

PROGRAM AND COURSE ARTICULATION MATRIX

B.TECH

DEPARTMENT OF CHEMICAL ENGINEERING

MALAVIYA NATIONAL INSTITUTE OF TECHNOLOGY JAIPUR



B.Tech Program Articulation Matrix (III – VIII Semester)

Course Code	Course Name	CORRELATION WITH PROGRAM OUTCOMES (POs)												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES (PSOs)		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CHT201	Chemical Process Calculations	2.00	3.00	1.67	1.33	1.00	1.33	1.00	1.00	--	1.33	2.00	1.33	3.00	1.67	1.67
CHT202	Heat Transfer	3.00	3.00	1.40	2.20	1.20	--	2.00	--	1.20	1.20	2.00	1.20	2.80	2.00	1.40
CHT203	Momentum Transfer Operations	3.00	2.75	1.75	1.67	--	1.00	--	1.00	1.25	1.75	--	1.00	2.50	1.50	2.25
CHT204	Chemical Reaction Engineering-I	3.00	2.75	1.75	2.00	--	1.50	1.50	1.75	2.00	1.00	2.00	1.50	2.50	2.00	1.75
CHT205	Chemical Engineering Thermodynamics-I	3.00	3.00	1.00	1.00	3.00	2.00	3.00	1.00	2.00	1.00	1.00	3.00	3.00	2.50	2.50
CHT206	Industrial Pollution Abatement	1.67	1.67	3.00	1.33	--	2.00	3.00	1.25	1.00	1.00	--	1.00	2.25	2.00	1.75
CHT207	Energy Resources Utilization	2.00	1.00	1.00	--	--	1.75	2.25	--	--	--	--	1.00	2.50	2.50	2.00
CHT208	Fluid Particle Mechanics	2.33	2.50	2.00	1.67	1.00	1.67	2.67	1.33	1.00	2.00	--	1.00	1.40	2.60	1.40
CHT209	Process Instrumentation	3.00	2.67	1.67	2.00	--	1.00	--	--	1.33	1.67	--	1.00	2.00	1.67	1.67
CHT210	Mass Transfer-I	3.00	3.00	2.50	1.50	2.00	1.50	2.00	1.00	--	--	--	2.00	3.00	2.00	1.00
CHT211	Numerical Methods in Chemical Engineering	2.67	2.67	2.67	2.67	1.67	1.00	--	--	1.67	1.00	--	1.67	2.67	1.00	1.33
CHT301	Mass Transfer-II	2.50	3.00	3.00	2.67	1.50	1.50	1.50	--	1.00	--	2.50	2.50	2.50	1.50	1.50
CHT302	Process Engineering and Plant Design	3.00	1.67	2.00	2.33	2.67	1.00	2.00	1.00	1.60	1.75	2.20	2.00	3.00	2.00	2.00
CHT303	Chemical Reaction Engineering-II	2.67	2.33	2.67	2.67	1.00	1.00	1.33	1.00	1.00	1.00	--	1.33	2.00	2.00	1.33
CHT304	Petroleum Refining	2.25	2.00	2.50	1.75	1.00	1.25	2.25	1.00	1.75	1.75	1.00	1.00	2.50	1.75	1.25
CHT305	Optimization of Chemical Processes	2.00	2.50	2.00	2.50	2.33	1.50	2.00	2.00	1.00	1.25	1.67	2.00	2.50	2.00	1.50
CHT306	Mathematical Methods in Chemical Engineering	3.00	3.00	2.00	2.00	3.00	1.00	2.00	1.00	--	1.00	--	2.00	3.00	2.50	2.00
CHT307	Chemical Engineering Thermodynamics-II	3.00	3.00	3.00	3.00	3.00	--	--	2.00	2.00	--	-	2.00	3.00	2.00	1.00
CHT308	Process Dynamics and Control	3.00	3.00	1.80	2.00	3.00	1.80	1.00	2.00	1.00	1.75	1.00	1.00	3.00	2.80	2.80
CHT309	Process Equipment Design	3.00	3.00	3.00	2.00	3.00	--	2.00	1.00	3.00	3.00	1.00	3.00	3.00	2.00	2.00
CHT310	Chemical Technology	3.00	2.00	1.75	1.75	2.00	1.75	1.75	1.00	1.00	1.40	2.00	1.75	1.80	1.25	1.00
CHT312	Transport Phenomena	3.00	2.00	3.00	1.00	3.00	--	--	1.00	1.00	1.00	--	3.00	2.75	1.75	1.25
CHT321	Petroleum, Petrochemicals and Natural Gas Engineering	2.75	2.25	1.50	2.00	--	1.75	2.50	1.67	1.00	1.50	1.50	1.50	2.50	1.75	1.25
CHT403	Modelling and Simulation	3.00	3.00	1.50	2.00	1.50	--	--	--	1.00	---	--	1.00	2.50	2.00	2.00

