

Date- 30/06/2021

# Hindustan College of Science & Technology

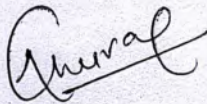
(Farah, Mathura)

## Chemical Engineering Department

### Notice

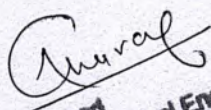
This is for information to all the students of 3<sup>rd</sup> year that the Value Added Course (**Process Equipment Design**) shall begin from 12<sup>th</sup> of July 2021. All the students of 3<sup>rd</sup> year are directed to register themselves and fill up the registration form in the departments before start of the regular classes for the above courses.

The registration can be done from 6<sup>th</sup> July 2021 up to 10<sup>th</sup> July 2021.



**Mr. Anurag Bajpai**

**Head, Department of Chemical Engineering**



Head  
Department of Chemical Engg.  
Hindustan College of Science & Technology  
Farah, Mathura



Director  
Hindustan College of  
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**HINDUSTAN COLLEGE OF SCIENCE & TECHNOLOGY,  
FARAH -MATHURA**

**DEPARTMENT OF CHEMICAL ENGINEERING**



*Value Added Course*  
**VAC-1701-Process Equipment Design**

*12<sup>th</sup> July '2021 – 20<sup>th</sup> Nov 2021 - Every Saturday: 3:10 PM – 4:50 PM*



*By*

*Mr. Anurag Bajpai*  
*HOD -Chemical Engineering*

**Registration Dates**  
**6<sup>th</sup> July 2021 – 10<sup>th</sup> July 2021**

**For Registration: Please contact**  
**Mr. Raj Kumar, Office Staff, Department of Chemical Engineering**

*Anurag*  
Head  
Department of Chemical Engg  
Hindustan College of Science & Technology  
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*[Signature]*  
Director  
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# HINDUSTAN COLLEGE OF SCIENCE & TECHNOLOGY, FARAH -MATHURA



## DEPARTMENT OF CHEMICAL ENGINEERING

### *Value Added Course*

### **VAC -1701 - Process Equipment Design**

**12<sup>th</sup> July '2021 – 20<sup>th</sup> Nov 2021 - Every Saturday: 3:10 PM – 4:50 PM**

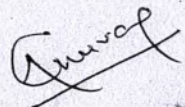
### Course Objectives

The main objective of this value added course are as follows:

1. Plan logistics for waste collection and disposal .
2. Formulate strategies for segregation of waste and waste reduction.
3. Plan appropriate recycles facility for heterogeneous wastes.
- 4 Plan and design waste collection systems.

### Course Syllabus

Units	Details	Course Out comes
1	Introduction to waste management Logistics, importance, methods of logistics, human components, technological components- waste handling equipment and technology, and managerial goals, steps in waste management logistics	CO1
2	Waste collection system and organization Environmental aspects of waste collection, role of public authority and private sector in waste collection, organizing collection of residential waste, fee schemes, public awareness programs	CO2
3	Source segregation and collection source-segregated waste, Purpose of source segregation, segregation criteria and guidance, segregation potential and efficiencies, systems for collecting segregated fraction	CO3
4	Waste transfer stations Waste delivery, waste transfer, transportation of the reloaded waste, siting and Design of waste transfer station, economical considerations, recycling solid wastes, materials recovery facilities	CO4

  
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# HINDUSTAN COLLEGE OF SCIENCE & TECHNOLOGY, FARAH -MATHURA



## DEPARTMENT OF CHEMICAL ENGINEERING

*Value Added Course*

**VAC-1701 - Process Equipment Design**

**12<sup>th</sup> July '2021 – 20<sup>th</sup> Nov 2021 - Every Saturday: 3:10 PM – 4:50 PM**

### Course Outcomes

- CO1 Plan logistics for waste collection and disposal  
Formulate strategies for segregation of waste and waste reduction.
- CO2
- CO3 Plan appropriate recycles facility for heterogeneous wastes.
- CO4 Plan and design waste collection systems.

