डॉ बी आर अम्बेडकर राष्ट्रीय प्रौद्योगिकी संस्थान,जालंधर

Dr. B R Ambedkar National Institute of Technology, Jalandhar

Department of Chemical Engineering

Ref.: NITJ/CH/ 912

Date: 06/09/2022

Subject: Minutes of 2nd Internal Meeting of Board of Studies (BOS)

Dear Sir

Please find the Minutes of 2nd Internal Meeting of Board of Studies, Department of Chemical Engineering.

(HD/CH) 06/09/22

Dean Academics

MINUTES

OF

2nd INTERNAL MEETING
OF

BOARD OF STUDIES

OF

DEPARTMENT OF CHEMICAL ENGINEERING

August 03, 2022 AT 12:30 PM

DEPARTMENTAL LIBRARY

Dr. B.R.AMBEDKAR NATIONAL INSTITUE OF TECHNOLOGY
JALANDHAR- 144011

2nd INTERNAL BOARD OF STUDIES (BOS) MEETING OF DEPARTMENTAL FACULTY MEMBERS WAS CONDUCTED ON AUGUST 03, 2022 AT 12:30 PM IN THE DEPARTMENTAL LIBRARY OF CHEMICAL ENGINEERING DR. B.R. AMBEDKAR NAIONAL INSTITUTE OF TECHNOLOGY, JALANDHAR. MINUTES OF THE MEETING OF BOS ARE AS FOLLOWS

The following members were present:

1. Dr. Renu Gupta — Chairperson
   Associate Professor & Head
   Department of Chemical Engineering
2. Dr. B.S. Kaith — Member
   Professor
   Department of Chemistry
3. Dr. M.K. Jha — Member
   Professor (HAG)
   Department of Chemical Engineering
4. Dr. Sangeeta Garg — Member
   Associate Professor
   Department of Chemical Engineering
5. Dr. Poonam Gera — Member
   Associate Professor
   Department of Chemical Engineering
6. Dr. S. Bajpai — Member
   Associate Professor
   Department of Chemical Engineering
7. Dr N K Srivastava — Member
   Associate Professor
   Department of Chemical Engineering
8. Dr. Jatinder Kumar Ratan — Member
   Associate Professor
   Department of Chemical Engineering
9. Dr. Neetu Divya — Member
   Assistant Professor
   Department of Chemical Engineering

10. Dr. Shashikant Yadav — Member
    Assistant Professor
    Department of Chemical Engineering

11. Dr. Deepak Sahu — Member
    Assistant Professor
    Department of Chemical Engineering

12. Dr. Amit D Saran — Member
    Assistant Professor
    Department of Chemical Engineering

13. Dr. Anurag Tiwari — Member
    Assistant Professor
    Department of Chemical Engineering

14. Dr. D Giri Babu — Member
    Assistant Professor
    Department of Chemical Engineering

15. Dr. Nitin Naresh Pandhare — Member
    Assistant Professor
    Department of Chemical Engineering

16. Dr. Anjireddy Bhavanam — Member Secretary
    Assistant Professor
    Department of Chemical Engineering

The following members could not attend the meeting due to pre-occupation.

1. Dr Ajay Bansal — Member
   Professor and Registrar (I/C)
   Department of Chemical Engineering

2. Dr Harsh K Verma — Member
   Professor and Dean Academic
   Computer Science & Engg. Department

3. Dr. Renu Dhir — Member
   Associate Professor
   Computer Science & Engg. Department

21/9/22

The Chairman, Board of Studies welcomed the members of the BOS. Thereafter, the following agenda items were taken up for discussion

Item No.	Particular No.
Item 2.1	Confirmation of Minutes of 1st Internal BOS meeting held on 19th May 2022
Item 2.2	Revision of Eligibility Criteria for Admission in M. Tech Chemical Engineering
Item 2.3	Revision of Eligibility Criteria for Admission in PhD Chemical Engineering
Item 2.4	Revision of Program Outcomes (POs) and Program Specific Outcomes (PSOs) of B.Tech. Chemical Engineering
Item 2.5	Revision of Course Outcomes (COs) Mapping with POs and PSOs of B.Tech. Chemical Engineering

Item 2.1

Confirmation of Minutes of 1st Internal BOS meeting held on 19th May 2022.

Members approved the Minutes of 1st Internal BOS meeting held on 19th May 2022.

Item 2.2

Revision of Eligibility Criteria for Admission in M. Tech Chemical Engineering

Members deliberated and approved the revision of Eligibility Criteria for Admission in M. Tech Chemical Engineering. The finalized eligibility criteria is as follows

Admission through CCMT*

B.Tech in Engineering /Technology with valid GATE score
or
M.Sc in sciences with valid JRF-NET /GATE
or
B.Pharm with valid GATE /G-PAT Score

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Admission through Self-sponsored*

B.Tech in Engineering /Technology
or
MSc in sciences
or
B.Pharm

*Other terms and conditions are as per the institute norms

Item 2.3
Revision of Eligibility Criteria for Admission in PhD Chemical Engineering

Members deliberated and approved the revision of Eligibility Criteria for Admission in PhD Chemical Engineering. The finalized eligibility criteria is as follows