CHT404	Advanced Separation Processes	2.00	2.50	2.00	2.00	1.50	2.00	2.00	2.50	1.50	2.00	1.50	1.50	2.00	2.33	1.50
CHT408	Process Safety and Hazards	2.25	2.67	2.33	2.50	2.00	2.67	1.50	2.00	1.50	1.50	1.67	1.00	2.25	2.00	2.00
CHT409	Operations Research	2.67	2.33	3.00	2.33	2.00	1.50	1.00	1.00	2.00	--	2.33	2.00	3.00	1.67	1.67
CHT411	Polymer Science and Technology	3.00	2.75	1.75	1.67	--	1.00	--	--	1.50	1.50	--	1.25	2.50	1.50	2.00
CHT412	Advanced Process Control	1.50	2.33	2.00	1.50	2.33	2.00	2.33	1.33	--	1.00	2.00	3.00	3.00	2.00	2.00
CHT413	Bioprocess Engineering	2.80	2.80	2.40	2.00	1.00	1.40	2.00	1.00	1.00	--	--	1.00	2.80	2.80	2.40
CHT415	Non-Conventional Energy Sources	2.50	2.50	2.50	2.00	1.00	1.00	2.67	1.50	1.00	2.00	--	1.00	1.67	2.67	1.33
CHT416	Catalytic Processes	3.00	3.00	2.50	2.33	2.00	2.00	2.50	1.75	2.00	--	--	2.00	2.75	2.00	1.25
CHT417	Mechanical Design of Process Equipment	1.80	2.16	1.33	2.00	1.67	1.67	1.00	2.00	2.00	2.00	3.00	3.00	2.50	2.16	1.00
CHP212	Fluid Particle Mechanics Lab	1.75	1.25	1.67	1.75	2.50	1.00	--	--	1.00	--	1.00	1.00	2.00	1.00	1.00
CHP213	Momentum Transfer in Chemical Engineering Lab	2.75	2.75	2.00	1.67	1.75	1.00	--	--	1.00	--	1.00	1.00	2.25	1.00	1.00
CHP214	Heat Transfer in Chemical Engineering Lab	3.00	3.00	1.50	2.25	1.25	--	2.00	--	1.25	1.25	2.00	1.50	2.75	2.00	1.25
CHP215	Numerical Methods in Chemical Engineering Lab	2.33	1.67	2.00	1.00	3.00	1.00	--	--	1.33	--	--	1.50	2.67	1.00	1.33
CHP216	Industrial Pollution Abatement Lab	2.00	1.50	1.00	1.25	--	1.25	2.25	1.00	1.33	--	--	1.33	1.75	1.25	1.50
CHP217	Simulation Lab	2.33	2.33	2.00	1.00	3.00	1.00	--	--	1.33	--	--	2.00	2.67	1.00	1.33
CHP311	Chemical Reaction Engineering Lab	2.67	1.67	2.00	2.00	1.00	--	1.67	--	3.00	2.00	1.00	1.67	3.00	2.33	1.00
CHP313	MASS TRANSFER LAB	1.00	1.00	--	--	--	--	--	1.00	1.00	1.00	--	1.00	1.00	1.00	--
CHP315	Process Equipment Design Lab	2.00	2.33	2.67	--	3.00	1.00	--	--	2.00	2.00	1.67	1.00	3.00	2.00	3.00
CHP316	Process Dynamics and Control Lab	2.00	1.00	2.00	--	3.00	1.00	--	--	2.00	2.00	--	1.00	3.00	1.00	2.00
CHP318	Process Engineering & Plant Design lab	1.75	2.50	1.50	1.00	1.75	1.00	0.25	1.00	2.25	0.75	2.00	2.00	2.25	2.50	1.50

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

B.Tech Course Articulation Matrix (III – VIII Semester)

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT201.1	Student understood the concept of units and dimensions essential for various chemical process calculations.	3.00	3.00	1.00	2.00	--	1.00	1.00	1.00	--	2.00	--	1.00	3.00	1.00	2.00
CHT201.2	Student understood the concept of steady state and unsteady state, mass and energy balances for reactive and non-reactive process were made clear.	2.00	3.00	2.00	1.00	1.00	2.00	1.00	--	--	1.00	--	1.00	3.00	2.00	1.00
CHT201.3	Student understood the concept of the reaction between different state of matter and the concept of equilibrium occurring between these states.	1.00	3.00	2.00	1.00	--	1.00	1.00	1.00	--	1.00	2.00	2.00	3.00	2.00	2.00
CHT201	Chemical Process Calculation	2.00	3.00	1.67	1.33	1.00	1.33	1.00	1.00	--	1.33	2.00	1.33	3.00	1.67	1.67

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		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
CHT202.1	Students understood the basic fundamentals of heat transfer and also various mode of heat transfer along with governing laws and conductive mode of heat transfer in different bodies and for extended surfaces.	3.00	3.00	1.00	2.00	1.00	--	2.00	--	1.00	1.00	--	1.00	3.00	2.00	1.00
CHT202.2	Students understood the concept of heat transfer coefficient and its calculation for natural and forced convection using various empirical correlations.	3.00	3.00	1.00	2.00	1.00	--	2.00	--	1.00	1.00	--	1.00	3.00	2.00	1.00
CHT202.3	Students understood concept of boiling and condensation phenomenon and correlation for the various heat transfer coefficient.	3.00	3.00	1.00	2.00	1.00	--	2.00	--	1.00	1.00	--	1.00	3.00	2.00	2.00
CHT202.4	Students understood the concepts of radiation and calculations for radiative heat transfer between bodies of different size and shapes	3.00	3.00	1.00	2.00	1.00	--	2.00	--	1.00	1.00	--	1.00	2.00	2.00	1.00
CHT202.5	Students were trained to design heat exchanger and evaporators for different applications in a chemical process plant	3.00	3.00	3.00	3.00	2.00	--	2.00	--	2.00	2.00	2.00	2.00	3.00	2.00	2.00
CHT202	Heat Transfer	3.00	3.00	1.40	2.20	1.20	--	2.00	--	1.20	1.20	2.00	1.20	2.80	2.00	1.40

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		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
CHT203.1	To understand types of flows, various laws related to fluid flow and concept of fluid friction and its determination	3	2	1	--	--	1	--	--	2	1	--	1	2	1	2
CHT203.2	To understand principles and working of various fluid moving devices.	3	3	2	2	--	--	--	--	1	2	--	1	3	1	1
CHT203.3	To illustrate the principles of fluid flow on some real systems such as piping, porous beds, fluidized beds, metering devices and fluid machinery.	3	3	2	2	--	--	--	--	1	2	--	1	2	2	3
CHT203.4	To understand and apply the concept of Boundary layer	3	3	2	1	--	--	--	1	1	2		1	3	2	3
CHT203	Momentum Transfer Operations	3.00	2.75	1.75	1.67	--	1.00	--	1.00	1.25	1.75	--	1.00	2.50	1.50	2.25

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		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
CHT204.1	Ability to generate appropriate reaction schemes for a given set of reactants	3	2	1	1	0	1	0	1	2	0	0	1	2	2	1
CHT204.2	Ability to perform kinetics analysis for chemical reactors and reaction systems	3	3	1	2	0	1	0	2	2	0	0	1	3	2	1
CHT204.3	To provide practice at developing critical and creative thinking skills related to reaction engineering	3	3	2	2	0	2	1	2	2	1	0	2	3	2	2
CHT204.4	To provide experience for students to solve open-ended reaction engineering problems in terms of performing non-ideal reactor analysis	3	3	3	3	0	2	2	2	2	1	2	2	2	2	3
CHT204	Chemical Reaction Engineering-I	3.00	2.75	1.75	2.00	--	1.50	1.50	1.75	2.00	1.00	2.00	1.50	2.50	2.00	1.75