### CO-PO Mappings

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3											2		
CO2	2	3											2		
CO3	2			3						2	2	2	2		
CO4			2	3						2	2	2		3	
Average	2	3	2	3						2	2	2	2	3	

**Evaluation Criteria: 1. Evaluation of Practical assignments, Group project, Viva/Quiz**

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**HINDUSTAN COLLEGE OF SCIENCE & TECHNOLOGY, FARAH -MATHURA**  
**DEPARTMENT OF CHEMICAL ENGINEERING**

*Value Added Course*  
**VAC-1701 - Process Equipment Design**



**Program Schedule**

**12<sup>th</sup> July '2021 – 20<sup>th</sup> Nov 2021 - Every Saturday: 3:10 PM – 4:50 PM**

Session	Date	Time	No of Lectures	Session Topic	Resource Person
1	17-07-2021	3:10 PM – 4:50 PM	2	Topic 1: Design project procedure, design information from the literature	Mr. Anurag Bajpai
2	24-07-2021	3:10 PM – 4:50 PM	2	Topic 2: Flow diagrams, preliminary design	Mr. Anurag Bajpai
3	31-07-2021	3:10 PM – 4:50 PM	2	Topic 3: Comparison of different processes, equipment design	Mr. Anurag Bajpai
4	07-08-2021	3:10 PM – 4:50 PM	2	Topic 4: Scale-up in design, Materials of construction	Mr. Anurag Bajpai
5	14-08-2021	3:10 PM – 4:50 PM	2	Topic 5: Selection of materials, fabrication of equipment	Mr. Anurag Bajpai
6	21-08-2021	3:10 PM – 4:50 PM	2	Topic 6: Pressure vessels – calculation of thickness of cylindrical and spherical shells	Mr. Anurag Bajpai
7	28-08-2021	3:10 PM – 4:50 PM	2	Topic 7: Subjected to internal pressure, heads or covers	Mr. Anurag Bajpai
8	04-09-2021	3:10 PM – 4:50 PM	2	Topic 8: Storage vessels – storage of nonvolatile liquids, storage of volatile liquids	Mr. Anurag Bajpai
9	11-09-2021	3:10 PM – 4:50 PM	2	Topic 9: Storage of gases. Supports for vessels – bracket or lug supports	Mr. Anurag Bajpai
10	18-09-2021	3:10 PM – 4:50 PM	2	Topic 10: Leg supports, skirt supports, saddle supports	Mr. Anurag Bajpai
11	25-09-2021	3:10 PM – 4:50 PM	2	Topic 11: Design of double pipe heat exchangers	Mr. Anurag Bajpai
12	09-10-2021	3:10 PM – 4:50 PM	2	Topic 12: Shell and tube heat exchangers (1-2,2-4), optimum design and heat recovery	Mr. Anurag Bajpai
13	16-10-2021	3:10 PM – 4:50 PM	2	Topic 13: Selection of suitable heat exchanger	Mr. Anurag Bajpai
14	23-10-2021	3:10 PM – 4:50 PM	2	Topic 14: Design of single and multiple effect evaporators without boiling point elevation	Mr. Anurag Bajpai
15	30-10-2021	3:10 PM – 4:50 PM	2	Topic 15: Finite-stage contactors- bubble cap tray, sieve tray and valve tray units	Mr. Anurag Bajpai
16	06-11-2021	3:10 PM – 4:50 PM	2	Topic 16: Maximum allowable vapor velocities, plate and column efficiency, other design factors	Mr. Anurag Bajpai
17	13-11-2021	3:10 PM – 4:50 PM	2	Topic 17: Continuous contactors – types of packing, liquid distribution, pressure drop	Mr. Anurag Bajpai
18	20-11-2021	3:10 PM – 4:50 PM	2	Topic 18: Packing efficiencies. Relative merits of plate and packed towers, selection of contacting equipment	Mr. Anurag Bajpai
<b>Total Number of Hours covered</b>			<b>36 (30 Hours)</b>		

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# Value added course-1

## Process Equipment Design (VAC-1701)

### UNIT-I

#### INTRODUCTION TO PLANT DESIGN.

#### PROCESS DESIGN DEVELOPMENT:

Design project procedure, design information from the literature, flow diagrams, preliminary design, comparison of different processes, equipment design, scale-up in design. Materials of construction, selection of materials, fabrication of equipment.

Learning Outcomes: After the completion of the Unit I, the student will be able to

1. Discuss the preliminary design of various processes
2. Identify various materials for fabrication of equipment
3. Explain the scale up in design

### UNIT-II

#### MECHANICAL DESIGN OF PROCESS EQUIPMENT:

Pressure vessels – calculation of thickness of cylindrical and spherical shells subjected to internal pressure, heads or covers.

Storage vessels – storage of nonvolatile liquids, storage of volatile liquids, storage of gases. Supports for vessels – bracket or lug supports, leg supports, skirt supports, saddle supports.

