

DEPARTMENT OF MECHANICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Course Title	DESIGN OF HEAT EXCHANGERS		
Course Code	MEHO15	No. of Credits	3
Course Code of Pre-requisite subject(s)	MEPC22		
Session	July 2018	Section (if, applicable)	B. Tech Mechanical III & IV Year–A & B
Name of Faculty	Dr. Hakeem Niyas. U.S.	Department	Mechanical
Name of Course Coordinator(s) (if, applicable)	-		
E-mail	hakeem@nitt.edu	Telephone No.	9976677804
Course Type	<input type="checkbox"/> Core course	<input type="checkbox"/> Elective course	<input checked="" type="checkbox"/> Honors course
COURSE SYLLABUS			
<p>Types of heat exchangers, shell and tube heat exchangers – regenerators and recuperators Temperature distribution and its implications - Parts description, Classification as per Tubular Exchanger Manufacturers Association (TEMA).</p> <p>Heat transfer correlations, Overall heat transfer coefficient, analysis of heat exchangers – LMTD and effectiveness method. Sizing of finned tube heat exchangers, U tube heat exchangers, Design of shell and tube heat exchangers, fouling factors, pressure drop calculations.</p> <p>Types, Merits and Demerits, Design, Performance parameters of compact heat exchangers and plate heat exchangers.</p> <p>Design of surface and evaporative condensers –cooling tower – performance characteristics.</p>			
COURSE OBJECTIVES			
<ol style="list-style-type: none"> 1. To get a broad exposure to heat exchangers, in general. 2. To learn the thermal and stress analysis on various parts of the heat exchangers. 3. To analyze the sizing and rating of the heat exchangers for various applications. 			

COURSE OUTCOMES (CO)	
Course Outcomes	Aligned Programme Outcomes (PO)
On completion of this course, the students will be able to	
1. Conceive a design based on the information provided for a particular application	1,3,5,6,12
2. Comprehend the sizing and predict the thermal behavior of the heat exchanger	1,3,5,6
3. Carry out stress analysis of heat exchanger from first principles	1,5,6,11
4. Come up with a mechanical design of heat exchangers as per the relevant codes	1,3,5,6,8,11,12

COURSE PLAN – PART II			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week	Topic	Mode of Delivery
1	1 st Week	Basic concepts of Heat Transfer, Conduction and convection, Overall heat transfer coefficient	Chalk and Talk/ PPT
2	2 nd Week	Introduction and classification of heat exchangers	Chalk and Talk/ PPT
3	3 rd Week	Introduction to Thermal aspects, sizing and rating, LMTD and NTU method.	Chalk and Talk/ PPT
4	4 th Week	Design of double – pipe heat exchangers, heat transfer coefficients and hydraulic calculations, series and parallel configurations of hairpins	Chalk and Talk/ PPT
5	5 th Week	Thermo-hydraulic design of shell-and-tube heat exchangers, design guidelines and strategy	Chalk and Talk/ PPT
6	6 th Week	Shell-side design – Kern method, Bell and Delaware method	Chalk and Talk/ PPT
7	7 th Week	Cross flow heat exchangers, practical examples and sizing of components	Chalk and Talk/ PPT
8	8 th Week	Augmented heat transfer and compact heat exchangers	Chalk and Talk/ PPT
9	9 th Week	Regenerators – Application and design aspects	Chalk and Talk/ PPT
10	10 th Week	Plate type heat exchangers – Importance and thermo-hydraulic design	Chalk and Talk/ PPT
11	11 th Week	Boiling heat transfer, reboilers and condensers	Chalk and Talk/ PPT
12	12 th Week	Cooling towers – Introduction, types and design.	Chalk and Talk/ PPT
13	13 th Week	Heat exchanger testing	Chalk and Talk/ PPT

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Mid Semester Examination	8 th Week	90 min	30
2	Assignment	-	-	10
3	In class Quiz	-	-	10
4	Compensation Assessment (Retest)	13 th Week	90 min	Corresponding
5	Final Assessment	14 th Week	180 min	50

ESSENTIAL READINGS :

Textbooks:

1. R. K. Shah, D. P. Sekulic, Fundamentals of Heat Exchanger Design, John Wiley & Sons, 2003.
2. R.W. Serth, T. Lestina, Process Heat Transfer – Principles, Applications and Rules of Thumb, Academic Press, Elsevier, 2nd Edition, 2014.

Reference Books:

1. S. Kakaç, H. Liu, A. Pramuanjaroenkij, Heat Exchangers Selection – Selection, Rating and Thermal Design, CRC Press, 3rd Edition, 2012.
2. D.Q. Kern, Process Heat Transfer, Tata McGraw Hill Education, 1997.
3. J.E. Hesselgreaves, R. Law, D.A. Reay, Compact Heat Exchangers – Selection, Design and Operation, Butterworth-Heinemann, Elsevier, 2nd Edition, 2017.
4. R.F. Barron, G.F. Nellis, Cryogenic Heat Transfer, CRC Press, 2nd Edition, 2016.

COURSE EXIT SURVEY

- Feedback from the students during class committee meetings.
- Anonymous feedback through questionnaire.

COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, academic honesty and plagiarism)

MODE OF CORRESPONDENCE (email/ phone)

All the students are advised to come to the class regularly. All the correspondence (schedule of classes/ schedule of assessment/ course material/any other information regarding this course) will be intimated in the Class only.

ATTENDANCE

- At least 75 % attendance in each course is mandatory.
- A maximum of 10 % shall be allowed under On Duty (OD) category.
- Students with less than 65 % of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

COMPENSATION ASSESSMENT

- Retest will be conducted for 30 marks

ACADEMIC HONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

ADDITIONAL INFORMATION

- The faculty is available for consultation at times as per the intimation given by the faculty.
- Queries (if required) to the course teacher shall only be emailed to the email id specified by the teacher(hakeem@nitt.edu)

FOR APPROVAL

Course Faculty USaliyas

Dr Hakeem Niyas U.S.
(9086)

CC-Chairperson Ⓟ
29/8/18

HOD [Signature]