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		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
CHT205.1	Understand principles of chemical engineering thermodynamics to solve chemical engineering problems and analyze thermodynamic feasibility	3	3	1	1	3	2	3	1	2	1	1	3	3	2	2
CHT205.2	Understand the concepts of thermodynamic system, surrounding, internal energy, enthalpy, entropy, work, heat, and apply to calculate their changes for ideal gases.	3	3	1	1	3	2	3	1	2	1	1	3	3	2	2
CHT205.3	Understand the use and applications of the first and second laws of thermodynamics.	3	3	1	1	3	2	3	1	2	1	1	3	3	3	3
CHT205.4	Understand behaviour of substances, equation of states such as ideal gas equation, Virial equation etc, tables, charts and databases.	3	3	1	1	3	2	3	1	2	1	1	3	3	3	3
CHT205	Chemical Engineering Thermodynamics-I	3.00	3.00	1.00	1.00	3.00	2.00	3.00	1.00	2.00	1.00	1.00	3.00	3.00	2.50	2.50

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		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
CHT206.1	Gained knowledge of the Environmental legislation and standards	--	--	--	--	--	2.00	3.00	2.00	--	1.00	--	1.00	1.00	2.00	2.00
CHT206.2	Gained insights of characteristics of water and wastewater and capable of process design of wastewater treatment plant.	2.00	2.00	3.00	2.00	--	2.00	3.00	1.00	1.00	1.00	--	1.00	3.00	2.00	2.00
CHT206.3	Made aware of fundamentals of air pollution and its control devices	2.00	2.00	3.00	1.00	--	2.00	3.00	1.00	1.00	1.00	--	1.00	3.00	2.00	1.00
CHT206.4	Learned the characteristics of solid wastes and their management.	1.00	1.00	3.00	1.00	--	2.00	3.00	1.00	1.00	1.00	--	1.00	2.00	2.00	2.00
CHT206	Industrial Pollution Abatement	1.67	1.67	3.00	1.33	--	2.00	3.00	1.25	1.00	1.00	--	1.00	2.25	2.00	1.75

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		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
CHT207.1	This course prepared students for future work in energy-related fields by providing an overview of the challenges related to energy production.	--	1	--	--	--	2	3	--	--	--	--	1	3	2	2
CHT207.2	Students were familiarized with environmental and economic issues related to energy production	--	--	--	--	--	2	3	--	--	--	--	1	2	3	2
CHT207.3	Students understood several major energy systems. The details of such energy systems were examined using engineering principles, particularly focusing on relevant chemical processes.	2	1	1	--	--	1	1	--	--	--	--	1	3	2	2
CHT207.4	Students understood different energy sources such as fossil fuels, the hydrogen economy, biofuels, nuclear energy, fuel cells, batteries, and the electricity grid	2	--	--	--	--	2	2	--	--	--	--	1	2	3	2
CHT207	Energy Resources Utilization	2.00	1.00	1.00	--	--	1.75	2.25	--	--	--	--	1.00	2.50	2.50	2.00

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		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
CHT208.1	Students understood the concepts of bulk solid handling and their size-based differentiation and reduction techniques.	2.00	2.00	3.00	--	--	1.00	3.00	2.00	1.00	--	--	--	2.00	3.00	1.00
CHT208.2	Fundamentals and use of screens for size-based separations and analysis were successfully understood by the students.	--	--	--	2.00	--	1.00	2.00	1.00	1.00	--	--	1.00	1.00	2.00	1.00
CHT208.3	The essential theories of solid-liquid and solid-gas separation and the instruments used to achieve the same were taught both theoretically and experiment.	3.00	3.00	2.00	--	1.00	--	3.00	--	--	2.00	--	--	2.00	3.00	2.00
CHT208.4	The concepts and use of Fluidization techniques along with transport techniques were well demonstrated.	--	--	1.00	1.00	--	3.00	--	--	--	2.00	--	1.00	1.00	3.00	2.00
CHT208.5	Storage and handling of materials and principles of solid-liquid mixing were understood both theoretically and experimentally by the students.	2.00	--	--	2.00	1.00	--	--	1.00	--	--	--	--	1.00	2.00	1.00
CHT208	Fluid Particle Mechanics	2.33	2.50	2.00	1.67	1.00	1.67	2.67	1.33	1.00	2.00	--	1.00	1.40	2.60	1.40

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		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
CHT209.1	To understand scientific concepts, principles and theories appropriate to instrumentation.	3	2	1	--	--	1	--	--	2	1	--	1	2	1	1
CHT209.2	Students developed an understanding of various process instruments, control valves, pressure measurement, temperature measurement, flow measurement devices.	3	3	2	2	--	--	--	--	1	2	--	1	1	2	2
CHT209.3	Students gained understanding of the performance criteria of instruments (range: precision, accuracy, sensitivity and range ability).	3	3	2	2	--	--	--	--	1	2	--	1	3	2	2
CHT209	Process Instrumentation	3.00	2.67	1.67	2.00	--	1.00	--	--	1.33	1.67	--	1.00	2.00	1.67	1.67

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		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
CHT210.1	Students understood the basic fundamentals of mass transfer operations such as distillation, absorption, liquid-liquid extraction, adsorption and leaching, stage equilibrium stages and operating conditions	3	3	2	1	2	1	2	1	--	--	--	2	3	2	1
CHT210.2	Students developed understanding of various design aspects of stage type columns, multi component distillation and various methods of designing stage type distillation	3	3	3	2	2	2	2	1	--	--	--	2	3	2	1
CHT210	Mass Transfer-I	3.00	3.00	2.50	1.50	2.00	1.50	2.00	1.00	--	--	--	2.00	3.00	2.00	1.00