Learning Outcomes: After the completion of the Unit II, the student will be able to

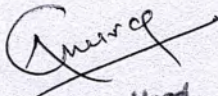
1. Identify various stresses acting on the walls of pressure vessels
2. Estimate the thickness of thin walled pressure vessels
3. Calculate the thickness of heads of pressure vessels

### UNIT-III

#### HEAT TRANSFER EQUIPMENT DESIGN:

Design of double pipe heat exchangers, Shell and tube heat exchangers (1-2,2-4), optimum design and heat recovery, selection of suitable heat exchanger.

  
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Design of single and multiple effect evaporators without boiling point elevation.

Learning Outcomes: After the completion of the Unit III, the student will be able to

1. Identify the purpose of various heat exchangers
2. Estimate the overall heat transfer coefficient for heat exchangers
3. Calculate the area of multiple effect evaporator .

#### UNIT-IV

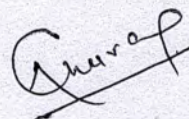
##### **MASS TRANSFER EQUIPMENT DESIGN:**

Finite-stage contactors- bubble cap tray, sieve tray and valve tray units, maximum allowable vapor velocities, plate and column efficiency, other design factors.

Continuous contactors – types of packing, liquid distribution, pressure drop, packing efficiencies. Relative merits of plate and packed towers, selection of contacting equipment.

Learning Outcomes: After the completion of the Unit IV, the student will be able to

1. Select the suitable contactor for a given mass transfer operation
2. Design a packed bed
3. Evaluate the design parameters of tray tower



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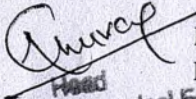


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**Hindustan College of Science and Technology - Mathura** **CHEMICAL ENGG.**

**CLASS TIME TABLE FOR ODD SEMESTER 2021-22**

SESSION:	2021-22		W.E.F :	11/10/2021		CLASS TEACHER:	Mr. Anurag Bajpai (AB)			
YEAR/SEM-SEC:	III Year (V Sem)		ROOM.NO :	504-B		COUNSELLORS :				
Time / Day	I	II	III	IV	V	VI	VII	VIII		
	10:10 TO 11:00	11:00 TO 11:50	11:50 TO 12:40	12:40 TO 01:30	01:30 TO 02:20	02:20 TO 03:10	03:10 TO 04:00	04:00 TO 04:50		
MONDAY	MT-I	OT	CRE-II	PDC	<b>LUNCH</b>	Mass Transfer-I Lab		IPRS		
	SKV	SA	AB	LSB				SKV		
	504-B	504-B	504-B	504-B				504-B		
TUESDAY	OT	IPRS	CI	CRE-II		MT-I	PDC	Value Added Course		
	SA	AB	DJ	AB		SKV	LSB			
	504-B	504-B	504-B	504-B		504-B	504-B			
WEDNESDAY	MT-I	PDP		OT		<b>LUNCH</b>	Library	Process Modelling and Simulation Lab		
	SKV			SA						
	504-B			504-B						
THURSDAY	MT-I	OT	CRE-II	IPRS			Mini Project or Internship Assessment		Value Added Course	
	SKV	SA	AB	AB						
	504-B	504-B	504-B	504-B						
FRIDAY	CRE-II	CRE-II	PDC	MT-I			PDC Lab		CI	
	AB	AB	LSB	SKV					DJ	
	504-B	504-B	504-B	504-B	504-B					
SATURDAY	PDC	CI	OT	PDC	IPRS		VAC-1701			
	LSB	DJ	SA	LSB	SKV					
	504-B	504-B	504-B	504-B	504-B					
Name of the Subject			Subject Code	Name of the Faculty			Total No. of Lect./Tut./Practical			
							Lect.	Tut.	Pract.	
Mass Transfer -I (MT-I)			KCH501	Mr. Sandeep Kr. Verma (SKV)		4	1	0		
Intellectual Property Rights & Standardization (IPRS)			KCH058	Mr. Sandeep Kr. Verma/Mr. Anurag Bajpai		3	1	0		
Chemical Reaction Engg.-II (CRE-II)			KCH502	Mr. Anurag Bajpai (AB)		4	1	0		
Process Dynamics and Control (PDC)			KCH503	Mr. Lalit Singh Baghel (LSB)		4	1	0		
Optimization Techniques (OT)			KCH052	Dr. Salim Ahmad (SA)		3	1	0		
Constitution of India (CI)			NC	Mr. Dilip Johri (DJ)		3	0	0		
Mini Project or Internship				Mr. Anurag Bajpai/Mr. Asim Shukla		0	0	2		
Process Modelling and Simulation Lab			KCH 553	Dr. Salim Ahmad (SA)		0	0	2		
Mass Transfer-I Lab			KCH551	Mr. Sandeep Kr. Verma/Mr. Venktesh		0	0	2		
PDC Lab			KCH 552	Mr. Lalit Singh Baghel/Mr. Venktesh		0	0	2		