Institute fellowship*
M.Tech in Engineering/Technology along with Bachelor's Degree in Engineering/ Technology
or
B.Tech in Engineering /Technology with CGPA of 8.5 and above on a 10 point scale or 75% aggregate from a Centrally Funded Technical Institute (CFTI).
or
M.Sc in sciences with JRF-NET/GATE Score
or
M.Pharm with GATE /G-PAT Score

Part time*
M.Tech in Engineering/Technology along with Bachelor's Degree in Engineering/ Technology
Or
B.Tech in Engineering /Technology with CGPA of 8.5 and above on a 10 point scale or 75% aggregate from a Centrally Funded Technical Institute (CFTI).
Or
MTech in Engineering /Technology
Or
MSc in sciences
Or
M.Pharm

Self sponsored*
M.Tech in Engineering /Technology along with Bachelor's Degree in Engineering/ Technology
or

B.Tech in Engineering /Technology with CGPA of 8.5 and above on a 10 point scale or 75% aggregate from a Centrally Funded Technical Institute (CFTI).
or
MSc in sciences
or
M.Pharm

*Other terms and conditions are as per the institute norms

Item 2.4
Revision of Program Outcomes (POs) and Program Specific Outcomes (PSOs) of B.Tech. Chemical Engineering
Members approved the revised Program Outcomes (POs) and Program Specific Outcomes (PSOs) of B.Tech. Chemical Engineering. The Revised POs and PSOs are as follows

Programme Outcomes (POs):

Graduates of Chemical Engineering will demonstrate:

1. **Engineering knowledge:** Students will be able to learn the basics of various unit operations and processes related to chemical and allied industries.
2. **Problem analysis**: Students to identify formulate and analyse simple and complex Chemical Engineering problems.
3. **Design/development of solutions:** Students will be able to design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Students will be able to learn and apply latest engineering softwares and skills for modelling, simulation and design of chemical engineering processes.
6. **The engineer and society**: Students to understand ethical aspects of chemical engineering and the impact of the profession on society.
7. **Environment and sustainability:** Students will have an understanding of global economic, environmental, demographic and political issues, the impact of engineering decisions on the local and global environment, economy, and society and cultures other than that from which they originate.

8. **Ethics:** Students will be able to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Students will be required to do the various curricular and extra-curricular activities individually and in groups to have multifaceted growth.
10. **Communication:** Students will be able to produce effective written and oral communication and adapt their presentation style and content to match the audience.
11. **Project management and finance**: Students will be able to apply knowledge and understanding of the engineering and management principles and implement these to their own work, as a member and leader in a team, to investigate the techno-economic feasibility and to manage projects.
12. **Life-long learning**: Students will be proficient in the use of a variety of informational and educational media such as textbooks, scientific and technical journals, library system, internet and educational software, have an understanding of and exposure to the breadth and structure of the professional and technical support system that will be available to the students upon graduation.

Programme Specific Outcomes (PSOs):

1. **PSO1** Apply the fundamentals of mathematics, basic science and engineering knowledge to understand, analyze, and solve the complex problems of chemical Engineering and allied disciplines.
2. **PSO2** To design, innovate and implement the knowledge for the benefit of chemical and allied industries.
3. **PSO3** Implementation of communication skills, professional engineering solutions and ethics for sustainable development of the society.

Item 2.5
Revision of Course Outcomes (COs) Mapping with POs and PSOs of B.Tech. Chemical Engineering

Members approved the revised Course Outcomes (COs) Mapping with POs and PSOs of B.Tech. Chemical Engineering. The revised mapping is given Annexure I.

Chairman BOS may kindly go through it and approve the same.

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2/9/2022

(Dr. Anjireddy Bhavanam)
Assistant Professor and Member Secretary
BOS, Chemical Engineering.

05/09/22

HD/CH
Cum Chairperson, BOS, Chemical Engineering.

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CO and PO mapping - Annexure I

Course Code	Course Title	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CHPC-201	Chemical Process Calculations	CO1: Understand the material and energy balances of chemical processes.	3	2	3	2	1		1				1		2		1
		CO2: Able to perform material and energy balances on chemical processes/equipment without and with reactions.	3	3	2	2	3				1	1	1	1	3	2	2
		CO3: Able to draw the flow diagram and solve the problems involving recycle, purge and bypass in a process or unit	3	3	2	1	2				1	2		1	3	2	2
		CO4: Understand the ideal and real behavior of gases, vapors and liquids	2	2	2	1	2								1	1	1
CHPC-203	Fluid Mechanics	CO1 : students would be able to measure pressure drop, flow rates etc. for incompressible and compressible fluids.	3	3	1										3	1	
		CO2: Ability to select pumps, valves, and would be able to calculate power requirement for pumping as well as agitation operations.	3	3	3										3	3	
		CO3: Ability to analyze the fluid flow problems with the application to the momentum balance.	3	3	1										2	1	
		CO4: Applying the principles of fluid mechanics to	3	3	3										3	3	