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		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CHT211.1	Able to understand the difference among all types of mathematical functions, e.g., Linear equations, Nonlinear equations, Ordinary differential equations, Partial differential equations.	2	2	2	2	1	1	--	--	1	1	--	1	3	1	1
CHT211.2	Able to solve linear and nonlinear algebraic equations with various numerical methods, Eigen value and Eigen vectors of matrices.	3	3	3	3	2	--	--	--	2	--	--	2	2	1	1
CHT211.3	Able to apply different numerical techniques for function approximation for best fitting of experimental data and regression, interpolate and extrapolate for the missing data, solve initial and boundary value ordinary differential equations including the different types of partial differential equations.	3	3	3	3	2	--	--	--	2	--	--	2	3	1	2
CHT211	Numerical Methods in Chemical Engineering	2.67	2.67	2.67	2.67	1.67	1.00	--	--	1.67	1.00	--	1.67	2.67	1.00	1.33

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		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
CHP212.1	Students applied the knowledge of mechanical operations to gain hand-on experience on particle mechanics.	2	2	--	1	2	1	--	--	1	--	1	1	3	1	1
CHP212.2	Students analyzed, determined and verified size reduction laws, separation processes, rate of filtration, specific cake resistance, settling phenomena and power consumed in mixing process.	2	2	2	2	3	--	--	--	1	--	--	--	2	1	1
CHP212.3	Able to understand the process of mechanical sieving. Students also understood the process of size reduction by using jaw crusher and ball mill and separation by using elutriator and cyclone separator etc.	3	1	2	3	3	--	--	--	--	--	--	-	2	1	1

CHP212.4	Solve and analyze the process of filtration by using plate-and-frame filter press, rotary vacuum filter and sedimentation.	--	--	1	1	2	--	--	--	--	--	--	--	1	1	--
CHT212	Fluid Particle Mechanics Lab	1.75	1.25	1.67	1.75	2.50	1.00	--	--	1.00	--	1.00	1.00	2.00	1.00	1.00

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC 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
CHP213.1	Students understood the types of fluid flow by using Reynolds's apparatus, major and minor energy losses due to friction and various fittings by using pipes and fittings apparatus, head lost in different types of pipes and pipes made of different materials by using pipe friction apparatus.	3	2	1	--	1	1	--	--	1	--	1	1	3	1	1
CHP213.2	Students understood flow measuring devices such as venturi and orifice meter, fluidization by using fluidized bed apparatus, pressure drop in a packed bed apparatus.	3	3	2	1	2	--	--	--	--	--	--	--	2	1	1
CHP213.3	Students analyzed, determined and verified flow behavior, coefficient of discharge, major and minor losses, minimum fluidization velocity, pressure drop, etc.	2	3	3	2	2	--	--	--	--	--	--	-	2	-	1
CHP213.4	Students understood the application of devices such as Bernoulli's Apparatus, Reynolds's Apparatus etc.	3	3	2	2	2	--	--	--	--	--	1	1	2	1	1
CHT213	Momentum Transfer Operations Lab	2.75	2.75	2.00	1.67	1.75	1.00	--	--	1.00	--	1.00	1.00	2.25	1.00	1.00

CO	Statement	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2	PSO 1	PSO 2	PSO 3
CHT214.1	Students understood steady state and device such as composite metal wall, insulated materials, metal rods, emissivity of given material etc.	3	3	1	2	1	--	2	--	1	1	--	1	3	2	1
CHT214.2	Students understood heat transfer by natural convection, forced convection, heat transfer in agitated vessel.	3	3	1	2	1	--	2	--	1	1	--	1	2	2	1
CHT214.3	Students analysed and determined heat transfer coefficient in various operations such as boiling phenomenon, film wise and drop wise condensation etc.	3	3	1	2	1	--	2	--	1	1	--	2	3	2	2
CHT214.4	Students understood the application of heat transfer devices such as shell & tube heat exchanger double pipe heat exchanger.	3	3	3	3	2	--	2	--	2	2	2	2	3	2	1
CHT214	Heat Transfer Lab	3.00	3.00	1.50	2.25	1.25	--	2.00	--	1.25	1.25	2.00	1.50	2.75	2.00	1.25

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC 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
CHP215.1	Attain proficiency to write C/C++ code and utilize tools available to solve the given numerical methods	2	2	2	--	3	1	--	--	1	--	--	1	3	1	1
CHP215.2	Debug and troubleshoot code for the generation of solution. Interpretation of software based simulation results from prior chemical engineering knowledge	2	2	2	--	3	--	--	--	1	--	--	--	2	1	1
CHP215.3	Develop programming skills to carry out process simulation in C/C++, such as, solving linear & nonlinear algebraic equations, fitting of experimental data and regression, ordinary & partial differential equations, etc.	3	1	2	1	3	--	--	--	2	--	--	2	3	1	2

CHT215	Numerical Methods in Chemical Engineering Lab	2.33	1.67	2.00	1.00	3.00	1.00	--	--	1.33	--	--	1.50	2.67	1.00	1.33
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CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC 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
CHP216.1	Ability to apply the knowledge of water pollution and evaluate the quality of water or wastewater by measuring physical and chemical parameters	2	2	--	1	--	2	3	--	2	--	--	1	3	2	2
CHP216.2	Students will be able to get hands-on exercise to determine chemical parameters such as, DO, BOD and COD of a real wastewater sample using titrimetric method	2	2	1	2	--	1	2	1	1	--	--	2	2	1	1
CHP216.3	Students will be able to determine physical parameters such as, TS, TSS, TDS, VSS and FSS by standard method. They also able to determine pH, EC & turbidity by direct measurement method	2	1	--	1	--	1	2	--	1	--	--	1	1	1	--
CHP216.4	Students understood the measurement method of oil & grease, and chlorine content of a given sample	2	1	--	1	--	1	2	1	--	--	--	--	1	1	--
CHT216	Industrial Pollution Abatement Lab	2.00	1.50	1.00	1.25	--	1.25	2.25	1.00	1.33	--	--	1.33	1.75	1.25	1.50

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		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
CHP217.1	Attain proficiency to write MATLAB code, understanding of inbuilt tools and functions available to solve the given chemical engineering application-based problems using numerical methods.	2	2	2		3	1	--	--	1	--	--	2	3	1	1
CHP217.2	Debug and troubleshoot code for the generation of solution. Interpretation of software-based simulation results from prior chemical engineering knowledge.	2	2	2	--	3	--	--	--	1	--	--	2	2	1	1

