




DEPARTMENT OF CHEMICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I						
Course Title	CHEMICAL PROCESS EQUIPMENT DESIGN					
Course Code	CLPC27	No. of Credits	L	T	P	C
			2	2	0	4
Course Code of Pre-requisite subject(s)	CLPC10, CLPC19, CLPC20, CLPC21					
Session	July 2018	Section (if, applicable)	Not Applicable			
Name of Faculty	Dr A ARUNAGIRI	Department	Chemical Engineering			
Email	aagiri@nitt.edu	Telephone No.	91-431-2503114			
Name of Course Coordinator(s) (if, applicable)	Dr P Sivashanmugam					
E-mail	psiva@nitt.eu	Telephone No.	91-431-2503106			
Course Type	<input checked="" type="checkbox"/> Core course					
Syllabus (approved in BoS)						
<p>Design of Pressure Vessels: Design of vessels and its components under internal pressure, external pressure and combined loadings, design of heads/closures, design of supports and design of high pressure vessels.</p> <p>Design of Storage tanks, Agitated vessels and Reaction vessels.</p> <p>Design of Phase Separation Equipment - Design of physical separation equipments.</p> <p>Design of Heat Transfer Equipments - Design of Heat Transfer Equipments such as heat exchangers without and with phase change.</p> <p>Design of Mass Transfer Equipments: Design of mass transfer equipments such as distillation columns, absorption columns, extraction columns.</p> <p>Design of Simultaneous Heat & Mass Transfer Equipments: Design of dryers and cooling towers.</p>						
REFERENCE BOOKS						
<ol style="list-style-type: none"> 1. R. H. Perry, "Chemical Engineers' Handbook", 7th Edn., McGraw Hill, New York, 1998. 2. R. K. Sinnott, "Chemical Engineering Design", Coulson and Richardson's Chemical Engineering Series, Volume-6, Fourth Edition, Butterworth-Heinemann, Elsevier, New Delhi, 2005. 3. L. E. Brownell and E.H. Young, "Process Equipment Design - Vessel Design", Wiley Eastern Edn. New York, 1968. 4. B.C. Bhattacharyya, "Introduction to Chemical Equipment Design Mechanical Aspects", CBS Publishers & Distributors, New Delhi. 5. D.Q.Kern "Process Heat Transfer", Tata McGraw Hill Edn., 2004. 6. V. V. Mahajani and S. B. Umarji, "Joshi's Process Equipment Design", 4th Edn., Mac Millan Publishers India Limited, New Delhi, 2009. 						
COURSE OBJECTIVES						
<p>On completion of the course, A student can</p> <ol style="list-style-type: none"> 1. To apply the basic principles/concepts learned in the subjects of Fluid Mechanics, Heat Transfer, Mass Transfer, and Mechanical Operation in the design of chemical process equipment. 2. To develop the skill to select and design the appropriate process equipment for the required unit or process operation. 3. To analyses and evaluate the performance of existing equipment. 						

COURSE OUTCOMES (CO)	
Course Outcomes	Aligned Programme Outcomes (PO)
1. Perform the mechanical design of vessel and its auxiliaries	1,2,3,4,5,11
2. Integrate the knowledge acquired from core chemical engineering subjects for design of chemical process equipment (pressure vessels, storage tanks, reactor vessels, phase separation equipment)	1,2,3,4,5,8, 9,10,11,12
3. Identify the process equipment problems and provide suitable alternate solutions	1,2,3,4,5,8, 9,10,11,12

