Module (Course Syllabus) Catalogue

2022-2023

College/ Institute	**Koya Technical Institute**	
Department	**Petroleum Technology**	
Module Name	**Heat Transfer**	
Module Code		
Degree	**Technical Diploma** [•] **Bachler** [ ] **High Diploma** [ ] **Master** [ ] **PhD** [ ]	
Semester	**3th**	
Qualification	**PhD**	
Scientific Title	**Lecturer**	
ECTS (Credits)		
Module type	**Prerequisite** [ ] **Core** [•] **Assist.** [ ]	
Weekly hours		
Weekly hours (Theory)	**(2)hr Class**	**( )Total hrs Workload**
Weekly hours (Practical)	**(2)hr Class**	**( )Total hrs Workload**
Number of Weeks	**12**	
Lecturer (Theory)	**Dr. Barhm Abdullah Mohamad**	
E-Mail & Mobile NO.	**barhm.mohamad@epu.edu.iq 07512209152**	
Lecturer (Practical)		
E-Mail & Mobile NO.		
Websites		

Course Book

<table>
<tr><td>Course Description</td><td colspan="5">This course will focus on the Demonstrating the basic concepts of heat transfer and covering process related to heat transfer such as conduction, convection and radiation.</td></tr>
<tr><td>Course objectives</td><td colspan="5">• Providing knowledge about fundamentals of heat transfer.
• Analysing how heat transfer occur.
• Educating students to solve problems.</td></tr>
<tr><td>Student's obligation</td><td colspan="5">• Attending classes and participate in the lecture.
• Make reports and studies on different topics.
• Assignment preparations.
• Make quizzes and exams to make sure they got necessary knowledges.</td></tr>
<tr><td>Required Learning Materials</td><td colspan="5">• Handouts, notes and references.
• Showing necessary videos and reports.
• Showing equipment on different sites if possible.</td></tr>
<tr><td rowspan="12">Evaluation</td><td colspan="2">Task</td><td>Weight (Marks)</td><td>Due Week</td><td>Relevant Learning Outcome</td></tr>
<tr><td colspan="2">Paper Review</td><td></td><td></td><td></td></tr>
<tr><td rowspan="6">Assignments</td><td>Homework</td><td>5</td><td></td><td></td></tr>
<tr><td>Class Activity</td><td>2</td><td></td><td></td></tr>
<tr><td>Report</td><td>10</td><td></td><td></td></tr>
<tr><td>Seminar</td><td>10</td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Quiz</td><td>8</td><td></td><td></td></tr>
<tr><td colspan="2">Lab.</td><td>15</td><td></td><td></td></tr>
<tr><td colspan="2">Midterm Exam</td><td>10</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>40</td><td></td><td></td></tr>
<tr><td colspan="2">Total</td><td>100</td><td></td><td></td></tr>
<tr><td>Specific learning outcome:</td><td colspan="5">1- Theory of heat transfer.
2- Analyzing problems.
3- Solving heat transfer problems.</td></tr>
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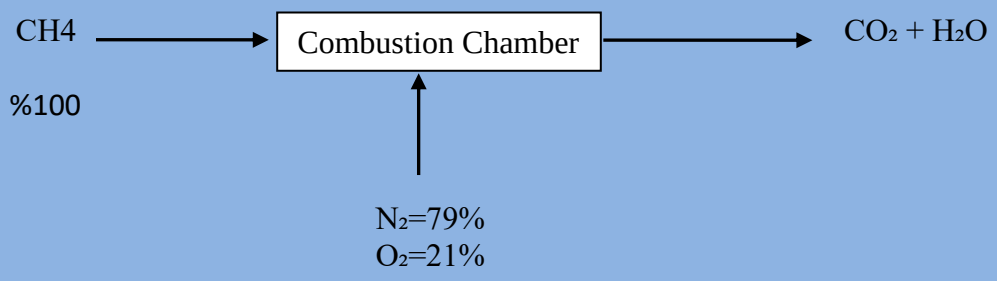
Course References:	1. Bejan, A. and Kraus, A.D. (2003) Heat and Mass Transfer Handbook. John Wiley and Sons, Hoboken. 2. Cengel, Y. A., & Ghajar, A. J. (2014). Heat and mass transfer: Fundamentals and applications (5th ed.). McGraw-Hill Professional.

Course topics (Theory)	**Week**	**Learning Outcome**
Introduction	1	General information about heat transfer
Conduction, convection and radiation	2	Importance of types of heat transfer
Heat exchanger concepts	3	The selection of heat exchanger
Cooling tower	4, 5, 6 & 7	Cooling tower types
Psychrometric Chart	8	Psychrometric Chart Principle and usages
Steam boiler	9 & 10	Steam generation types and its approaches
Furnace (Heater)	11	Basics design of heater
Combustion	12	The combustion phenomena
Practical Topics	**Week**	**Learning Outcome**
Temperature Measurements and Calibration	1	Thermometer readings and calibration technique
Thermal conductivity	2	Measuring thermal conductivity of materials
Free and Forced Convection	3	Concepts of convection heat transfer
The effect of varying flow rate-parallel flow double pipe heat exchanger	4&5	Basic design of heat transfer
The effect of varying water flow rate on the performance of mechanical draught cooling tower	6	The approaches of mechanical draught cooling tower

Questions Example Design

Ex. 1: Calculate the equivalence ratio for the following system, if you know the A/F Actual = 12: 1 :

Solution:



Let complete combustion:

$$CH4 + 2O_2 + 3.76N_2 \longrightarrow CO_2 + 2\,H_2O + 3.76N_2$$

$$\text{A/F Stoic.} = \frac{\text{M.weight[air]}}{\text{M.weight[fuel]}}$$

$$\text{A/F Stoic.} = \frac{[2\times32]+[3.76\times28]}{[16]} = 10.58 = \frac{10.58}{12} = 0.88$$

$$\text{Equivalence Ratio } [\theta] = \frac{\text{A/F stoic.}}{\text{A/F actual}}$$

$\theta<1$ The mixture is lean.

Ex. 2: 20 kg of (C_3H_8)fuel burned with 400kg of air to product CO_2 and H_2O, what is the equivalence ratio for the following system, if you know the A/F Actual = 11 : 1 ?

Solution:

$$C_3H_8 + 5O_2 + 3.76\,N_2 \longrightarrow 3CO_2 + 4H_2O + 3.76\,N_2$$

Basis: 20 kg of C_3H_8 and 400kg of air [O_2, N_2]

$$\text{A/F Stoic.} = \frac{\text{M.weight[air]}}{\text{M.weight[fuel]}}$$

$$\frac{A}{F}\text{Stoic.} = \frac{\frac{400}{160}+\frac{400}{105.28}}{\frac{20}{44}} = 13.85$$

$$\text{Equivalence Ratio } [\theta] = \frac{\text{A/F stoic.}}{\text{A/F actual}} = \frac{13.85}{11} = 1.25$$

$\theta> 1$ The mixture is rich.

Extra notes:
External Evaluator