		chemical engineering problems.															
CHPC-205	Chemical Technology-I	CO1: Able to analyze the flow of raw materials to finished products quantitatively and qualitatively in each step of process.	3	3	3	3	2	1	2	1			3	1	2	3	2
		CO2: Able to understand the unit operations and unit processes involved.	3	3	3	2	2	2	2	1			3	1	2	3	2
		CO3: Able to identify process flow diagrams of different chemical process industries and to understand the various associated engineering problems.	3	3	3	3	2	1	2	1	1		3	1	2	3	2
		CO4: Ability to get knowledge on materials of construction and corrosion problems.	3	3	3	2	2	2	2	1	1		3	1	2	3	2
CHPC-207	Mechanical Operations	CO1: The student would understand the physical properties, property measurement and handling of solid-solid and solid-fluid mixtures.	3	3	2	1	1	2	2	1	2		1	3	3	2	1
		CO2: The student would understand separation processes for solid-solid and solid-fluid mixtures.	3	3	2	1	1	3	2	1	2		1	3	3	2	1
		CO3: To understand the processes involved in agitation and mixing of liquids	3	3	2	1	1	1	2	1	2		1	3	3	2	1
		CO4:To understand the working and applications of	3	3	2	1	1	2	1	1	2		1	3	3	2	1

		solid-storage and conveying, and flow through packed and fluidized beds															
CHPC-209	Material Science for Chemical Engineers	CO1: Understand the basics knowledge such as internal structure, crystal geometry, crystal imperfection of the engineering materials	1	2	2	1									3	1	
		CO2: Understand the various properties and corrosion behavior of the selected materials in chemical industries.	3	3	3	1	1		1						3	3	
		CO3: Able to get experience in the metallic and nonmetallic material selection and handling material in chemical engineering in the areas of equipment design.	3	2	1				1						2	1	
		CO4: Able to get knowledge on advanced materials and their application.	3	2	3				1						3	2	
CHPC-221	Fluid Mechanics Lab	CO1 The student must be able to approach and solve typical problems in fluid dynamics at the appropriate level.	3	3	1						1	2	1	1	2	2	1
		CO2 Students will be able to understand the fluid dynamics and also the principles of turbulent flow, calculation of turbulent boundary layers with pressure gradient, transition from laminar to turbulent flow.	3	3	2						1	1	1	1	3	2	1

		CO3 Learn tomeasurevolumetric and mass flow rates through the Venturi meter and Orifice meter and efficiency of pumps.	3	3	2										3	2	1
		CO4 Ability to understand and analyze the applications to industrial flows.	2	2	3						1	1	1	2	3	2	1
CHPC-223	Mechanical Operations Lab	CO1: To experimentally analyze the properties, size-reduction, filtration and handling of solid-solid and solid-fluid mixtures	3	3	2						1	1	1	1	2	2	1
		CO2: To experimentally analyze separation processes for solid-solid and solid-fluid mixtures	3	3	2						1	1	1	1	3	2	1
		CO3: To experimentally analyze the parameters involved in agitation and mixing of liquids	3	3	2						1	1	1	1	3	2	1
		CO4: To experimentally analyze the working and applications of packed and fluidized beds	3	3	2						1	1	1	1	3	2	1
CHPC-202	Chemical Engineering Thermodynamics	CO1:Ability to understand the basic concepts of thermodynamic such as temperature, pressure, system, properties, process, state, cycles and equilibrium.	3	3	3	2	2		1			1		1	3	3	
		CO2:Ability to apply the laws of thermodynamics for solving problems related to flow. processes and equilibrium	3	3	3	3	2					1			3	3	

		systems															
		CO3:Ability to define energy transfer through mass, heat and work for closed and control volume systems.	3	3	3	3	3					1			3	2	
		CO4:Ability to understand the homogeneous gas phase reactions and heterogeneous chemical equilibrium	3	3	3	3	3					1			3	3	
CHPC-204	Heat Transfer	CO1: Ability to understand and solve conduction, convection and radiation problems.	3	3	3										3	2	
		CO2: students should be able to perform heat flux calculations through constant and variable area elements and estimate optimum insulation thickness.	3	3	3										3	2	
		CO3: Develop correlations using elementary dimensional analysis and comprehend the laws governing radiation mode.	3	3	2										3	2	
		CO4: Ability to design and analyze the performance of heat exchangers and evaporators, reactor heating and cooling systems.	3	3	3										3	3	
CHPC-206	Chemical Technology-II	CO1 :To understand the manufacturing processes in various chemical process industries. etc. for incompressible and compressible fluids.	3	3	3	2	2	1	2	1			3	1	3	3	2

		CO2: To understand the different raw materials, process parameters and industrial variations	3	3	3	3	2	2	2	1			3	1	3	3	2
		CO3: Able to identify process flow diagrams of different chemical process industries and to understand the various associated engineering problems	3	3	3	3	2	1	3	1	1		3	1	3	3	2
		CO4: Ability to get knowledge on materials of construction and corrosion problems.	3	3	3	2	2	2	2	1	1		3	1	3	3	2
CHPC-208	Energy Technology	CO1 : The students will understand the concepts of coal origin, classification, preparation and their conversion technologies for energy production.	3	3	3			1	3			1	2	1	3	3	1
		CO2 : Ability to understand different types of unit process involved in petroleum refining.	3	3	3			1	3			1	2	1	3	3	1
		CO3 : Able to gain knowledge on manufacturing process of gaseous fuels and their utilization.	3	3	3			1	3			1	2	1	3	3	1
		CO4 : Able to acquire the knowledge on various alternate energy technologies and their importance in fulfilling the present day energy needs.	1	1	1			1	3			1	2	1	3	3	1
CHPC-210	Process	CO1: Introduce to standards	3	2	3	1	2	2	2	1		1		1	2	2	1