CHP217.3	Develop programming skills to carry out process simulation in MATLAB by solving linear & nonlinear algebraic equations, fitting of experimental data using single and multiple variable linear and non-linear regression, ordinary & partial differential equations, producing 2-dimensional and 3-dimensional plots, Simulink application for Initial value problems and regression analysis etc.	3	3	2	1	3	--	--	--	2	--	--	2	3	1	2
CHP217	Simulation Lab	2.33	2.33	2.00	1.00	3.00	1.00	--	--	1.33	--	--	2.00	2.67	1.00	1.33

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT301.1	The fundamentals of diffusion-molecular and bulk diffusion, diffusion theories-film, two film, penetration, boundary layer theory. One component diffusion, equimolar diffusion, mass transfer coefficients, mass transfer correlations etc. Diffusion in solids.	3.00	3.00	--	2.00	--	--	1.00	--	1.00	--	--	3.00	3.00	1.00	2.00
CHT301.2	Separation of gaseous mixtures using gas absorption and its design. Packed bed column design for gas absorption and distillation, Cooling of hot water using cooling towers, humidification of air and other gases.	3.00	3.00	3.00	3.00	2.00	2.00	2.00	--	1.00	--	3.00	3.00	3.00	2.00	1.00
CHT301.3	Basics of drying, design of equipments, Crystallization process fundamentals, solid-liquid equilibrium process types and equipments types and their design.	3.00	3.00	3.00	3.00	1.00	--	--	--	--	--	2.00	3.00	3.00	2.00	2.00
CHT301.4	Basics of membrane separation process, Types of membrane - symmetric and asymmetric membranes, composite membranes, Overview of processes -reverse osmosis, ultrafiltration, microfiltration, dialysis, electrodialysis, pervaporation, etc.	1.00	--	--	--	--	1.00	--	--	--	--	--	1.00	1.00	1.00	1.00
CHT301	Mass Transfer-II	2.50	3.00	3.00	2.67	1.50	1.50	1.50	--	1.00	--	2.50	2.50	2.50	1.50	1.50

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT302.1	Students will be able to understand the concept of chemical project design and hierarchy of a chemical project design and process synthesis heuristics	3.00	2.00	2.00	2.00	2.00	1.00	2.00	1.00	2.00	2.00	2.00	2.00	3.00	1.00	2.00
CHT302.2	Students will be able to understand the concept of conceptual design and flow sheet, finding out the best flow sheet, recycle structure and separation systems	3.00	2.00	2.00	2.00	3.00	1.00	2.00	1.00	2.00	1.00	1.00	2.00	3.00	2.00	2.00
CHT302.3	Students will be able to understand the concept of heat exchanger network (HEN), minimum energy requirement (MER), pinch approach	3.00	1.00	2.00	3.00	3.00	1.00	2.00	1.00	2.00	--	2.00	--	3.00	1.00	2.00
CHT302.4	Students will be able to understand the concepts of project engineering and economics for chemical plant design and economic feasibility of the project	--	--	--	--	--	--	--	--	1.00	2.00	3.00	2.00	--	3.00	2.00
CHT302.5	Students will be able to understand the cash flow, profitability analysis, rate of return, payback period, depreciation	--	--	--	--	--	--	--	--	1.00	2.00	3.00	2.00	--	3.00	2.00
CHT302	Process Engineering and Plant Design	3.00	1.67	2.00	2.33	2.67	1.00	2.00	1.00	1.60	1.75	2.20	2.00	3.00	2.00	2.00

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT303.1	Students developed the capability to diagnose non ideal flow in process vessels.	3	3	2	3	1	0	1	1	1	1	0	1	2	2	2
CHT303.2	Understood the fundamentals of Catalyst manufacture and its characterization.	2	1	3	1	0	1	2	1	0	1	0	2	1	2	1
CHT303.3	Gained knowledge of fundamentals of effects of intra-pellet diffusion on reaction rates in isothermal pellets.	3	3	3	2	1	1	1	1	1	0	0	1	3	2	1
CHT303	Chemical Reaction Engineering-II	2.67	2.33	2.67	2.67	1.00	1.00	1.33	1.00	1.00	1.00	--	1.33	2.00	2.00	1.33

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT304.1	Select the appropriate characterization parameters.	2	1	3	2	--	1	2	--	2	1	--	1	2	1	1
CHT304.2	Specify the properties of petroleum products.	2	2	2	2	--	1	2	--	1	2	--	1	2	2	1
CHT304.3	Attain knowledge of various separation & conversion processes involved in petroleum refining.	3	3	2	1	--	2	2	--	2	2	1	1	3	2	2
CHT304.4	Attain knowledge of manufacturing of various petrochemical products.	2	2	3	2	1	1	3	1	2	2	1	1	3	2	1
CHT304	Petroleum Refining	2.25	2.00	2.50	1.75	1.00	1.25	2.25	1.00	1.75	1.75	1.00	1.00	2.50	1.75	1.25

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT305.1	Identify different types of optimization problems.	3	3	--	2	--	2	3	2	1	2	--	1	2	1	1
CHT305.2	Understanding of different optimization techniques.	2	3	2	3	2	--	--	--	--	1	1	3	3	2	1
CHT305.3	Ability to solve various multivariable optimization problems.	2	3	3	3	2	--	1	--	--	1	1	2	3	2	2
CHT305.4	Ability to solve optimization using Excel Solver and MATLAB.	1	1	1	2	3	1	--	--	--	1	3	2	2	3	2
CHT305	Optimization of Chemical Processes	2.00	2.50	2.00	2.50	2.33	1.50	2.00	2.00	1.00	1.25	1.67	2.00	2.50	2.00	1.50

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT306.1	Students understood the complex problem solving approach, which help them in solving the practical problems given in the project.	3	3	2	2	3	1	2	1	--	1	--	2	3	2	2
CHT306.2	Students understood the basic fundamentals of heat, mass and momentum transfer.	3	3	2	2	3	1	2	1	--	1	--	2	3	3	2
CHT306	Mathematical Methods in Chemical Engineering	3.00	3.00	2.00	2.00	3.00	1.00	2.00	1.00	--	1.00	--	2.00	3.00	2.50	2.00

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT307.1	Understand the concepts of multi-component systems	3	3	3	3	3		0	2	2		0	2	3	2	1
CHT307.2	To apply phase equilibria using various thermodynamic models	3	3	3	3	3		0	2	2		0	2	3	2	1
CHT307.3	To grasp the calculation of chemical reaction equilibria	3	3	3	3	3		0	2	2		0	2	3	2	1
CHT307	Chemical Engineering Thermodynamics-II	3	3	3	3	3	0	0	2	2	0	0	2	3	2	1