  
 Mr. Anurag Bajpai  
 Head of the Department  
 Department of Chemical Engg.  
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 Farah, Mathura

  
 Director  
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# Hindustan College of Science & Technology

Department of Chemical Engineering

Value Added Course - Registration Form

## Process Equipment Design

Session 2021-22

From 12th July, 2021 to 20th Nov, 2021

Sr. No.	Roll No.	Name	Department	Semester	Signature of Student
1	1900640510001	Hardik Kumar	Chemical	V	H. Kumar
2	1900640510002	Ritkrati Agarwal	Chemical	V	Riti
3	2000640519001	Aditya Raghav	Chemical	V	Aditya
4	2000640519002	Shivam Saraswat	Chemical	V	Shivam
5	2000640519003	Sumant Kumar Singh	Chemical	V	Sumant

*Sumant*

Department of Chemical Engineering  
Hindustan College of Science & Technology  
Farah, Mathura

*Ch...*

Director

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# Hindustan College of Science & Technology

Department of Chemical Engineering

Value Added Course - Registration Form

## Process Equipment Design

Session 2021-22 (Odd Sem)

session wise Attendance Sheet

Sl. No.	Roll No.	Name	SEM	Signature of the Student by Session																					
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18				
				17.07	24.07	31.07	07.08	14.08	21.08	28.08	04.09	11.09	18.09	25.09	02.10	09.10	16.10	23.10	30.10	06.11	13.11	20.11			
1	1900640510001	Hardik Kumar	V	H.K	H.Km	H.Km	A	H.K	H.Km	H.Km	H.K	H.Km	A	H.Km	H.Km	H.K	A	H.Km	H.Km	H.Km	A	H.Km	H.Km	H.Km	A
2	1900640510002	Ritkrati Agarwal	V	Riti	A	Riti	Riti	Riti	A	Riti	Riti	Riti	Riti	A	Riti	Riti	Riti	Riti	Riti	Riti	A	Riti	Riti	Riti	Riti
3	2000640519001	Aditya Raghav	V	A	Aditya	Aditya	Aditya	Aditya	Aditya	A	Aditya	Aditya	A	Aditya	Aditya	Aditya	Aditya	Aditya	Aditya	Aditya	Aditya	Aditya	Aditya	Aditya	Aditya
4	2000640519002	Shivam Saraswat	V	Shm	Shm	Shm	Shm	A	Shm	Shm	A	Shm	Shm	Shm	Shm	A	Shm	Shm	Shm	Shm	Shm	Shm	Shm	Shm	Shm
5	2000640519003	Sumant Kumar Singh	V	Sumat	Sumat	Sumant	Sumat	A	Sumant	Sumat	Sumat	Sumant	Sumat	A	Sumant	Sumat	A	Sumant	Sumat	Sumant	A	Sumant	Sumat	A	Sumant

*Sumant*

Head  
Department of Chemical Engg.  
Hindustan College of Science & Technology  
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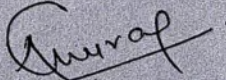
*Pb...*  
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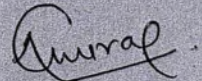


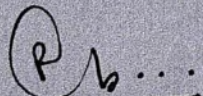
***Certificate of Completion***

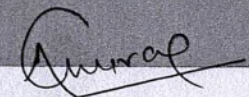
**DEPARTMENT OF CHEMICAL ENGINEERING  
Academic Session 2021-22**

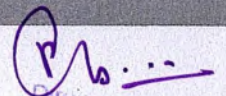
***This is to certify that Mr. Hardik Kumar, Roll No: 1900640510001 of Course: B. Tech. Chemical Engineering, V semester has successfully completed 30 hours Value Added Course titled "Process Equipment Design" (Course code: VAC-1701).***

  
Course Coordinator

  
Head of Department

  
Director, HCST

  
Head  
Department of Chemical Engg.  
Hindustan College of Science & Technology  
Farah, Mathura

  
Director  
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FARAH, MATHURA**



***Certificate of Completion***

**DEPARTMENT OF CHEMICAL ENGINEERING**  
*Academic Session 2021-22*

*This is to certify that Mr. Shivam Saraswat, Roll No: 2000640519002 of Course: B. Tech. Chemical Engineering , V semester has successfully completed 30 hours Value Added Course titled "Process Equipment Design" (Course code: VAC-1701).*

Course Coordinator

Head of Department

Director, HCST

Head  
Department of Chemical Engg.  
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