	Equipment Design	for the mechanical design of equipment used in the process industry.															
		CO2: This course enables the students to use the design codes.	2	3	3	2	2	2	2	1		2		2	2	2	1
		CO3: The students would demonstrate general understanding of fabrication techniques and equipment testing as a designer.	3	2	3	2	3	1	1	2	1	2	2	2	2	3	2
		CO4: Students will able to design, fabricate and identify design problems in industrial equipment based on the knowledge obtained from this course.	3	3	3	3	3	1	2	2	1	2	2	2	3	3	3
CHPC-222	Chemical Technology Lab	CO1: Acquire the knowledge to determine acid and saponification value of given oil sample	3	1	1			2	2						2	2	
		CO2: Able to understand the measurement of various properties like viscosity, Molecular weight using viscometer	3	2	2	1		2	2						2	2	
		CO3: Acquire knowledge in analysis of cement and preparation of urea.	3	3	2	1		1	2		1				2	2	
		CO4: Ability to estimate the reducing and non reducing nature of sugar sample, adulteration of food samples and corrosion rate of a metals.	3	2	2	1		2	2		1				2	2	
CHPC-224	Heat Transfer Lab	CO1:The students will exhibit the skills of handling equipment at laboratory	3	3	3	3					1		1	2	3	3	1

		scale and co-relate the theoretical aspects by performing experiments related to heat transfer.															
		CO2: The students will develop the hand experience for industry.	3	3	3	3					1		1	2	3	3	1
		CO3: Ability to understand, explain and select instrumental for heat transfer analysis.	3	1	2	2							1	2	2	2	
		CO4: The students will develop the skill of presenting the results in form of written reports.	1	1	1	2			3	1		3	1	2	1	2	3
CHPC-301	Mass Transfer- I	CO1: Ability to understand the principles of mass transport	3	3	2	2	1	2	3	1	2	1	2	3	3	2	2
		CO2 :The students are able to comprehend the concepts of co current & counter current processes, cascades and concept of Ideal stage and stage efficiencies, continuous contact equipment's	3	3	3	2	2	2	2	1	3	2	2	3	3	3	2
		CO3: Ability to perform calculations of number of transfer units and height of a transfer unit (NTU & HTU) concepts, packed column for absorption, equipment for gas absorption and batch & continuous drying equipment's	3	3	3	3	2	2	2	1	2	1	2	2	2	2	2
		CO4: Applying the concepts to mass transport to industrial flows.	3	3	3	2	3	2	2	2	3	1	3	2	2	3	2

CHPC-303	Chemical Reaction Engineering - I	CO1:To understand the mechanism of chemical kinetics for different types of reactions	2	3	3	2					1				2	3	2
		CO2:To design batch and flow reactors for single homogeneous reactions	3	3	3	3					2		2		3	2	2
		CO3:To understand the factors affecting the conversion, yield and selectivity in multiple reactions	2	3	3	2					2		2		2	3	2
		CO4:To understand solid-fluid non-catalytic reaction kinetics and design of reactors	3	3	3	3					1				2	2	2
CHPC-305	Process Engineering and Economics	CO1: To understand the contributing factors leading to cost-estimation of a process plant	2	1				1	2			3	1	1	2	1	1
		CO2: To understand concepts like interests, investments, taxes and insurance, depreciation, profitability, and alternative investments.	2	1			1	1	2			3	1	1	1	1	1
		CO3: To understand profitability concept and use for alternative investments	2	1	1		1	2	3	2	1	3	2	2	1	2	1
		CO4: To be able to optimally design the plant operation conditions	3	3	3	1	2	1	2	2	1	3	2	3	3	2	2
CHPC-307	Environmental Engineering	CO1: The students are able to understand the impact of air, water and solid pollution effects on the environment.	1	2	2	1		2	3	1			1	2	3	1	1

		CO2: The students are able to design various engineering systems of control of air, water and solid waste pollution by equipment and by process changes.	2	3	3	3	2		2	1			2	2	3	3	1
		CO3: The students gain the knowledge of different standards for the measure and control of air, water and solid waste pollution in the environment.	1	1	1	1		1	1	1			1	2	2	1	
		CO4: The students exhibit the skill to solve the problems related to the environmental engineering.	1	3	3	3	1	1	3	1			1	2	3	3	
CHPC-321	Environmental Engineering Lab	CO1: Students will develop the skills to co-relate the theoretical aspects by performing experiments.	1	3	2	3		2	3	1			2	2	3	2	1
		CO2: Students can able to determining various properties contributing towards the water quality such as acidity, alkalinity, hardness, dissolved oxygen (DO), biochemical oxygen demand (BOD) and chemical oxygen demand(COD) present in the given sample	1	3	1	3		2	3	1			2	2	3	2	1
		CO3: Students will be able to distinguish between the poor and good quality of life sustaining elements (water, air and soil).		1	1	3		2	3	1			2	2	3	2	1
		CO4: The students will develop the skill of	1	1	1	2			3	1		3	1	2	1	2	3