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT308.1	Development transfer function models for linear dynamical processes	3	3	1	2	3	1	1	2	1	--	1	1	3	2	2
CHT308.2	Characterize the dynamics and stability of processes based on mathematical analysis	3	3	1	2	3	1	1	2	1	2	1	1	3	3	3
CHT308.3	Understand the principles of feedback controllers	3	3	3	2	3	3	1	2	1	2	1	1	3	3	3
CHT308.4	Design PID controllers using different tuning rules	3	3	3	2	3	3	1	2	1	1	1	1	3	3	3
CHT308.5	Carry out a frequency-response analysis of control loop systems	3	3	1	2	3	1	1	2	1	2	1	1	3	3	3
CHT308	Process Dynamics and Control	3.00	3.00	1.80	2.00	3.00	1.80	1.00	2.00	1.00	1.75	1.00	1.00	3.00	2.80	2.80

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT309.1	To be able to design shell and tube heat exchanger design	3	3	3	2	3	--	2	1	3	3	1	3	3	2	2
CHT309.2	To be able to design distillation column	3	3	3	2	3	--	2	1	3	3	1	3	3	2	2
CHT309.3	To be able to design packed bed, absorption column	3	3	3	2	3	--	2	1	3	3	1	3	3	2	2
CHT309.4	To be able to design agitated vessels and evaporators	3	3	3	2	3	--	2	1	3	3	1	3	3	2	2
CHT309	Process Equipment Design	3.00	3.00	3.00	2.00	3.00	--	2.00	1.00	3.00	3.00	1.00	3.00	3.00	2.00	2.00

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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	PSO2	PSO3
CHT310.1	Identify different types of chemical process industries classified as inorganic, organic and natural product industries and their applications	3.00	2.00	2.00	1.00	--	2.00	2.00	1.00	1.00	1.00	--	1.00	1.00	--	--
CHT310.2	Recall various unit operation techniques and their use to synthesize a particular chemicals	3.00	2.00	2.00	2.00	--	2.00	3.00	--	--	1.00	--	2.00	2.00	1.00	1.00
CHT310.3	Understand the process flow diagram and various process parameters for the manufacture of various inorganic, organic and natural chemicals	3.00	1.00	1.00	--	--	1.00	1.00	1.00	1.00	2.00	--	3.00	1.00	2.00	--
CHT310.4	Recognize and solve engineering problems during production	3.00	3.00	2.00	2.00	2.00	2.00	1.00	--	1.00	1.00	--	--	2.00	1.00	1.00
CHT310.5	Interpret and illustrate the material balance involved in process synthesis	3.00	2.00	--	2.00	2.00	--	--	--	--	2.00	2.00	1.00	3.00	1.00	1.00
CHT310	Chemical Technology	3.00	2.00	1.75	1.75	2.00	1.75	1.75	1.00	1.00	1.40	2.00	1.75	1.80	1.25	1.00

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC 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
CHP311.1	Students developed the capability to handle various types of reactors	3	2	2	--	1	--	2	--	3	2	--	2	3	3	1
CHP311.2	Students learnt to determine kinetics of homogeneous and heterogeneous reactions	3	2	2	3	-	--	1	--	3	2	--	1	3	2	1
CHP311.3	Students worked on non-catalytic gas-solid reaction, catalyst properties and RTD studies in reactors	2	1	2	1	1	--	2	--	3	2	1	2	3	2	1
CHP311	Chemical Reaction Engineering Lab	2.67	1.67	2.00	2.00	1.00	--	1.67	--	3.00	2.00	1.00	1.67	3.00	2.33	1.00

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT312.1	students understood the chemical and physical transport processes and their mechanism, heat, mass and momentum transfer analysis of simple processes.	3	2	3	1	3	--	--	1	1	1	--	3	2	2	1
CHT312.2	students understood how to solve differential momentum, heat, and mass balances for 1-D steady state problems and quasi-steady-state problems occurring in laminar and turbulent flows in terms of vector and tensor fluxes.	3	2	3	1	3	--	--	1	1	1	--	3	3	1	1
CHT312.3	students understood how to formulate conservation statements in heat, mass, and momentum at multi-scales from microscopic to macroscopic in both steady and unsteady modes.	3	2	3	1	3	--	--	1	1	1	--	3	3	2	1
CHT312.4	The students understood how to analyze transport problems in heat, mass, and momentum, both macroscopic and microscopic formulate simultaneous energy and mass balances in chemical processes.	3	2	3	1	3	--	--	1	1	1	--	3	3	2	2
CHT312	Transport Phenomena	3.00	2.00	3.00	1.00	3.00	--	--	1.00	1.00	1.00	--	3.00	2.75	1.75	1.25

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC 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
CHP313.1	Students understood Static and dynamic Mass transfer phenomenon involves in operation during experimental studies of diffusion, absorption, drying and distillation.	1	1	0	0	0	0	0	1	1	1	0	1	1	1	0
CHP313.2	Students understood multiphase mass transfer operations such as in experimental study of binary vapor liquid equilibrium & wetted wall column.	1	1	0	0	0	0	0	1	1	1	0	1	1	1	0

CHP313.3	Students analyzed and determined mass transfer coefficient in various operation such as solid in air diffusion & water cooling tower apparatus.	1	1	0	0	0	0	0	0	1	1	1	0	1	1	1	0
CHP313.4	Students understood the application of mass transfer devices such as batch crystallizer & bubble cap distillation column.	1	1	0	0	0	0	0	0	1	1	1	0	1	1	1	0
CHP313	Mass Transfer Lab	1.00	1.00	--	--	--	--	--	--	1.00	1.00	1.00	--	1.00	1.00	1.00	--

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC 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
CHP315.1	Understand the basic principles of design and application of the same in the chemical industry.	2	3	2	--	3	1	--	--	2	2	1	1	3	2	3
CHP315.2	Develop the skill of using commercial software for flowsheeting problems.	2	2	3	--	3	1	--	--	2	2	2	1	3	2	3
CHP315.3	Students learn to design and understand the Design of the process equipments using software as well as manually	2	2	3	--	3	1	--	--	2	2	2	1	3	2	3
CHP315	Process Equipment Design Lab	2.00	2.33	2.67	--	3.00	1.00	--	--	2.00	2.00	1.67	1.00	3.00	2.00	3.00

