NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

This course outline template acts as a guide for writing your course outline. As every course is different, please feel free to amend the template/ format to suit your requirements.

COURSE OUTLINE TEMPLATE							
Course Title	**PROCESS CALCULATIONS**						
Course Code	**CLPC15**	**No. of Credits**		**L**	**T**	**P**	**C**
				3	1	0	4
Department	**Chemical Engineering**	**Faculty**		**N.Anantharaman**			
Pre-requisites Course Code	**NIL**						
Course Coordinator(s) (if, applicable)	**Dr.N.ANANTHARAMAN**						
Other Course Teacher(s)/Tutor(s) E-mail	**-**	**Telephone No.**		**0431-2503103**			
Course Type	**Core course**						

COURSE OVERVIEW

1. To give students fundamental knowledge in Units and conversions and also the basic laws governing chemical operations.
2. **To impart knowledgeable on material and energy balance with and without reactions**

COURSE OBJECTIVES

1.To nurture students to observe and understand the need of material balance and energy balance in chemical process industries.

2. To impart strong fundamental and technical knowledge among student to pursue various mathematicall techniques to solve material balance and energy balance problems.

3. To provide students experience in data analysis to formulate, solve and interpret the solutions to various unit operation problems by writing material balance.

4. To enable students to analyze and solve material balance and energy balance problems by applying basic principles of Chemical Engineering and Mathematics

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. COURSE OUTCOME 1. Students will have the capability to convert units and dimensions and also modify equations from system to another.	PO1,PO2, PO3, PO5, PO8. PO9 and PO12
2. Students will have the capability apply the laws of physics and chemistry in solving process industry related applications.	PO1, PO2, PO4, PO5, PO8, PO9, PO11and PO12

3. Students will have the proficiency to integrate the data and formulate the mass and energy balance problems.	PO1,PO2,PO3,PO5,PO8, PO9, PO11 and PO12
4. Students will have the capability to use mathematical knowledge for solving mass and energy balance problems with and without chemical reactions.	PO1,PO2, PO3, PO5, PO8, PO9, PO11 and PO12

COURSE TEACHING AND LEARNING ACTIVITIES *(* : It is likely that some of the classes will be lost due to holidays and hence the semester will go upto 14 weeks*)

S.No.	Week	Topic	Mode of Delivery
1	Week 1	Introduction and Objectives	Chalk and talk
2	Week 1	Introduction to units and Dimensions	Chalk and talk
3	Week 1	Problems on conversion of units	Chalk and talk
4	Week 1	Conversion of equations	Chalk and talk
5	Week 2	Problems on conversion of equations	Chalk and talk
6	Week 2	Expressing concentration and density	Chalk and talk
7	Week 2	Expressing concentration and density (continued)	Chalk and talk
8	Week 2	Problem solving	Chalk and talk
9	Week 3	Concept of average molecular weight	Chalk and talk
10	Week 3	Problems	Chalk and talk
11	Week 3	Ideal gases	Chalk and talk
12	Week3	Concepts of partial pressure and partial volume	Chalk and talk
13	Week 4	Problems on non-reacting systems	Chalk and talk
14	Week 4	Problems on reacting systems	Chalk and talk
15	Week 4	Concept of vapour pressure	Chalk and talk
16	Week 4	VLE data estimation	Chalk and talk
17	Week 5	Application to mass balance	Chalk and talk
18	Week 5	Steam distillation	Chalk and talk
19	Week 5	Concepts of crystallization	Chalk and talk
20	Week 5	Problems on estimation of yield	Chalk and talk
21	Week6	Problems on estimation of yield with hydrated salt	Chalk and talk
22	Week 6	Definitions on psychrometry	Chalk and talk
23	Week 6	Test 1	
24	Week 6	Psychrometric chart and its uses	Chalk and talk
25	Week 7	Problem solving using psychrometric chart	Chalk and talk
26	Week 7	Problem solving using psychrometric chart	Chalk and talk
27	Week 7	Problem solving using psychrometric chart	Chalk and talk
28	Week 7	Material balance for non reacting systems	Chalk and talk
29	Week 8	Material balance for non reacting systems	Chalk and talk
30	Week 8	Material balance for reacting systems	Chalk and talk

31	Week 8	Material balance for reacting systems	Chalk and talk
32	Week 8	Material balance for reacting systems	Chalk and talk
33	Week 9	Material balance for reacting systems	Chalk and talk
34	Week 9	Combustion problems	Chalk and talk
35	Week 9	Combustion problems	Chalk and talk
36	Week 9	Combustion problems	Chalk and talk
37	Week 10	Recycle, purge and bypass	Chalk and talk
38	Week 10	Recycle, purge and bypass	Chalk and talk
39	Week 10	Test 2	
40	Week 10	Thermo-chemistry concepts	Chalk and talk
41	Week 11	Problems on the above topic	Chalk and talk
42	Week 11	Energy balance	Chalk and talk
43	Week 11	Adiabatic flame temperature estimation	Chalk and talk
44	Week 11	Adiabatic flame temperature estimation	Chalk and talk
45	Week 12	Material balance in Unsteady state operations	Chalk and talk
46	Week 12	Material balance in Unsteady state operations	Chalk and talk
47	Week 12	Energy balance in Unsteady state operations	Chalk and talk
48	Week 12	Overview of the course	Talk

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assignment-1	3rd week	-	2%
2	I cycle test	6th week since commencement	1 hour	20%
3	Assignment-2	8th week	-	3%
4	Assignment -3	10th week		3%
5	II cycle test	12h week since commencement	1 hour	20%
6	Assignment -4	14th week	-	2%
7	End semester examination	16th week since commencement	1 hour	50%

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

TEXT BOOKS:

1. *Himmelblau, "Basic Principles and Calculations in Chemical Engineering", 8th Edn., Prentice Hall of India Ltd, India 2012*
2. *V.Venkataramani, N.Anantharaman and K.M. Meera Sheriffa Begum, 2nd Edn., 'Process Calculations' Prentice Hall of India Ltd, New Delhi. 2013*

REFERENCE BOOKS:

3. *O. A .Hougen, K. M. Watson and R. A. Ragatz, "Chemical Process Principles", Vol- I, CBS Publishers and Distributors, New Delhi, 1995.*
4. *B. I. Bhatt, "Stoichiometry", 5th Edn., Tata McGraw Hill Publishers Ltd., New Delhi, 2010.*

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)
1) Feed back is planned to be collected twice; once in the mid semester and one at the end of course as soon as classes are over. 2) The academic performance of the students will be assessed based on 2 cycle tests (each 20 marks), one final examination (50 marks) and assignments (10 marks). 3) Suitable mapping of Cos with Pos will be made and attainment will be calculated.
COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)
1) It is expected that the students will not indulge in any form of malpractice. In the event of any malpractice reported, all those who are involved will loose all the marks in that test/examination/assignment. Reappearance /additional assignment will not be given. 2) Attendance of 75% and above is expected. The 25% allowance is given for absence due to illness/institute related activities(sports/competitions/seminars etc)
ADDITIONAL COURSE INFORMATION
eg.: The Course Coordinator is available for consultation at times that are displayed on the coordinator's office notice board. Queries may also be emailed to the Course Coordinator directly at **naraman@nitt.edu**
FOR SENATE'S CONSIDERATION
 Course Faculty _____   CC-Chairperson _____ HOD _____