هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Process Heat Transfer**
Course Code:	**223 CHET**
Program:	**Chemical Engineering Technology (CHET)**
Department:	**Chemical Engineering Technology**
College:	**College of Applied Industrial Technology (CAIT)**
Institution:	**Jazan University**
Version:	**20241**
Last Revision Date:	modified on: 01/03/2024

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	2				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☐	Elective☒			
3. Level/year at which this course is offered:	**5th/2yr**				
4. Course general Description This course presents the principles of process heat transfer and their application. The course integrates Momentum transfer (CHET 121). Dimensionless numbers and their significance is also studied for the heat transfer coefficient determination. The course is introduced through two classes weekly. They are 2 classes (1 hour each) for theoretical part and 2 hours class for laboratory for which students apply and implement the concepts of the lectures.					
5. Pre-requirements for this course (if any): 222 CHET					
6. Co- requirements for this course (if any): NA					
7. Course Main Objective(s): Study basics of heat transfer phenomena. Laws and mechanisms of steady state heat transfer are introduced along with their applications to process equipment including heat exchangers, boilers and condensers etc. This course is supported by laboratory experiments.					

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	100%
2.	E-learning	-	-
3.	Hybrid • Traditional classroom • E-learning	-	-
4.	Distance learning	-	-

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	11
2.	Laboratory/Studio	22
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
	Total	33

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
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.).	K1.2	Lecture, tutorial, active learning	Quiz, class activities, Assignment, exams
…				
2.0	Skills			
2.1	Formulate the well-defined heat transfer engineering problems with applying the knowledge, techniques: skills, mathematics, science, and technology.	S1.1	Lecture, tutorial, active learning	Quiz, class activities, Assignment, exams
2.2	Evaluate the energy involved using standard methods in the heat transfer unit operations.	S2.3	Lecture, tutorial, active learning	Quiz, class activities, Assignment, exams
2.3	Compare the several heat transfer unit operations based on principles and the energy requirements.	S4.3	Lecture, tutorial, active learning	Quiz, class activities, Assignment, exams
3.0	Values, autonomy, and responsibility			
3.1	Managing deadlines for the given task (assignments) by utilizing the information from several sources of information.	V1.3	active learning and work assigned	Surprise test, class activities, and participating in classroom
3.2	Show independent timeliness work in classroom with effective contribution with classmates	V2.3	active learning and work assigned	Surprise test, class activities, and participating in classroom
…				

C. Course Content

No	List of Topics	Contact Hours
1.	Definitions and fundamental concepts • Introduction	1
2.	Modes and Laws of Heat transfer • Fourier's Law of Heat Conduction • Newton's Law of Cooling for Convection • Radiation Heat Transfer and associated laws • Combined Conduction and Convection	2
3.	Heat Transfer through Slab/Cylinder/Spherical Surfaces • Heat Transfer through Composite Slabs	2

	• Heat Transfer through Cylindrical vessel • Combined Conduction and Convection	
4.	MID EXAM	1
5.	• Forced and Free Convection • Fully Developed Turbulent Flow • Turbulent Flow in Rough Pipes • Free Convection and Forced convection	
6.	Energy balance and Dimensionless Numbers • Energy Relationship Introduction • Dimensionless Numbers • Energy Relationship	1
7.	Heat Exchanger • Log Mean Temperature difference (LMTD) • Temperature Profiles • Overall Heat Transfer Coefficients • Fouling Factor	1
8.	Heat Exchanger and Classification • Gasketed Plate-Frame Heat Exchanger • Shell-and-Plate Heat Exchange • Double pipe HEx	1
9.	Other heat exchange equipment • Plate-fin Heat Exchangers • Extended Surfaces • Purpose of Baffles and Passes in HEs Discussion on Operation, Maintenance, And Inspection (OM&I) • Installation Procedure • Operation	1
10.	Heat Exchangers and auxiliaries (some more topics) • Types of Baffles used in Heat Exchangers • Pipes, Tubes & their specifications • Valves and Fittings • Waste Heat Boiler • Evaporators • Condensers and Quenchers • Thermal Resistance • What is Scaling	A brief Self Study Report (SSR) on the given topics
Total		11

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Oral discussion and participation in classroom (+Assignments for Self-study, Attendances etc.)	All weeks	5%
2.	Quizzes	Week 3/4 & 9/10	10%
3.	Midterm Exam	Week 6-7	15%
4.	Lab (Learning expt. and submitting report and viva)	All weeks	15%
5.	Homework (SSR, ppt, performance in whole semester)	Last week	15%
6.	Final Term Exam	As scheduled	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	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
Supportive References	Process heat transfer, by Robert W. Serth, Elsevier Science and Technology 2007.
Electronic Materials	Lecture slides (other reading materials)
Other Learning Materials	• Yes: Internet source, etc.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Simulation room
Technology equipment (projector, smart board, software)	Aspen Hysys
Other equipment (depending on the nature of the specialty)	NA

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program Leaders	Direct, Indirect survey
Effectiveness of students assessment	Faculty	Indirect
Quality of learning resources	Faculty	Indirect
The extent to which CLOs have been achieved	Faculty	Excel software Direct evaluation
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	Chemical Engineering Technology, CAIT
REFERENCE NO.	CAITCET24012
DATE	modified on: 01/03/2024