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC 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
CHP316.1	Understand open loop dynamics of typical chemical engineering processes such as fluid flow, chemical reactors, manometers and heated stirred tanks.	2	1	2	--	3	1	--	--	2	2	--	1	3	1	2
CHP316.2	Understand closed loop experiments which involve control loop design, controller tuning, multivariable and computer control.	2	1	2	--	3	1	--	--	2	2	--	1	3	1	2
CHP316.3	Students learn to design and execute their own experiments based on supplied objectives. Analysis and presentation of the results are done through oral and written reports.	2	1	2	--	3	1	--	--	2	2	--	1	3	1	2
CHP316	Process Dynamics and Control Lab	2.00	1.00	2.00	--	3.00	1.00	--	--	2.00	2.00	--	1.00	3.00	1.00	2.00

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		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
CHP318.1	Understand the concept of Chemical Project design and hierarchy of a Chemical Project design	2	3	2	1	1	1	1	1	2	1	1	1	3	1	1
CHP318.2	Understand the concept of Designing and the fundamental of different chemical processes and other advanced processes for designing	3	3	3	2	1	2	0	1	2	1	1	2	3	3	2
CHP318.3	Understand the concepts of engineering and economics for chemical plant design and optimization	2	1	1	1	2	1	0	2	2	1	3	2	2	3	1
CHP318.4	Understand the application of Aspen HYSYS Process simulation software for process monitoring, optimization and conceptual design, especially chemical process industries design and process calculation	0	3	0	0	3	0	0	0	3	0	3	3	1	3	2
CHP318	Process Engineering and Plant Design Lab	1.75	2.50	1.50	1.00	1.75	1.00	0.25	1.00	2.25	0.75	2.00	2.00	2.25	2.50	1.50

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT321.1	Develop understanding of petroleum engineering in particular within the oil, gas and petroleum industries.	2.00	1.00	1.00	2.00	--	1.00	2.00	1.00	--	1.00	--	--	2.00	1.00	1.00
CHT321.2	Introduction to the most recent principles and concepts of refining process ensure you are up to date with the most progressive ideas in the field.	3.00	2.00	1.00	2.00	--	2.00	2.00	--	--	1.00	--	--	2.00	2.00	1.00
CHT321.3	Students will be equipped with the necessary skills to identify, formulate and solve engineering problems related to petroleum refining process.	3.00	3.00	2.00	2.00	--	2.00	3.00	2.00	--	2.00	1.00	1.00	3.00	2.00	2.00
CHT321.4	Explain different area safety classifications used in the process industry and the impact these classifications have on maintenance work.	3.00	3.00	2.00	2.00	--	2.00	3.00	2.00	1.00	2.00	2.00	2.00	3.00	2.00	1.00
CHT321	Petroleum, Petrochemicals and Natural Gas Engineering	2.75	2.25	1.50	2.00	--	1.75	2.50	1.67	1.00	1.50	1.50	1.50	2.50	1.75	1.25

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT403.1	Able to understand how physical world can be modeled	3.00	3.00	1.00	--	1.00	--	--	--	--	--	--	1.00	2.00	2.00	2.00
CHT403.2	Understood several mathematical techniques to solve and analyze the physical problems.	3.00	3.00	2.00	2.00	2.00	--	--	--	1.00	--	--	1.00	3.00	2.00	2.00
CHT403	Modelling and Simulation	3.00	3.00	1.50	2.00	1.50	--	--	--	1.00	--	--	1.00	2.50	2.00	2.00

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT404.1	Choose a suitable separation technique for separation of product mixture	3	3	1	1	--	1	2	--	1	--	--	1	2	2	1
CHT404.2	Understated the concept of membrane based separation technique	2	2	3	2	1	--	3	2	--	1	2	2	3	2	--
CHT404.3	Understand the fundamental of ion exchange and other advanced separation techniques	1	--	2	3	2	3	1	3	2	3	1	--	1	3	2
CHT404	Advanced Separation Processes	2.00	2.50	2.00	2.00	1.50	2.00	2.00	2.50	1.50	2.00	1.50	1.50	2.00	2.33	1.50

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT 405.1	Student got knowledge of uses and techniques of plastics materials, processing, including life cycle analysis of plastic materials.	1	1	2	--	--	2	2	2	--	1	--	1	2	1	1
CHT405	Introduction to Plastic Materials	1.00	1.00	2.00	--	--	2.00	2.00	2.00	--	1.00	--	1.00	2.00	1.00	1.00

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT408.1	Show an understanding of the fundamental principles underlying safety and risk management.	3.00	2.00	1.00	--	--	3.00	2.00	3.00	--	2.00	2.00	1.00	3.00	2.00	1.00
CHT408.2	Demonstrate an understanding of issues related to the practical application of safety and risk management.	2.00	3.00	3.00	2.00	1.00	--	1.00	--	1.00	1.00	--	--	2.00	2.00	2.00
CHT408.3	Establish expertise relevant to the practice of safety and risk management.	2.00	3.00	3.00	3.00	--	2.00	1.00	--	--	1.00	1.00	--	3.00	2.00	2.00
CHT408.4	Demonstrate management skills related to planning, developing and report writing activities.	2.00	--	--	--	3.00	3.00	2.00	1.00	2.00	2.00	2.00	1.00	1.00	2.00	3.00
CHT408	Process Safety and Hazards	2.25	2.67	2.33	2.50	2.00	2.67	1.50	2.00	1.50	1.50	1.67	1.00	2.25	2.00	2.00

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT409.1	Apply the concept of optimization and optimum design with an overview of different optimization methods.	3	1	--	2	--	1	1	1	2	--	1	2	3	1	2
CHT409.2	Implement the theory and applications of optimization techniques for solving linear, non-linear, geometric, dynamic, integer and stochastic programming techniques.	3	3	3	2	--	2	--	--	2	--	3	2	3	2	1
CHT409.3	Identify, formulate and solve practical problems associated with chemical engineering in a comprehensive manner.	2	3	3	3	2	--	--	--	2	--	3	2	3	2	2
CHT409	Operations Research	2.67	2.33	3.00	2.33	2.00	1.50	1.00	1.00	2.00	--	2.33	2.00	3.00	1.67	1.67

