



**National Institute of Technology Meghalaya**  
An Institute of National Importance

**CURRICULUM**

Programme	<b>Master of Technology in Mechanical Engineering</b>	Year of Regulation	<b>2018</b>
Department	<b>Mechanical Engineering</b>	Semester	<b>I</b>

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
<b>ME503</b>	<b>Thermal and Fluid System Design</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>200</b>
Course Objectives	To introduce different properties of fluid with governing equations for fluid flows	Course Outcomes	CO1	Able to classify fluids and understand the governing equations for fluid flows (Understanding)					
	To introduce to the concept of pipe and tube materials and their specifications and fittings, design of piping layout and optimum pipe diameter		CO2	Able to solve for the optimum piping layout and optimum pipe diameter with consideration of amortization, installation, maintenance cost (Applying, Analyzing and Executing).					
	To introduce to concept of heat exchangers and design of heat exchangers		CO3	Able to solve for efficiency of shell and tube, finned heat exchangers along with heat recovery analysis (Executing)					
	To introduce to the concept of testing, quality control and assurance		CO4	Able to explain testing, maintaining quality control and assurance					

**SYLLABUS**

No.	Content	Hours	COs
I	<b>Fundamental:</b> The design process, bid process, engineering design approaches, project management, fluid properties and basic equations in fluid mechanics	<b>06</b>	<b>CO1</b>
II	<b>Piping system:</b> Pipe and tubing standards, equivalent diameter of noncircular ducts, equation of motion for flow in duct, friction factor and pipe roughness, minor losses, series piping system, flow through non circular cross section, optimization process for economic pipe diameter, equivalent length of fittings, symbol of pipe system, support system for pipe, piping system design practices, pressure drop in two phase flow, support system design for low temperature application	<b>12</b>	<b>CO2</b>
III	<b>Heat exchanger:</b> Shell and tube heat exchanger, plate and frame heat exchanger, cross flow heat exchanger, analysis of shell and tube heat exchanger, heat recovery, design of heat exchanger, extended or finned system heat exchanger	<b>12</b>	<b>CO3</b>
IV	<b>Quality control:</b> Quality assurance, quality control, inspection and testing	<b>06</b>	<b>CO4</b>
<b>Total Hours</b>		<b>36</b>	

**Essential Readings**

- W. S. Janna, "Design of Fluid Thermal System", PWS Publishing, 2011
- L. C. Burmeister, "Elements of Thermal-Fluid System Design", 1st Edition, Prentice Hall, 1998
- Y. Jaluria, "Design Optimisation of Thermal Systems", McGraw-Hill, 3rd Edition, 1998
- F. Owen, D. Maidment, "Quality assurance : a guide to the application of ISO 9001 to process plant projects", Rugby : Institution of Chemical Engineers, 1st Edition 1996

**Supplementary Readings**

- Y. A. Cengel, "Heat Transfer: A Practical Approach", McGraw-Hill, 2002
- B.K. Taylor and R.P. Taylor, "Analysis and design of Energy Systems, Hodge", Prentice Hall, 1999
- J. P. Gupta, "Fundamentals of heat exchanger and pressure vessel technology", Hemisphere publishing corporation, 1990