هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	Process Heat Transfer
Course Code:	241 CHET
Program:	Chemical Engineering Technology
Department:	Chemical Engineering Technology
College:	College of Applied Industrial Technology
Institution:	Jazan University

Table of Contents

A. Course Identification

1. Credit hours: (2Lec+3Lab)h/week = 5 hr/week
2. Course type **a.** University ☐ College ☐ Department ■ Others ☐ **b.** Required ☐ Elective ■
3. Level/year at which this course is offered:
4. Pre-requisites for this course (if any)**: 122 CHET**
5. Co-requisites for this course (if any)**: No**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	75	100%
2	**Blended**		-
3	**E-learning**		-
4	**Distance learning**		-
5	**Other**		-

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	45
3	**Tutorial**	-
4	**Others** (specify)	-
	Total	**75**

B. Course Objectives and Learning Outcomes

1. Course Description

This course introduces the student to the basics of heat transfer phenomena. Basic laws and mechanisms of steady state heat transfer are introduced along with their applications to process equipment including heat exchangers, boilers and condensers. Operating and maintenance problems in heat exchangers are being discussed. This course is supported by laboratory experiments on heat exchangers like shell and tube, Double pipe, and Cross flow. Also includes experiments on Free and Forced Convection and Radiation, Radial heat conduction, and Thermal conductivity.

2. Course MainObjective

This course is designed to for 5^{th} level students in chemical engineering the basics of heat transfer phenomena. Basic laws and mechanisms of steady state heat transfer are introduced along with their applications to process equipment including heat exchangers, boilers and condensers. This course is supported by laboratory experiments on heat exchangers like

Double pipe.

3. Course Learning Outcomes

CLOs		AlignedPLOs
1	**Knowledge and Understanding**	
1.1	***Explain*** modes of heat transfer such as heat conduction convective and radiation and applying the law associated with them on the several heat transfer unit operations (e.g., heat exchangersetc.).	K1.2
...		
2	**Skills:**	
2.1	***Formulate*** the well-defined heat transfer engineering problems with applying the knowledge, techniques: skills, mathematics, science, and technology.	S1.1
2.2	***Evaluate*** the energy involved using standard methods in the heat transfer unit operations.	S2.2
2.3	***Compare*** the several heat transfer unit operations based on principles and the energy requirements.	S4.2
2...		
3	**Values:**	
3.1	***Managing*** deadlines for the given task (assignments) by utilizing the information from several sources of information.	V1.3
3.2	***Show*** independent timeliness work in classroom with effective contribution with classmates	V2.2

C. Course Content

No	List of Topics	Contact Hours
1	Definitions and fundamental concepts • Introduction • Fourier's Law of Heat Conduction Units and Basic Calculation Heat Transfer through Slab/Cylinder/Spherical Surfaces • Heat Transfer through Composite Slabs • Heat Transfer through Cylindrical vessel	4
2	Heat Transfer through Slab/Cylinder/Spherical Surfaces • Heat Transfer through Cylindrical vessel • Newton's Law of Cooling • Combined Conduction and Convection Forced Convection • Fully Developed Turbulent Flow • Turbulent Flow in Rough Pipes • Free Convection	4
3	Radiation Heat Transfer • Kirchoff's Law • Applications Heat Exchangers • Introduction	4

	• Energy Relationship • Heat Exchanger Classification	
	MID EXAM	2
4	Heat Exchangers • Log Mean Temperature difference (LMTD) • Temperature Profiles • Overall Heat Transfer Coefficients • Fouling Factor Types of Heat Exchangers • Double Pipe Heat Exchanger • Shell-and-Tube Equipment	4
5	Types of Heat Exchangers • Gasketed Plate-Frame Heat Exchanger • Shell-and-Plate Heat Exchange • Plate-fin Heat Exchangers • Extended Surfaces Other heat exchange equipment • Evaporators • Waste Heat Boiler • Condensers • Quenchers	4
6	The Delaware Method • Empirical model equations	4
7	Operation, Maintenance, And Inspection (OM&I) • Installation Procedure • Operation	4
Total		**30**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge and Understanding**		
1.1	***Explain*** modes of heat transfer such as heat conduction convective and radiation and applying the law associated with them on the several heat transfer unit operations (e.g., heat exchangers etc.).	Lecture, tutorial, active learning	Quizzes, class activities, exams
…			
2.0	**Skills**		
2.1	***Formulate*** the well-defined heat transfer engineering problems with applying the knowledge, techniques: skills, mathematics, science, and technology	Lecture, tutorial, active learning	Quizzes, class activities, exams

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
2.2	***Evaluate*** the energy involved using standard methods in the heat transfer unit operations.	Lecture, tutorial, active learning	Quizzes, class activities, exams
2.3	***Compare*** the several heat transfer unit operations based on principles and the energy requirements.	Lecture, tutorial, active learning, oral discussion	Quizzes, class activities, exams
…			
3.0	**Values**		
3.1	***Managing*** deadlines for the given task (assignments) by utilizing the information from several sources of information.	Lab/ Group Discussion	Lab exam/ Participation in classroom oral discussion
3.2	***Show*** independent timeliness work in classroom with effective contribution with classmates.	Lab/ Group Discussion	Lab exam/ Participation in classroom oral discussion
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class activities (Quizzes, Labs) every week from week 4 to week 13	Week 4 till Week 13	30%
2	Oral discussion and participation in classroom (+Assignments, Attendances etc.)	All weeks	5%
3	Midterm	Week 6	15%
4	Final Term Exam	As scheduled	50%

***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:

Office hours are specified, and instructors can be reached through emails/WhatsApp/Phone calls.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Process heat transfer, by Robert W. Serth, Elsevier Science and Technology 2007.
Essential References Materials	Coulson & Richardson's Chemical Engineering Volume 1, 6th edition, Fluid Flow, Heat Transfer and Mass Transfer, J R Backhurst J H Harker J.F. Richardson J.M. Coulson,1999 Elsevier

Electronic Materials	Lecture slides (other reading materials)
Other Learning Materials	• Yes Internet source, lecture notes etc.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms should be furnished for 25 students with • White board • Appropriate Chairs BB (if it is an online teaching)
Technology Resources (AV, data show, Smart Board, software, etc.)	Computer with data show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Not utilized

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Confidential student Course Evaluation Survey	Institution	Online Direct Survey
End of semester CLO	Course Coordinator	Direct Survey

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

H. Specification Approval Data

Council / Committee	Chemical Engineering Technology, CAIT.
Reference No.	CAITCHET211101
Date	01/02/2022