UNIVERSITI TEKNOLOGI MARA

CMT574: CHEMICAL TECHNOLOGY

Course Name (English)	CHEMICAL TECHNOLOGY APPROVED
Course Code	CMT574
MQF Credit	3
Course Description	This course will involve students cognitively and scientifically in areas of fluid mechanics and heat transfer. Students will be exposed to definitions, concepts, principles and some calculations involving problems related to fluid mechanics and heat transfer.
Transferable Skills	The students should be able to perform simple analysis and calculation regarding flows in pipes, and heat exchangers
Teaching Methodologies	Lectures, Discussion
CLO	CLO1 Demonstrate the behaviour of fluids when subjected to different conditions of pressure, resistance due to friction, and flow of fluids through various fittings CLO2 Illustrate an understanding of how fluids flow under various conditions and also the factors that can affect its flow CLO3 Explain how heat is transferred from a hot body to a cold body under different conditions of temperature, fluid flow and resistance to heat flow CLO4 Describe the design of heat exchangers given various conditions of flow
Pre-Requisite Courses	No course recommendations

Topics
1. Introduction to properties of fluids and measurements 1.1) 1.1 Definition 1.2) 1.2 Fluid properties 1.3) 1.2.1 Density 1.4) 1.2.2 Viscosity 1.5) 1.2.3 Surface tension
2. Static pressure 2.1) 2.1 Pressure head 2.2) 2.2 Pascal's law 2.3) 2.3 Hydraulic jack/press 2.4) 2.4 Manometer 2.5) 2.4.1 Simple 2.6) 2.4.2 Differential 2.7) 2.4.3 Inverted
3. Liquid in motion 3.1) 3.1 Types of flow 3.2) 3.1.1 Laminar flow 3.3) 3.1.2 Transitional flow 3.4) 3.1.3 Turbulent flow 3.5) 3.2 Reynolds number
4. Bernoulli's equation 4.1) 4.1 Mechanical-energy balance in potential flow 4.2) 4.2 Practical applications of Bernoulli's equation 4.3) 4.2.1 Venturi 4.4) 4.2.2 Orifice 4.5) 4.2.3 Pitot tube 4.6) 4.2.4 Siphon 4.7) 4.2.5 Nozzle 4.8) 4.3 Hydraulic coefficients

4.9) 4.3.1 Coefficient of discharge
4.10) 4.3.2 Coefficient of contraction
4.11) 4.3.3 Coefficient of velocity
4.12) 4.4 Velocity distribution of liquid flowing over a pipe section
4.13) 4.5 Hagen Poiseuille's law for viscous flow
4.14) 4.6 Bernoulli's equation with resistance
4.15) 4.6.1 Resistance due to pipe friction
4.16) 4.6.2 Resistance due to fittings
4.17) 4.6.3 Equivalent length

5. Heat transfer
5.1) 5.1 Introduction
5.2) 5.2 Methods of heat transfer
5.3) 5.3 Heat transfer by conduction- Fourier's law
5.4) 5.4 Steady flow of heat in homogeneous bodies
5.5) 5.4.1 Resistance in series
5.6) 5.4.2 Resistance in parallel
5.7) 5.5 Mean area and mean temperature difference
5.8) 5.6 Heat transfer by convection
5.9) 5.6.1 Concept of film resistance
5.10) 5.6.2 Overall coefficient of heat transfer
5.11) 5.6.3 Evaluation of individual film coefficients
5.12) 5.6.4 Critical thickness of insulation
5.13) 5.7 Free and forced convection
5.14) 5.7.1 Velocity boundary layer
5.15) 5.7.2 Thermal boundary layer
5.16) 5.7.3 Laminar boundary layer flow over a flat plate
5.17) 5.7.4 Turbulent boundary layer flow over a flat plate
5.18) 5.8 Radiation
5.19) 5.8.1 Radiative properties
5.20) 5.8.2 Spectral effects
5.21) 5.8.3 Geometric effects
5.22) 5.8.4 Relations between view factors

6. Design and prediction of performance of heat exchangers
6.1) 6.1 Types of heat exchangers
6.2) 6.2 Fouling Factors
6.3) 6.3 LMTD method
6.4) 6.4 NTU method

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	written assignment	20%	CLO4
Quiz	Quizzes	20%	CLO1
Test	Test	20%	CLO2

Reading List

Recommended Text

- **Cangel, Y.A. and Thurner, R.H., 2005, *Fundamentals of Thermal-Fluid Sciences*, 2nd Ed., McGraw Hill**
- **Cangel, Y.A .and Cimbala, J.M 2006, *Fundamentals and Applications*, 1st Ed., McGraw Hill**

Reference Book Resources

- **Frank P. Incropera, David P. DeWitt 2002, *Heat Transfer*, 5th Ed., John wiley & Sons USA**
- **J.F.Douglas, R.D.Matthews 1996, *Solving Problems in Fluid Mechanics*, Pearson Longman**
- **John F. Douglas, Janusz M. Gasiorek, John A. Swaffield, Lynne B. Jack 2005, *Fluid Mechanics*, 5th Ed., Pearson Longman**
- **Cangel, Y.A .and Cimbala, J.M. 2006, *Fluid Mechanics Fundamentals and Applications*, 1st Ed., McGraw Hill**
- **Cangel, Y.A. and Thurner, R.H. 2005, *Fundamentals of Thermal-Fluid Sciences*, 2nd Ed., McGraw Hill**

Article/Paper List: This Course does not have any article/paper resources

Other References: This Course does not have any other resources