Gulf Publishing Company,Houston, Texas, 2010
04	HVAC: Handbook of Heating, Ventilation and Air Conditioning for Design and Implementation	Ali Vedavarz, NY Sunil Kumar, and NY Muhammed Iqbal Hussain	Industrial Press INC., New York2007
05	Process Piping Drafting	Rip Weaver	Gulf Publishing Company, Houston, Texas, 1975
06	Piping Design Handbook	John Mcketta	CRC Press, India, First Edition, 1992
07	Piping Handbook	M L Nayyar	McGraw Hill, Inia
08	Pipe Drafting and Design	Robert A. Rhea and Roy A. Perisher	Gulf Professional Publishing, NewDelhi, Second Edition, 2001
09	Process Plant Layout and Piping Design	Hunt and Bausbacher	Pearson, India, 1993
10	Design of Piping Systems	M W Kellogg	Wiley, USA, Second Edition 2010
11	HVAC Drafting and Design: A Study of the Components, Classification and Design Layouts of HVAC System	Muthuraman S	VDM VErlag Dr. Muller, Germany2011
12	HVAC Design & Drafting per ASHRAE	Mohamed Abdulaziz	Institute of Piping Engineering& Building Services, Hyderabad 2015
13	Advanced Strategy Guideline: Air Distribution Basics and Duct Design	Arlan Burdick	U.S. Department of Energy, Energy Efficiency & Renewable Energy, Building Technologies Program, 2011

ASSESSMENT AND CERTIFICATION

S. No.	Criteria for Assessment
1.	A trainee will be assessed based on the performance in End Examination for Theory and Practical conducted internally in the Project Polytechnic College for a duration of 3 hours
2.	A trainee must have 75% of attendance to appear for End examination in Theory and Practical.
3.	The assessment for theory part will be based on the marks scored in the end examination on the knowledge bank of questions (1 word/objective type questions)
4.	The assessment for practical part will be based on the marks scored in the end examination conducted by the Project Polytechnic and assessed by the Examiners approved by Strategic Plan Implementation Committee (SPIC) of the project polytechnic.
5.	The passing criteria for successful completion of training is every trainee should score 50% of marks in theory and practical examination.
6.	On successful completion of training , Certificate will be issued to the participants by the Directorate of Technical Education through the Project Polytechnics.

END EXAMINATION

ALLOCATION OF MARKS

S.NO	Description	Max.Marks
1.	Theory Examination	20
2.	Practical Examination	
	a)Aim and Procedure	20
	b)Demonstration / Execution	25
	c) Result & Viva Voce	15
	d)Record	20
	Total Marks	**100**

THEORY MODEL QUESTION PAPER

ME/2020/011 - PIPING AND DUCT DESIGN USING AUTO CAD

(Maximum Marks: 20)

(N.B: Answer any **Twenty** questions) **20x1= 20 Marks**

1. Define HVAC systems.
2. Name any two HVAC components.
3. Define the term “H” in HVAC.
4. Define the term “V” in HVAC.
5. Define the term “AC” in HVAC.
6. Draw any two valve symbols used in HVAC.
7. Draw any two sensing device symbols used in HVAC.
8. Expand the term “ANSI”.
9. Draw any two piping legends used in HVAC.
10. What are all the data required for Pipe rack development?
11. Write any two Pipe rack design criteria’s.
12. Define pipe route.
13. What is piping insulation?
14. Write any two insulating materials used.
15. What is meant by Pipe shoe?
16. What is the purpose of using pipe supports?
17. What do you mean by “Suction line”?
18. What do you mean by “Liquid line”?
19. Write the working principle of Direct heating systems.
20. Write the working principle of Indirect heating systems.
21. Define Pressurized sewers.
22. Name any two duct components.
23. Draw any two duct symbols.
24. What is meant by fan coil unit?
25. Write any two benefits of coordinated drawings.