		presenting the results in form of written reports.															
CHPC-323	Energy Technology Lab	CO1:The students will able to measure various properties of fuels like flash , fire ,smoke, melting, aniline, cloud and pour point	3	2	2	1		1	2		1				2	2	
		CO2:Able to understand the importance of proximate analysis for solid fuels	3	2	2	1		1	2		1				2	2	
		CO3: Able to gain knowledge on the application of distillation process	3	3	2	1		1	2		1				2	2	
		CO4:Able to analyze the flue gases and determine carbon residue	3	2	2	1		1	2		1				2	2	
CHPC-302	Mass Transfer- II	CO1:Ability to understand the basic principles of distillation, methods and types of distillation	3	3	2	1	2	2	1	1	1	1	2	1	2	1	2
		CO2: The students will be able to apply McCabe Thiele method for determination of number of stages in a distillation column	3	3	2	1	2	1	2	1	2	2	2	1	2	2	2
		CO3 : The students will be able to calculate percentage recovery of solute and number of stages for liquid –liquid extraction operation	2	3	2	2	1	1	2	2	1	1	2	1	1	2	2
		CO4: Ability to perform calculations of HETP and NTU for the adsorption equipments	3	3	3	2	1	1	3	1	1	1	1	1	2	2	2
CHPC-304	Chemical Reaction	CO1To understand and analyze the non- ideal flow	2	3	3	3					1		2		2	2	1

	Engineering-II	behavior in reactors															
		CO2To understand and analyze the external and internal transport in catalytic reactionsystems	3	3	2	3					2		2		2	3	1
		CO3To understand physical properties and preparation of solid catalysts	2	3	2	3					3		1		3	2	1
		CO4To understand and analyze kinetic regimes in Fluid-Fluid reactions and reactor design	3	3	3	3					2		3		3	3	1
CHPC-306	Process Dynamics and Control	CO1: To understand the chemical process in terms of block diagram	3	3	2	1								1	2	2	1
		CO2:The students will able to understand the effect of various forcing function on first and higher order systems	2	2	2	1	3							1	2	2	1
		CO3:The students will able to understand the transient response of various controllers	1	3	2	3								1	2	2	1
		CO4:The students can identified the stability of control systems and be able to design the control system for chemical and allied industries.	2	2	3	3	2							1	2	3	1
CHPC-322	Mass Transfer Lab	CO1:The students will develop the skills to handle the equipment's at laboratory scale.	3	2	3	2		3			3			3	3	2	2
		CO2:Ability to co-relate the theoretical aspects by performing experiments related to mass	3	3	3	3		3			3			1	3	2	2

		transfer operations.															
		CO3:The knowledge related to distillation column, liquid-liquid extraction in a packed column, agitated batch crystallize, liquid-liquid extraction and heat and mass balance in cooling tower can lead to design of the experiments.	3	3	3	3	2	3			3			1	3	2	2
		CO4:Ability to understand and analyze the applications to industrial flows	3	3	3	3	2	3			3			1	3	2	2
CHPC-324	Reaction Engineering and Thermodynamics Lab	CO1: Ability to understand and analyze the rate kinetics for the given reaction	3	3	3	3	2		1	1	1	1		1	2	2	1
		CO2: Ability to analyze the properties of solid catalyst particles	2	2	1	2	1		1	1	1	1		1	1	1	1
		CO3: To analyze the residence time distribution curve in a packed-bed reactor	3	2	1	3	1		1	1		1		1	1	1	1
		CO4: To experimentally verify the adsorption isotherms	2	2	2	3	1		1	1		1		1	1	1	1
CHCI-300	Minor Project, Phase-II	CO1: Able to use the chemical engineering knowledge to come up with innovative research proposals for growth of profession and society.	3	3	3	3	2	2	1	2	3	3	2	2	3	2	2
		CO2: Ability to follow professional ethics while preparing project reports.	3	3	2	2	2	2	2	3	3	3	2	1	3	2	2
		CO3: Ability to present and communicate effectively.	3	3	3	2	2	2	3	3	3	3	2	2	3	2	2

		CO4: Ability to address the environmental and societal issues.	2	3	2	2	2	3	2	3	3	3	2	2	3	2	2
CHCI-401	Transport Phenomena	CO1: Understanding of transport processes.	3	3	3	3									3	3	
		CO2: Ability to do heat, mass and momentum transfer analysis.	3	3	3	3									3	3	
		CO3: Ability to analyze industrial problems along with appropriate boundary conditions.	3	3	3	3									3	3	
		CO4: Ability to develop steady and time dependent solutions along with their limitations.	3	3	3	3									3	3	
CHPC-403	Industrial Safety and Hazards Management	CO1:The students are able to understand the concept of loss prevention and hazard models such as pool fire, fireball, toxic dispersion etc.	3	2	2	3	2		2					1	3	3	1
		CO2:The students learn to exhibit the skill of performing risk assessment such as conducting Dow's fire and Explosion Index for the real plant unit	3	2	3	3	2		2					1	3	3	1
		CO3:Able to design the fire prevention and control systems	3	3	3	3	3		2					2	3	3	2
		CO4:Able to calculate the accident and loss statics for the real plant unit	3	3	3	3	3		2					2	3	3	2
CHPC-405	Process Plant Design	CO1: The students are able to handle the design of various typical chemical based equipment's like heat	3	3	3	1	3	1	1	2	2	2	3	3	3	3	3