COURSE PLAN – PART II			
COURSE OVERVIEW			
<p>Chemical Process Industries comprise problems in process design, unit operations, equipment design and overall plant design. A chemical engineer is expected to be able to make complete design of a piece of chemical equipment. The course emphasizes on the development of design skills among the students to take design related decisions. A number of problems will be solved to illustrate the concepts clearly related to the various aspects of design and analysis of the basic process equipment viz. heat transfer equipments, mass transfer equipments, simultaneous heat and mass transfer equipments, phase separation equipments, storage tanks, reactors including mechanical design. The course will be very useful to undergraduate students and practitioners.</p>			
COURSE TEACHING AND LEARNING ACTIVITIES			
S. No.	Week	Topic	Mode of Delivery
1	1	Design of Heat Transfer Equipments without phase change – Double Pipe Heat Exchanger	Lecture, Tutorials & Discussion
2	2	Design of Heat Transfer Equipments without phase change – Shell & Tube Heat Exchanger	Lecture, Tutorials & Discussion
3	3	Design of Heat Transfer Equipments with phase change – Condensers	Lecture, Tutorials & Discussion
4	4	Design of Heat Transfer Equipments with phase change – Reboilers	Lecture, Tutorials & Discussion
5	5	Design of Heat Transfer Equipments with phase change – Evaporators	Lecture, Tutorials & Discussion
6	6	Design of Mass Transfer Equipments – Packed Columns	Lecture, Tutorials & Discussion
7	7	Design of Mass Transfer Equipments – Sieve Tray Columns	Lecture, Tutorials & Discussion
8	8	Design of Simultaneous Heat & Mass Transfer Equipments – Dryers & Cooling Towers	Lecture, Tutorials & Discussion
9	9	Design of vessels and its components under internal pressure, external pressure and combined loadings	Lecture, Tutorials & Discussion
10	10	Design of heads/closures, design of supports and design of high pressure vessels.	Lecture, Tutorials & Discussion
11	11	Design of Storage tanks, Agitated vessels and Reaction vessels.	Lecture, Tutorials & Discussion
12	12	Design of Phase Separation Equipment - Design of physical separation equipments.	Lecture, Tutorials & Discussion
13	13	General Review	Discussion

COURSE ASSESSMENT METHODS (shall range from 4 to 6)				
S. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test – 1, (Written Exam)	August Fourth week	1 Hour	20%
2	Cycle Test – 2, (Written Exam)	October First Week	1 Hour	20%
3	Seminar, Assignments, Surprise test, Oral Examination	As per schedule given by the faculty	15 -20 minutes	10%
4	End Semester (Written Exam)	November	3 hour	50%
CPA	Compensation Assessment*	October Third Week	1 hour	20%
*mandatory				
COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)				
Students indirect feedback will be collected twice during the course, one in the mid of the course and one at the end of the course on course contents, delivery etc.				
COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, academic honesty and plagiarism etc.)				
MODE OF CORRESPONDENCE (Email/ phone etc) : The student can contact the course teacher through Email/phone as given above.				
COMPENSATION ASSESSMENT POLICY				
One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered. This will be conducted after the cycle test - 2. The portions includes both Cycle Test 1 & 2. No compensation assessment for final assessment.				
ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)				
<ul style="list-style-type: none"> ➤ 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. 				
ACADEMIC HONESTY & PLAGIARISM:				
<ul style="list-style-type: none"> ➤ Plagiarism in Assignments, malpractices in assessments in any form is strictly prohibited. ➤ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty. ➤ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark. ➤ 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. 				
The above policy against academic dishonesty shall be applicable for all the programmes.				
ADDITIONAL INFORMATION				
1. Final assessment on the entire syllabus with at least 30% weightage.				
2. The passing minimum shall be as per Institute regulations.				
FOR APPROVAL				
 Course Faculty (Dr. A. ARUNAGIRI)		 CC-Chairperson (Dr. T SIVASANKAR)		 HoD (Dr. P. SIVASHANMUGAM)

Guidelines:

- a) The number of assessments for a course shall range from 4 to 6.
- b) **Every course shall have a final assessment on the entire syllabus with at least 30% weightage.**
- c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.**
- d) **The passing minimum shall be as per the regulations.**

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or class average/2 whichever is greater.		Peak/3 or class average/2 whichever is lower		40%

- e) **Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.**
- f) **Absolute grading policy shall be incorporated if the number of students per course is less than 10.**
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.