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT411.1	Understand the basic concept of monomer, polymer and repeating units and their properties.	3	2	1	--	--	1	--	--	2	1	--	1	2	1	2
CHT411.2	Understand the basic concepts of degree of polymerization.	3	3	2	2	--	--	--	--	1	2	--	1	3	1	1
CHT411.3	Understand in detail about the chemistry of polymers and the possible chemical modification.	3	3	2	2	--	--	--	--	1	2	--	1	2	2	3
CHT411.4	Understand the physical and chemical characterization of raw materials.	3	3	2	1	--	--	--	--	2	1	--	2	3	2	2
CHT411	Polymer Science and Technology	3.00	2.75	1.75	1.67	--	1.00	--	--	1.50	1.50	--	1.25	2.50	1.50	2.00

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT412.1	Student understood the more advance control techniques such as discrete control system	--	3	1	1	2	2	3	2	--	1	2	3	3	2	2
CHT412.2	Student understood the analysis of discrete control systems by Z-transforms.	1	2	--	--	2	2	2	1	--	1	--	3	3	2	1
CHT412.3	Student understood the multivariable control with interaction among control loops, more applicable Industrial applications	2	2	3	2	3	2	2	1	--	--	2	3	3	2	3
CHT412	Advanced Process Control	1.50	2.33	2.00	1.50	2.33	2.00	2.33	1.33	--	1.00	2.00	3.00	3.00	2.00	2.00

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT413.1	Learn the fundamentals of cells, cell construction, cell construction chemicals, Enzyme kinetics i.e., enzyme catalyzed reactions, enzyme immobilization.	3	2	1	1	0	2	1	1	1	0	0	0			
CHT413.2	Learn the microorganisms growth stages and its quantifications, modeling of growth kinetics, factors affecting the growth, microbial immobilization	3	3	3	2	0	1	1	1	1	0	0	0			
CHT413.3	Learn the basics and the design of biochemical reactors -batch and continuous reactors, reactors with recycle, reactors in series etc.	3	3	2	3	0	1	2	0	1	0	0	1			
CHT413.4	Recall various unit operation techniques and their use for the separation processes of the cells and biochemical products	2	3	3	3	0	1	3	1	1	0	0	1			
CHT413.5	Apply the concepts of biochemical principles for the production of industrial important chemicals by microorganisms, treatment of industrial and municipal wastes.	3	3	3	1	1	2	3	0	1	0	0	1			
CHT413	Bioprocess Engineering	2.80	2.80	2.40	2.00	1.00	1.40	2.00	1.00	1.00	--	--	1.00			

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT415.1	Student will have some knowledge about the current scenario of energy utilization and their resources in India and on global scale.	2.00	2.00	3.00	--	--	1.00	3.00	2.00	1.00	--	--	--	2.00	3.00	1.00
CHT415.2	Students can gain some knowledge about the details of energy supply in India and storage and distribution of energy.	--	--	--	2.00	--	1.00	2.00	1.00	1.00	--	--	1.00	1.00	2.00	1.00
CHT415.3	Students will learn about the fundamentals of non-conventional energy sources, e.g. solar energy, biofuels, wind power, tidal power, geothermal energy etc.	3.00	3.00	2.00	--	1.00	--	3.00	--	--	2.00	--	--	2.00	3.00	2.00
CHT415	Non-Conventional Energy Sources	2.50	2.50	2.50	2.00	1.00	1.00	2.67	1.50	1.00	2.00	--	1.00	1.67	2.67	1.33

CO	STATEMENT	CORRELATION WITH POs												CORRELATION WITH PSOs		
		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
CHT416.1	Understood the fundamentals of heterogeneous Catalysts, characteristics, selectivity and deactivation Kinetics	3	3	1	--	--	2	3	2	2	--	--	2	3	2	1
CHT416.2	Learn synthesis and characterization of heterogeneous catalysts	3	3	3	2	--	1	2	1	2	--	--	2	2	1	1
CHT416.3	Understood the fundamentals of transport processes in heterogeneous catalyst and reactors	3	3	3	2	2	2	2	2	2	--	--	2	3	2	2
CHT416.4	Design of various heterogeneous reactors operating isothermally, adiabatically, and under non-adiabatic conditions.	3	3	3	3	2	3	3	2	2	--	--	2	3	3	1
CHT416	Catalytic Processes	3.00	3.00	2.50	2.33	2.00	2.00	2.50	1.75	2.00	--	--	2.00	2.75	2.00	1.25

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		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
CHT417.1	Students will be conversant with basic considerations in process equipment design such as fabrication techniques, equipment classification, material selection etc.	--	1.00	1.00	--	--	1.00	1.00	--	2.00	2.00	3.00	3.00	2.00	3.00	1.00
CHT417.2	Students will be able to classify the pressure vessels, use various codes for pressure vessels, selection of material of construction, operating conditions, supports etc.	1.00	2.00	2.00	--	--	2.00	1.00	--	2.00	2.00	3.00	3.00	3.00	2.00	1.00
CHT417.3	Students will be able to design shell, skirt, bearing plate and anchor bolt for tall towers.	3.00	3.00	--	2.00	1.00	--	--	--	2.00	2.00	3.00	3.00	3.00	2.00	1.00
CHT417.4	Students will be able to understand the considerations in filling of storage tanks, breathing losses, classification of storage tanks and design of liquid and gas storage tanks.	1.00	2.00	1.00	--	--	2.00	--	2.00	2.00	2.00	3.00	3.00	3.00	2.00	1.00
CHT417.5	Students will be able to design the heat exchangers	3.00	3.00	--	2.00	2.00	--	--	--	2.00	2.00	3.00	3.00	2.00	2.00	1.00
CHT417.6	Students will be able to select foundation and support for equipments/vessels, tall towers etc.	1.00	2.00	--	2.00	2.00	--	--	--	2.00	2.00	3.00	3.00	2.00	2.00	1.00
CHT417	Mechanical Design of Process Equipment	1.80	2.16	1.33	2.00	1.67	1.67	1.00	2.00	2.00	2.00	3.00	3.00	2.50	2.16	1.00

Add and delete rows for Course Outcomes as needed

Note:

- Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)