		exchangers, distillation columns etc															
		CO2: The students would also able to make plant layout of the newly developed plants and prepare written reports of design problems	3	2	3	1	2	1	1	1	2	1	2	3	3	2	2
		CO3: Ability to understand, explain chemical process plant.	3	2	3	1	2	2	2			1	2	2	2	2	2
		CO4: The students will develop the skill of presenting the data in correct form	2	2	2	2	2	1			1	2	2	1	2	1	1
CHPC-421	Process Control Lab	CO1:The students will develop the skills to handle the equipments at laboratory scale	3	1	2	2					2			2	3	2	1
		CO2:Able to co-relate the theoretical aspects by performing experiments of process control i.e. liquid level tank and control valve characteristics.	3	3	2	2					2			2	3	3	1
		CO3:Experimental exposure to the first and second order process systems.	3	2	2	2					2			2	3	3	2
CHPC-423	Chemical Engineering Computing Lab	CO1:The students would be well versed with the principles of computing methods with the theory involved in the solving the chemical engineering problems.	2	3	3	2	3	2			2			1	3	3	
		CO2:The students would be able to independently solve the problems in the	3	3	3	2	3	2			2			1	3	2	

		chemical engineering and would be aware about its applications.															
		CO3:Able to convert any chemical engineering problems in mathematical forms	3	3	3	3	3	3			3				3	3	
		CO4:Ability to understand and solve the numerically chemical engineering problems.	3	3	3	3	3				2			1	3	3	
CHPC-425	Summer Training	CO1:Use the theoretical knowledge to explore and analyse the industrial operations.	3	3	2	3	3	3	3						3	3	3
		CO2. Learn team work, managerial skills, communication skills, and positive attitude towards lifelong learning.									3	3	3	3			3
		CO3. Use safe, economical, and professional ethics for industrial and societal development.						3	3	3							3
		CO4. Acquire knowledge of various modern software and design tool to solve real life problems.	3	3	3	3	3								3	3	3
CHPC-402	Modeling and Simulation	CO1: The student would understand the basic concepts of process model formulation, analysis of variables, parameter estimation and simulation with mathematical techniques	3	3	3	3	2	1	1	1	1			1	3	2	1

		CO2: The student would understand the basic laws of chemical engineering and their mathematical treatment, leading to model development	3	3	3	3	2	1	1	1	1			1	3	2	1
		CO3: The student would get familiar with common mathematical and computational tools for simulation of different chemical engineering processes	3	3	3	3	2	1	1	1	1			1	3	2	1
CHPC-422	Modeling and Simulation Lab	CO1 The student is able to incorporate his entire knowledge of chemical engineering principles to an industrial or academic problem.	3	2	2	2	2				2	1		1	3	2	1
		CO2 The students to show their abilities to exhibit experimental, analytical and communication skills and make a record of the findings in the form of a report or thesis.	3	3	2	3	2				2	3		2	3	2	3
		CO3 The knowledge from this course can lead to design of the equipments.	3	3	3	2	3				2	1		2	3	3	1
		CO4 Ability to design unit processes which can yield best results.	3	3	3	3	3				2	1		2	3	3	1
CHCI-424	Industrial Lecture	CO1: To Understand and appreciate the novel technology/ innovations in the vast domain of Chemical Engineering and allied	2		3	1	1	1	1			3	1	2	3	3	3

		industries.															
		CO2: To understand and identify current challenges/limitations in the chemical industries and analysis of these challenges/limitations to provide effective solutions.	3	1	3	3	1	2	1			3	1	2	3	3	3
		CO3: To understand the current industrial issues related to environment and their impact on society.	2	1	3	3	1	3	1			3	1	2	3	3	3
		CO4: To learn the effective modes of oral, written and visual communication and adapt their presentation style and content to match the audience.					1					3			3	3	3
CHCI-400	Major Project (Phase –II)	CO1: Able to use the chemical engineering knowledge to come up with innovative research proposals for growth of profession and society.	3	3	3	3	2	2	1	2	3	3	2	2	3	2	2
		CO2: Ability to follow professional ethics while preparing project reports.	3	3	2	2	2	2	2	3	3	3	2	1	3	2	2
		CO3: Ability to present and communicate effectively.	3	3	3	2	2	2	3	3	3	3	2	2	3	2	2
		CO4: Ability to address the environmental and societal issues.	2	3	2	2	2	3	2	3	3	3	2	2	3	2	2
CHPE-351	Computational Fluid Dynamics	CO1:To understand mathematical characteristics of partial differential equations.	2	3	3	2	3								3	2	1
		CO2:To understand basic properties of computational	1	3	2	2	3								3	1	

