Course Specifications

Course Title:	**Applied Heat Transfer**
Course Code:	**ME468**
Program:	**Mechanical Engineering (UG)**
Department:	**Mechanical & Industrial Engineering**
College:	**College of Engineering**
Institution:	**Majmaah University**

Table of Contents

A. Course Identification

1. Credit hours:03
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☐ Elective ☑
3. Level/year at which this course is offered: 08/2019-20
4. Pre-requisites for this course (if any)**: Nil**
5. Co-requisites for this course (if any)**: ME 354**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	80
2	**Blended**	05	10
3	**E-learning**	05	10
4	**Correspondence**	0	0
5	**Other**	0	0

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	45
2	**Laboratory/Studio**	0
3	**Tutorial**	15
4	**Others** (specify)	0
	Total	60
Other Learning Hours*		
1	**Study**	30
2	**Assignments**	10
3	**Library**	10
4	**Projects/Research Essays/Theses**	05
5	**Others** (specify)	5
	Total	60

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

Classification of Heat Exchangers, Design Correlations and Fouling, Basic Thermal Design Methods and Iterative Techniques, Types of heat exchanger: Double-Pipe Heat Exchangers, Shell-and-tube Heat Exchangers, Compact Heat Exchangers, Other Heat Exchangers, Correlations for Two-Phase Flow, Condensers and Evaporators.

2. Course Main Objective

1. Understand unsteady state conduction and to apply Fourier equation.

2.	To know the working principle of heat exchangers.
3.	To determine heat transfer from surfaces with uniform cross-sections.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	Memorize the classification of heat exchanger and apply on related problems.	a
1.2	Design Correlations and Fouling of heat exchanger and related numerical problems.	e
1.3	Basic Thermal Design Methods and Iterative Techniques for numerical problems.	a
1.4	Correlations for Two-Phase Flow, Condensers and Evaporators and numerical problems.	e
2	**Skills :**	
2.1	Correlations for Two-Phase Flow, Condensers and Evaporators and numerical problems.	a
2.2	Solving and analyzing complex numerical problems for heat transfer in the heat exchanger..	e
2.3	Interpretation of the data and applying formulae and correlations for the given problems.	e
3	**Competence:**	
3.1	Demonstrate and share with classmates and teachers, help of internet for solving problems	e
3.2	Work with teams to appraise the issues	a

C. Course Content

No	List of Topics	Contact Hours
1	Classification of Heat Exchangers.	8
2	Design Correlations and Fouling.	8
3	Basic Thermal Design Methods and Iterative Techniques.	8
4	Types of heat exchanger: Double-Pipe Heat Exchangers.	8
5	Shell-and-tube Heat Exchangers.	8
6	Compact Heat Exchangers	4
7	Other Heat Exchangers, Correlations for Two-Phase Flow, Condensers and Evaporators	16
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Memorize the classification of heat exchanger and apply on related problems.	Lectures, tutorials and independent study assignments	Home assignments and Quizzes. Midterms and Final Exam
1.2	Design Correlations and Fouling of heat	Lectures, tutorials and	Home

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	exchanger and related numerical problems.	independent study assignments, Power point presentation on different topic related to this subject.	assignments and Quizzes. Midterms and Final Exam.
1.3	Basic Thermal Design Methods and Iterative Techniques for numerical problems.	Derivations, formulae, use of principle of various system and devices, solving the numerical based problems..	Mid Term/Quiz/Final Exam Home assignments and Quizzes. Midterms and Final Exam.
1.4	Correlations for Two-Phase Flow, Condensers and Evaporators and numerical problems.	Lectures, tutorials and study materials.	Home assignments and Quizzes. Midterms and Final Exam.
2.0	**Skills**		
2.1	Explain the results of the numerical problems	Class lectures, Tutorials, Home Assignments.	Class participation, Home assignments and Quizzes. Midterms and Final Exam.
2.2	Differentiate the mathematical equations use in system design.	Class lectures, Tutorials, Home assignments. Group discussions.	Home assignments and Quizzes. Midterms and Final Exam, Black Board submission.
2.3	Calculate the numerical values of questions and use computer application in solving problems.	Class lectures, Tutorials, Home assignments. Group discussions	Home assignments and Quizzes. Midterms and Final Exam, Black board submission
2.4	Participating in-group discussions.	Special Lectures on this topic.	Group discussion and Exams.
3.0	**Competence**		
3.1	Demonstrate and share with classmates and teachers, help of internet for solving problems	Making the teaching learning two-way communication. Getting students involved to solve problems and asking students did they understand the concept clearly.	Assignments, Term Exams and Final Exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.2	Work with teams to appraise the issues	Assignments without direct input, but let them calculate inputs from source data	Assignments, Term Exams and Final Exam

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz 1,2,3	03,10,15	05
2	Assignment/Homework	05,12	10
3	Mid Term 1	07	20
5	Mid Term2	11	20
6	Activity	3,7,12,15	05
7	Final Exam	15	40
			100

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Lecture hours as given in Time Tables: Monday 3.00 p.m.-5.00 p.m., Tuesday8.00a.m.-9 a.m.
Tutorial Tuesday 11.00 a.m. - 11:50 a.m.
(Class Rooms E09 and E07)

Office hours: : 10 AM -12 Noon Wednesday
(Office location 044-02-17)

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	• Fundamentals of Heat and Mass Transfer, Incropera F. P. and Dewitt D. P. John Wiley & Sons, 2002.
Essential References Materials	• Design and Optimization of Thermal Systems, Yogesh Jaluria, Taylor & Francis, Inc. 2007 • Class Notes
Electronic Materials	• Black Board chapters are available on site for self-study of the students. • Black Board Quiz and Question bank • http://www.ThermalEngineering.net/courses/
Other Learning Materials	• MS Excel • Heat Transfer software • http://www.ThermalEngineering.net/courses/

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Class Rooms

Item	Resources
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart board is provided
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	• - Interactive learning in the class. • Course evaluation questionnaire. • All students who attend the course fill forms.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	Students	Indirect Assessment
CLOs achievement	Faculty	Direct/Indirect Assessments
Learning Resources	Students	Indirect Assessment
Course Contents	Students	Indirect Assessment

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Department Council
Reference No.	**1/34/9767**
Date	**25/02/1432 H**