		methods–accuracy, stability, consistency.															
		CO3:To learn computational solution techniques for various types of partial differential equations.	1	3	3	2	3								3	2	
		CO4:To learn how to computationally solve Euler and Navier-Stokes equations	3	3	2	2	3								3	1	
CHPE-358	Petroleum Recovery Technology	CO1: An ability to design and conduct experiments, as well as to analyze and interpret data.	3	3	3	3						1	1	1	3	3	1
		CO2: An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	3	3	3	3			2	2		1	1	1	3	3	1
		CO3: An ability to identify, formulates, and solves engineering problems related to petroleum industry.	3	3	3	3			1			1	1	1	3	3	1
CHPE-457	Introduction to Multiphase Flow	CO1: Understanding of the characteristics of multiphase flow and master motion equations.	2	3	3	3	2	1	1				2	1	3	3	1
		CO2: Capability to analyze the multiphase flow problem with multiphase flow dynamics.	3	3	3	3	2	1	1		1		3		3	3	3
		CO3: Reinforcement of	2	3	3	3	3	1	2		1		3		3	3	3

		knowledge through practice with realistic problems															
		CO4: Enhancement of team working skills.	1	3	3	3	3	1			3		3	2	3	3	3
CHPE-459	New and Renewable Energy Resources	CO1:Create awareness among students about Non-Conventional sources of energy technologies	3	2	2	1		2	3	1			1		3	2	
		CO2: The students acquire sufficient knowledge about various types of renewable energy resources, the fundamental concepts and their application	3	2	2	1		2	3	1			1		3	2	
		CO3: The students also develop an understanding of and design related concepts of equipment and instruments used.	3	3	2	1		2	3	1			1		3	2	
		CO4: Equip the students with knowledge and understanding of various possible mechanisms about renewable energy projects	3	3	2	1		2	3	1			1	1	3	2	
CHPE-461	BioChemical Engineering	CO1Understanding of biological basics and bioprocessing	2	2				3	3	2	1	2		3	2	2	2
		CO2Understand the integrated approach of chemical engineering with basic life sciences in developing processes and products.	2	3	3	3	3	1	1		3	2	3	2	3	3	2
		CO3Acquire the knowledge of enzyme catalyzed reaction and inhibition mechanisms	2	3	3	3	3	1	1		3	2	3	2	3	3	2

		CO4Acquire knowledge about different types of bioreactor, its industrial applications and scale up criteria.	2	2	2	3	7	2	3	1	2	2	2	1	3	2	2
CHPE-463	Pressure Driven Membrane Separation Processes	CO1: Understand the basic principles for different membrane separation processes	2	3	2	2	2	1	1	1	1	2	1	2	2	2	2
		CO2: Identify and design the suitable membrane separation technique for intended problem	3	3	3	2	2	1	2	1	2	2	2	3	2	3	2
		CO3: The students are capable of applying various transport models for the calculation of membrane fluxes and the other separation properties for various membrane systems	3	3	3	3	3	2	2	2	2	2	1	2	2	2	1
		CO4: Students are able to identify established membrane separation processes and learn concepts of upcoming membrane separation processes	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2
CHPE-464	Process Instrumentation and Analystical Methods	CO1:The students will get acquaintance about various types of instruments for measurement of temperature, pressure, conductivity, pH, composition of the given mixture etc	3	2		2		1	1	1	1			2	2	2	1
		CO2:Students will attain the knowledge of principles for	2	2		2		1	1	1	1		1	2	3	3	1

		spectroscopic and chromatographic, etc															
		CO3:The course helps the students to extend the skills in procedures and instrumental methods applied in analytical tasks.	2	2		2		1	1	1	1		1	2	3	3	1
		CO4:The students will able to design and data analysis of the industrial instruments.	2	2		2		1	1	1	1		2	2	3	2	1
CHPE-465	Introduction to Colloids and Interfacial Science and Engineering	CO1:Understanding of basic nomenclature, concepts and tools of colloid and interface science and engineering.	3	2	3	2		2	1	1	1		1	2	3	2	1
		CO2:Ability to understand multi-phase nano-systems; mechanics and thermodynamics on small scales.	3	2	3	2		2	1	1	1		1	2	3	2	1
		CO3:Understanding of differences between the surface and bulk dominated regimes and behavior and exploitation of nano-behavior.	3	2	3	2		2	1	1	1			1	3	2	1
		CO4: Appreciation of how these concepts and tools translate into a variety of applications from processes to materials.	3	2	3	2		1	1	1	1			1	3	2	1
CHPE-466	Fluidzation Engineering	CO1: Ability to understand and solve Fluidization.	3	3	3	3	2	1	1	1	1		3	1	3	3	3
		CO2: Able to understand the Heat and Mass transfer in fluidized bed systems	3	3	3	3	2	1	1	1	1		3	1	3	3	3
		CO3: Able to understand the Fluidization of different	3	3	3	3	2	1	1	1	1		3	1	3	3	3

		phases.															
		CO4: Able to design a fluidized bed system for different applications.	3	3	3	3	2	1	1	1	1		3	1	3	3	3
		Avg	3	3	3	3	2	1	1	1	1		3	1	3	3	3
CHPE-467	Fertilizer Technology	CO1:Ability to understand the importance of fertilizers.	3	2	1			3	2	1			2	1	3	2	1
		CO2: Able to know different methods of production of various fertilizers	3	2	1			3	2	1			2	1	3	2	1
		CO3: Able to understand the various engineering problems occurring in fertilizer industries	3	2	2			3	2	1	1		2	1	3	2	1
		CO4: Ability to get knowledge on materials of construction and corrosion problems	3	1	2			2	3	1	1		2	1	3	2	1
CHPE-468	Bio Refinery and Bio Products Engineering	CO1: Understanding the possibilities of biorefineries in a future scenario without fossil fuels.	2	1	1	2		3	3	1			1	2	3	1	
		CO2: Understanding Green Chemical approaches and alternative processes to bioproducts from biomass and waste.	2	1	1	2		3	3	1			2	2	3	2	1
		CO3: Ability to identify key pathways for sustainable processing of feedstocks	2	1	2	2	2	3	3	1	1		2	2	3	2	1
		CO4: Knowing basic concepts of Biorefineries and Green Chemical methods and application to present industrial processes.	2	1	2	2	1	3	3	1	1		1	2	3	1	1
CHPE-353	Biomass Conversion	CO1:Understand basic concepts about biomass	2	1	1	2		3	3	1			1	2	3	1	

	Process	derived energy															
		CO2: Understand and evaluate various biomass pretreatment and processing techniques.	2	1	1	2		3	3	1			2	2	3	2	1
		CO3: Able to understand the various biomasses to energy conversion processes.	2	1	2	2	2	3	3	1	1		2	2	3	2	1
		CO4: Ability to design a sustainable biorefinery for biofuels and bioenergy production by combining various processes	2	1	2	2	1	3	3	1	1		1	2	3	1	1
CHPE-354	Nano Science and Technology	CO1: To understand the basic concepts of nanostructures and their properties	3	2	2	1	1	1	1	1	1	1	1	1	2	1	1
		CO2: To study the synthesis processes, for the manufacture of nanomaterials	3	2	3	2	2	2	2	1	1	1	2	2	3	2	2
		CO3: To understandthe structure and property relationship of various nanomaterials	2	2	2	2	1	1	1	1	1	1	1	1	2	1	
		CO4: To get familiar with latest devices and technologies based on nanomaterials	3	3	3	2	3	3	3	2	2	2	3	3	3	3	3
CHPE-355	Environmental Impact Assesment	CO1Ability to understand the current EIA methods and the techniques and tools used	2	2			1	3	3	2	1	2		3	2	2	2
		CO2Ability to understand the current assessment methods and legislation	2	3	2	3	3	1	1		3	2	3	2	3	3	2
		CO3Ability to understand the current environmental	2	3	3	3	2	1	1		3	2	3	2	3	3	2

		monitoring systems															
		CO4Ability to apply knowledge acquired to the process of environmental impact modeling and prediction as a design tool with application to a number of case studies	2	2	2	3	7	2	3	1	2	2	2	1	3	2	2
CHPE-356	Industrial Rheology	CO1: Understanding the importance of rheology	3	2	3	3	2	2	3	2	1		1	1	3	2	2
		CO2:Introducing the theories of linear and nonlinear viscoelasticity.	3	2	2	2		2	3	2	2	1	2	1	3	2	1
		CO3:Exposure to complex fluids and their behaviour in stress and strain controlled experiments	3	2	2	3		2	2	2		1	2	2	3	2	2
		CO4:Ability to analyze the industrial non-Newtonian flows.	3	2	2	3		2	2	2	1	1	2	2	3	2	2
CHPC-282	Heat and Mass Transfer (Biotechnology)	CO1: Ability to understand and solve conduction, convection and radiation problems.	3						1	1			1		3	1	
		CO2: Develop correlations using elementary dimensional analysis and comprehend the laws governing radiation mode.	1	2	2	1			1						2	3	
		CO3: Ability to understand the principles of mass transport.	2	2			2		1	1			1		2	2	
		CO4: The students are able to comprehend the concepts of co current & counter current processes, cascades and concept of Ideal stage and stage	1	1	1	1	2	1	1	1	2		1		1	1	

		efficiencies, continuous contact equipment's.															
CHPC-481	Instrumentation and Process Control (Biotechnology)	CO1: To understand the chemical process in terms of block diagram	3	3	2	1								1	2	2	1
		CO2:The students will able to understand the effect of various forcing function on first and higher order systems	2	2	2	1	3							1	2	2	1
		CO3:The students will able to understand the transient response of various controllers	1	3	2	3								1	2	2	1
		CO4: The students can identified the stability of control systems and be able to design the control system for chemical and allied industries.	2	2	3	3	2							1	2	3	1
CHPC-281	Fluid and Particle Mechanics (Biotechnology)	CO1: After studying the subject, students would be able to measure pressure drop, flow rates etc. for incompressible and compressible fluids.	3	2	1	2			1				1		3	1	1
		CO2: Ability to analyze the fluid flow problems with the application to the momentum balance.	3	1	1	1							1	1	3	1	1
		CO3: The students would understand the physical properties, property mmeasurement and handling of solid-solid and solid-fluid mixtures.	3	2	2	2	2				1		1	1	3	2	1
		CO4: The students would understand the seperation	3	2	2	2	2						1	1	3	2	1

		processes for solid-solid and solid-fluid mixtures.															

Note : 1 low; 2 moderate; 3 high (Correlation of CO with PO)

2/9/22